persons, when compelled to commit themselves to the water in case of accident on steamboats or shipboard may sustain themselves for days, or until they are rescued or reach a place of safety. Patented Feb. 4, 1868.

BALLASTING VESSELS.—John B. Stoner, New York city.—This invention has for its object to furnish an improved mode of temporarily ballasting a vessel, when necessary, by lowering weights into the water, so as to prevent the rolling or capsizing of said vessel. Patented Feb. 4, 1868.

MECHANISM FOR OPERATING STATIONARY MACHINERY.—Galusha Meranville, Hampton, N. Y.—This invention relates to a new arrangement of gear wheels, worms, cranks, and levers, for driving suction pumps, force pumps, and other suitable stationary machinery, and it consists in the general arrangement of gear wheels for obtaining the aforesaid object, and also in a new method of converting rotary into oscillating motion.

SCREW CAP FOR OIL CANS.—Wm. Rigg, London, England.—This invention relates to a new device to be applied to oil cans, in which kerosene and other oil is usually transported to foreign countries, so that the can may, when it arrives at its place of destination, be emptied without the loss of oil and without soiling the attendants.

TRIP HAMMER.—Charles Vogel, New York city.—This invention consists in a novel connection between the shank or stem of the hammer head and the beam through which the hammer head is tripped. Also in so constructing the beam carrying the hammer stem or shank, that it can be adjusted for raising the hammer head to a greater or lesser hight. Also a in novel combination and adaptation of springs imparting additional force and strength to the blow of the hammer, their comoination and arrangement being such as to be susceptible of adjustment for a blow of greater or lesser degree of force and strength. Also in a novel arrangement of parts for arresting the motion of the hammer without requiring the driving mechanism to be stopped. the arrangement being such as to be self-operating when set free. and to arrest the hammer when at or near the end of its upward stroke or movement and there hold it, leaving the anvil exposed. And, finally, in an arrangement of parts upon the driving shaft of the trip hammer on which they are hung. to swing about and over its driving pulley, in combination with a treadle or other suitable operating lever, for the purpose of enabling the driving belt to be more or less tightened about the driving pulley, as may be desired, or found necessary in the running of the hammer.

MANUFACTURE OF BUTTONS.—Lewis Moses.—New York city.—This invention relates to a new manner of securing the eyes or loops of glass buttons to the body of the buttons, and consists in the use of liquid glass mixed with finely powdered glass or other mineral matter, by which a sheet metal plate to which the said loop is soldered, or cemented to the underside of the button, in which a recess has been formed for the purpose. This invention is applicable to all glass or porcelain buttons and ornaments, such as breast-pins, etc.

TOY GUN—S Hubbard, Quincy, Ill.—This invention consists in the application of an elastic cord to a toy gun, in such a manner that it may be stretched or distended and held in a distended state by a catch with trigger attached, the cord being connected to a slide which works within the barrel of the gun, and all so arranged that by pulling the trigger, and thereby operating the catch and releasing the cord, the latter will, by its elasticity, eject the shot, or other missile, from the gun,

RAKING AND BINDING ATTACHMENT FOR REAPING MACHINES.—Christopher Lidren, Lafayette, Ind.—This invention relates to an attachment for automatically raking and binding grain, and is designed to be applied to reaping machines, and receives its motion from one of the driving wheels thereof,

SPRING ATTACHMENT FOR THILL COUPLINGS.—Kingston Goddard, Richmond, N. Y.—This invention consists in the application of a spring to a thill coupling, in such a manner that the jolting or jarring of the vehicle, the vertical movement of the pent axle, caused by the pent wheels passing over uneven surfaces and obstructions, will not be communicated in an appreciable degree to the thills of the vehicle, and the horse thereby relieved in the labor of drawing the vehicle, especially in traveling over rough roads.

THILL COUPLING.—Kingston Goddard, Richmond, N. Y.—This invention relates to an improved means for connecting the thills of vehicles to their front axles, and it has for its object the attachment of the thills in such a manner that the latter may be connected to and detached from the axle with the greatest facility, and when attached with the horse harnessed before the vehicle, casual detachment of the thills rendered impossible.

DUST PAN.—Samuel E. Condon, Brooklyn E. D., N. Y.—This invention relates to an improvement in dust pans for taking up dust, sweepings from floors or carpets, etc., so that the latter may be carried around a building from room to room, and the pan used and the dust deposited in the chamber until the latter is filled, when the dust chamber may be readily deprived of its contents and the sweeping, if not entirely finished, resumed.

ATTACHING SHOES TO BRAKE BARS.—James Brahn, Jersey City, N. J.—This invention relates to an improved manner of attaching shoes to the brake bars of railroad cars, whereby the shoes may be readily attached and detached, all bolts and screws being avoided, and the shoes, when attached, effectually prevented from being casually detached. The invention also relates to a peculiar application of india rubber to the shoes, whereby a requisite degree of elasticity is allowed the same, in order to prevent wear and tear.

CLOVER SEED HARVESTER.—S. L. Stockstell and W. H. H. Scarff, Medway, Ohio.—This invention relates to a machine for gathering or harvesting the heads of clover, cutting the heads from the standing stalks, and consists of a suitable bed suspended from an axle and provided with a cutting and raking attachment.

ORNAMENTING BOOTS AND SHOES.—Georgs Smith and Godfrey Smith, New York City.—This invention relates to a mode of ornamenting boots and shoes, designed as a substitute for and an improvement upon the ordinary mode of producing ornaments by crimping the leather through the medium of dies.

MACHINE FOR CUTTING VENEERS.—Henry Cassing, New York city.—This invention relates to a machine for cutting veneers, and consists in the employment or use of a reciprocating knife, arranged to work in a plane slightly inclined from a vertical position, in connection with a laterally moving log carriage, all being combined and arranged in such a manner that the knife is made to operate with a drawing cut, and perform its work in a perfect manner, and with but a moderate expenditure of power.

BOOT CRIMPING MACHINE.—E. H. Rice, Port Henry, N. Y.—This invention relates to a machine for crimping boots, and it consists of a series of rotary trees in connection with a plurality of jaws or pressure plates, all constructed and arranged in such a way as to admit of boots being crimped rapidly and in a perfect manner.

MOWING AND REAPING MACHINE.—James H. Redfield and Walter J. Cox, Salem, Ind.—This invention relates to a cutting apparatus, the same consisting of a series of hook shaped teeth, attached to or formed on a bar, the ends of which are attached to or connected with cranks, or crank pulleys, which operate the teeth or sickle bar so that each tooth of the bar will pass from the center of one guard or finger across the space and into the adjoining guard or finger, and in thus moving act with a drawing cut upon the grain or grass, cutting the same in a perfect manner, and with a very moderate expenditure of power. The invention further relates to a new and improved means for discharging the grain in gavels from the machine, and further, in a peculiar manner of applying the frame which supports the cutting apparatus and grain-discharging device, to the main frame, whereby the cutting apparatus may be adjusted higher or lower, as desired, with the greatest facility.

BED BOTTOM.—John C. Fry, Sidney, Ohio.—This invention relates to a new manner of securing the wire for holding the elastic rings, in the ends of the slats, and in the cross-pieces that are secured to the bedstead. The said wires are secured in such a manner that the ends of the slats are not only not weakened by their application, but are actually strengthened and prevented from splitting.

COSMETIC.—J. M. Wilson, Seguin, Texas.—This invention or discovery relates to a new and useful improvement in the composition of a cosmetic for removing freckles or tan discoloration from the skin and improving the complexion. This improvement consists in combining certain chemical ingredients and making a solution thereof with which the skin shall be wet for the purpose aforesaid without injury to the tissue.

HERNIA TRUSS.—Samuel Green, New York city. This invention relates to an improvement in the construction of a truss for ruptures of the bowels or hernia and consists in a novel and simple combination of springs and pads with the main supporting bars.

GATE HINGE.—Paul Dennis, Schuylerville, N. Y.—This invention consists of an improved gate hinge and has for its object increased strength and durability of the hinge and diminution of the friction in opening and closing the gate.

MACHINE FOR BORING POST HOLES.—A. Q. Allis, Dayton, Ohio.—This invention consists in operating a vertical boring bar by crank and gearing and in an arrangement whereby the auger is fed down into the ground by a screw and raised from the ground by a lever and also in the manner in which the feeding screw nut is made to engage with and is detached from the boring bar and also in a boring tube.

COMBINED PILLOW AND SUPPORTER.—Emeline T. Annis, Mt. Morris, N. Y.—This invention consists in forming the pillow on a plate or flat surface of metal or wood or some other suitable material, and attaching thereto a jointed bracket and supporting rod so arranged that the pillow may be adjusted to suit the wants of the invalid or other person occupying it by turning a thumb nut.

TREATING PHOSPHATIC MINERALS OR EARTHS.—John Commins, Charleston, S. C.—This invention relates to an improved mode of treating natural phosphates or phosphatic minerals and earths for the purpose of rendering them soluble to serve as fertilizers.

HORSESHOE.—James Jorey, Westville, Conn.—This invention relates to a horseshoe of that class which are provided with removable or detachable calks. The invention consists in having the calks constructed and applied to the shoe in such a manner that they may be not only detached from the shoe but also reversed and secured thereto in such reversed position as to admit of a fresh cutting or sharp edge for the calks being obtained, the calks being constructed with two edges to obtain this result. If necessary or desired one edge of the calks may be made sharp and the other edge comparatively blunt so that a horse may, by a very simple adjustment of the calks be provided with either sharp or blunt calks, be either sharp or "rough" shod, the latter condition being preferable when the roads are not very slippery or icy and the former condition preferable when there is much ice.

BREAD AND VEGETABLE CUTTER.—Hiram A. Titus, Gloversville, N. Y.—This invention relates to a new bread and vegetable cutter which is so fitted at its two ends in a frame that when it is drawn through the article to be cut a combined drawing and pressing cut will be imparted to it.

MACHINE FOR CLEANING COTTON.—Richard H. Hilton, Newbern, N. C.—This invention consists of a perforated case, into which the cotton is fed from the cotton gin, together with rollers, for the purpose of ejecting the cleaned cotton in the form of a sheet or pressed web more convenient for packing.

MEASURING AND TALLYING ATTACHMENT FOR THRESHING MACHINES.—W. F. Abbott, Marengo, Ill.—This invention relates to a machine for measuring grain, and tallying the number of measures of the same, which pass through it, and consists of an elevating spout measuring chambers and automatic tallying register, and other mechanism perfecting the whole.

CLEAT.—Jonathan Bangs, South Dennis, Mass.—This invention consists of a lever, having on its upper side a hook into which the line or rope is passed, and is thus passed under the handle so that any draft upon the hook will press down the handle, and thereby bind upon the line.

CATTLE PRICKER.—R. A. Carson and W. T. Peter, Briensburg, Ky.—This invention relates to a new method of constructing apparatus whereby cattle are prevented from lying down away from from home at night, and whereby also they are prevented from jumping fences, and are made more manageable when they are driven by droves. It consists of a leather strap fastened around the fore leg of the animal, above the knee, said strap having sharp pieces of metal secured to the same, and bent downward, so as to prick the animal when it attempts to lie down or jump.

GRAIN REGULATOR FOR GRIST MILLS.—E. W. Hitchings, Potsdam, N. Y.—This invention refers to an attachment to grist mill stones, for the purpose of regulating the supply of grain passing into the stone. It consists of a cylinder carrying a governor which regulates the opening through which the grain falls according as the stone is driven fast or slow, together with other devices perfecting the whole.

WAGON LOCK.—C. A. Kenyon, McGregor, Iowa.—This invention relates to a new and improved method of constructing wagon locks, by means of which the brake is more firmly held against the wheel, and whereby also the pressure of the same is more quickly and easily taken off. It consists of a pawl, pivoted in a slot in the lever by means of which the brake is operated, engaging in the teeth of a metallic segment, so as to hold the brake firmly against the wheel, after the hand of the operator has been removed. It consists also of the lever being bent at the lever end, and provided therein with a slot in which the pivot on which said lever turns may move, so that by the reverse motion of the lever the slot in the bent end of the lever will slide over the pivot, and the pressure of the brake upon the wheel will be relieved.

SAND HEADS FOR AXLES.—Norman Maxham, Hancock, Vt.—This invention relates to a new and improved method of constructing apparatus for preventing sand or dust from working into and injuring the boxes or axles of carriages. It consists of a sand head attached to the hub, revolving with said hub around the axle within a cover or box attached to the axle, said cover being provided on the under side of the same with a nick or notch through which sand or dirt caught will fall to the ground.

DRILL AND COUNTERSINK.—P. A. Whitney, Woodstock, Vt.—This invention relates to a new and improved method of constructing drills and countersinks, whereby they are combined in the same tool, are more simple in their construction, and more certain in their operation. It consists in the countersink being in two parts, with the drill between the same, keyed in such way in splines in the chuck as that the same are adjustable, the chuck being screwed into the lathe socket so that the two segments of the same are forced firmly together, thereby holding the drill and countersink firmly in the chuck. It consists also in one of the splines in the same segment of the chuck being deeper than the other, and deeper, also that the opposite spline in the outer segment of the chuck, whereby the cutting edge of counter sink is brought into proper position for cutting a countersink.

CURLING IRON.—Samuel E. Condon.—Brooklyn, E. D., N. Y.—The present invention relates to irons used for curling in the dressing of a person's hair, and consists in providing for the iron a casing or sleeve of suitable construction to incase and hold the same, whereby the iron, being first heated by inserting it in a suitable furnace therefor, or otherwise, and then placed in such case, the necessary heat is imparted thereto for curling the hair, when applied to the same, the combination of the case with the iron always preserving a smooth and even surface for being presented to the hair, however much the iron itself may become "scaled" from the action of the fire thereon.

BUCKLE OR FASTENER FOR STRAPS, ETC.—S. W. Durham, Ipava, Ill.—This invention relates to an improved fastener or buckle for securing and fastening the end of a strap when turned over at its end upon itself for forming a loop.

LITHOGRAPHIC AND AUTOGRAPHIC PRESS.—Chas. C. Maurice, New York city.—This invention relates to a lithographic, or other printing press, in which the stone or block is held in an adjustable frame, which can be expanded or contracted, so as to be adjusted to stones of different widths.

CONCRETE BRICK MACHINE.—Isaac Pardee, Vineland, N. J.—This invention relates to a new machine for pressing and forming concrete stones for building purposes, in a separate press, which is so constructed that it can be easily handled, and that the ready pressed concrete can be easily removed from it.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

202.—SEWING MACHINE.—Singer Manufacturing Company, New York city. Jan. 20, 1868.

214.—APPARATUS FOR INDICATING THE RELATIVE POSITIONS AND MOVEMENTS OF CERTAIN HEAVENLY BODIES.—John Davis, Allegheny City, Pa, Jan. 21, 1868.

207.—SECURING CORKS IN BOTTLES.—Richard Scrivener, New York city. Jan. 21, 1868.

215.—FURNACE.—Henderson Ross, Pittsburg, Pa. Jan. 21, 1868.

219.—LIBERATING THE COLORING MATTER OF MADDER, ETC., FROM THE LIGNEOUS MATTER OR CELLULOSE.—Alfred Paraf, Boston, Mass. Jan. 21, 1868.

269.—PULL FOR DOOR BELLS.—Sterling Bonsall and Louis Hillebrand, Philadelphia, Pa. Jan. 25, 1868.

278.—HATS, BONNETS, ETC., AND MACHINERY FOR MANUFACTURING THE SAME.—Henry Kellogg, New Haven, Conn. Jan. 27, 1868.

280.—MACHINERY FOR GRINDING AND POLISHING CONCAVE SURFACES.—Wm C. Hicks, New York city. Jan. 27, 1868.

281.—MACHINERY FOR FORMING HAT BODIES, SKIRTS, ETC.—John H. Prentice, Brooklyn, N. Y. Jan. 27, 1863.

299.—BELLOWS FOR FORGES.—John and Walter Bowden, Brooklyn, N. Y. Jan. 28, 1868.

317.—BREECH-LOADING FIRE-ARMS, AND CARTRIDGES AND BULLETS FOR THE SAME.—Hiram Berdan, New York city. Jan. 29, 1868.

Answers to Correspondents.

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

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however when paid for as advertisemets at $1 00 a line, under the head of "Business and Personal."

☞ *All reference to back numbers should be by volume and page.*

T. H., of Wis.—"In dispute A makes the following proposition: Of two equal bodies, impelled by equal force against equal resistance the time of their arrival at their respective destinations must be in the proportion of those distances, or: Equal bodies impelled by equal force against equal resistance will describe equal space in equal time. To this B dissents and asks for proof. A says the proposition is self-evident. What is your opinion?' We regard the proposition as self-evident and cannot conceive the ground of B's denial.

C. M. T., of Ind.—"How can I make a lithograph transparent? I have tried balsam of fir and dammar varnish but specks appear after drying." We think Canadian balsam, if pure and carefully laid on, would be effectual.

J. R. W., of N. C.—"What per cent of water is expended to elevate a given quantity of water to a certain hight by the hydraulic ram?" A good ram will yield effectively 60 per cent.

L. M., Jr., of Pa., is anxious to build a "paper boat" and wants to ascertain the sort of paper and *modus operandi*. Such boats have been built which were light, safe, and durable. A patent on making boats of paper is owned in part by Elisha Waters, Troy, N. Y. Write to him for information.

O. S., of Ohio.—"Is there anything gained by applying steam to the surface of a wheel, if confined as closely as in a steam engine cylinder creating no more friction? I have a simple device by which I can do this successfully." Yes. If you can make a rotary engine that has no more friction than a reciprocating one you have an invention we would like to see.

H. P. D., of Texas, says that kerosene oil on whet-stones is superior to any other for the purpose, as it keeps the stone in better condition and assists the operation of sharpening.

J. C. B., of Ill.—Tubing for an artesian well of 200 feet depth may be made of two-inch gas pipe, connected by thimbles and screw threads in the usual way. Piping or casing of cast iron four inches diameter should be sunk to the first stratum of rock.

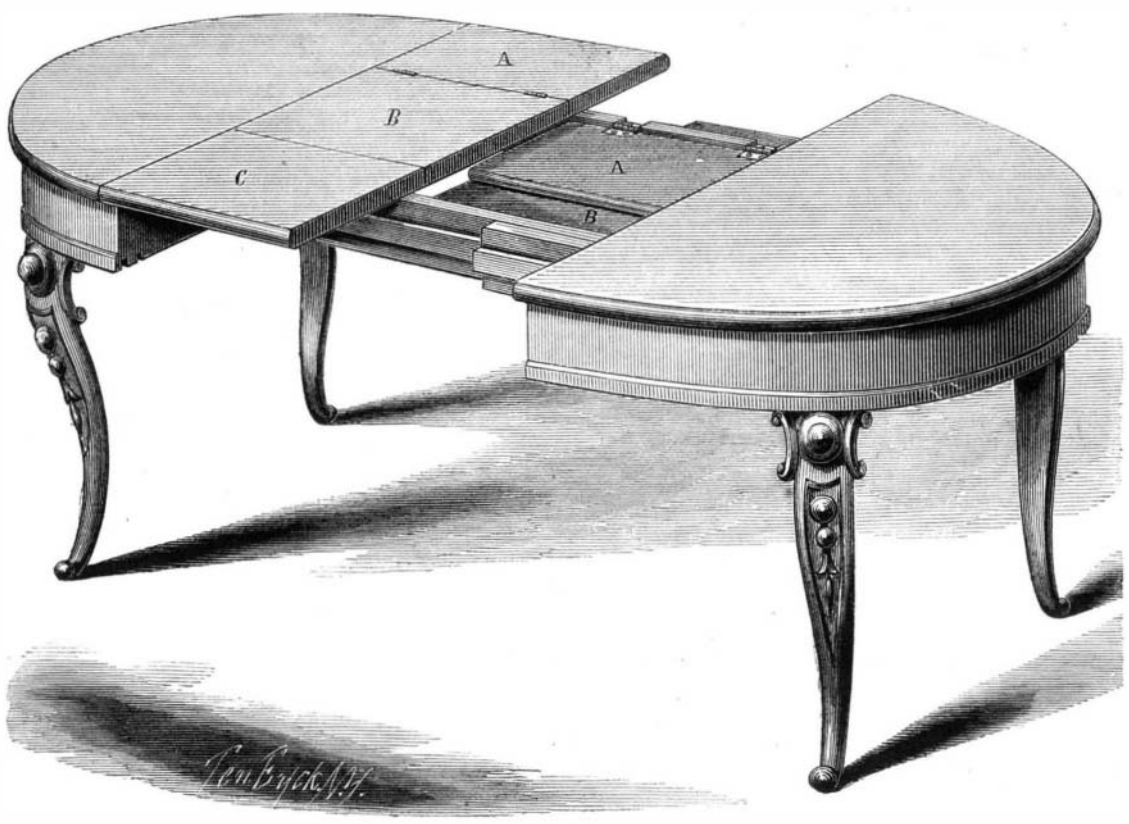
Business and Personal.

The charge for insertion under this head is one dollar a line.

Improvement in Extension Tables.

The dining table now in almost universal use, which may be made to accommodate from four to twelve or more persons, is a great improvement on the old fashioned table, the surface of which could be enlarged only by raising and securing in place hinged outside leaves. But to the modern extension table there are some objections, the lifting and finding a place to deposit the extra leaves when not required for use being quite a serious one. To obviate this difficulty is the principal object of the improved table seen in the engraving. As will be seen, the supplemental leaves are in three sections, hinged together in such a manner that they may be folded one upon the other and shut closely within the body of the table frame. One set is seen open in the engraving, and one set closed. A is the narrow section, being one of the outside leaves; B is the middle and widest section, and C one of the side leaves, folding, when closed, under the middle leaf, B. If greater support to the outer leaves than is afforded by their connection with each other and contact with the frame, is desired, a light bar is adapted to slip into suitable recesses on the outside rim of the table directly under the leaf.

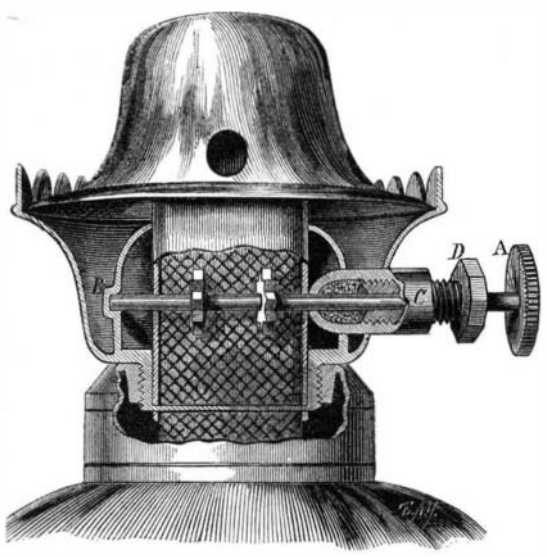
It will be seen that there is no annoyance or labor of lifting out and putting in heavy sections of table top, nor is there so much danger of the leaves splitting and warping as when they are large and movable. The table is essentially a unit, and even when closed to its smallest dimensions can be readily moved about, or used for a center table, and still contains within itself all the elements of an ordinary extension table. It is an invention, we predict, that will come into extensive use. It was patented through the Scientific American Patent Agency, Nov. 6, 1866, by J. B. Curtis, whom address for further information, at Port Henry, N. Y.



J. B. CURTIS' INCLOSED LEAVES EXTENSION TABLE.

GROSVENOR'S IMPROVED NON-EXPLOSIVE LAMP.

The cause of explosions of kerosene and other hydro-carbon lamps is generally believed to be the ignition of hydrogen gas contained in the reservoir between the surface of the liquid and the top inner surface of the lamp. Atmospheric



air or oxygen, being admitted to this space, makes, in combination with the hydrogen, a highly inflammable gas, needing only ignition or a certain degree of temperature to cause an explosion. Now if this gas can be displaced by one which is anti-phlogistic it is evident all danger from this source will be avoided. This, the inventor believes, he has accomplished in this simple improvement.

The engraving shows the details of this device as applied to an ordinary kerosene oil lamp. It is intended to entirely exclude atmospheric air from the interior of the lamp, no orifice but the wick tube—which should be filled by a closely fitting wick—leading from the external atmosphere to the interior of the lamp. All the joints of the burner are made air tight by soldering or brazing. The end of the elevating shaft opposite the thumb piece, A, which ordinarily passes through the side of the burner, is supported in a close socket, B, inside the shell, and the other end passes through a stuffing box, C, containing suitable packing which is set around the shaft by the hollow screw, D.

The inventor says, in brief, that "with this burner, as the vacuum made in the oil reservoir by the consumption of oil cannot be supplied with atmospheric air, it must, necessarily be supplied with nitrogen gas—or any uninflammable gas generated by combustion, as carbonic acid. As oxygen and nitrogen are separated by combustion, and the oxygen is consumed in the process, the liberated nitrogen necessarily descends by atmospheric pressure through the interstices of the wick, in sufficient quantity to supply the gradually extending vacuum, even to the entire exhaustion of the oil, when the reservoir will be filled with this anti-phlogistic gas, in which even a lighted match will not burn for an instant. As there is no orifice for ventilation, evaporation from within is precluded except through the tube to the flame, where it can be profitably used; consequently no oil can gather on the outside of the lamp to soil fingers or clothing or to invite external ignition and consequent internal explosion."

Patented Dec. 10, 1867, by Cyrus P. Grosvenor, who may be addressed at McGrawville, N. Y.

Treating Wood for Covering Walls, etc.

Patented by Abbot R. Davis, of Cambridge, Mass. My invention consists in the employment of glycerin for saturating the thin sheets or laminæ of wood to be used as a wall covering, or for other purposes. whereby the sheets are rendered soft and plastic, and thus prevented from cracking and breaking when exposed to a dry atmosphere before or after being applied to the wall or other surface.

Glycerin and water, in about the proportion of one part of the former to two or three of the latter, are mixed together, the two ingredients readily uniting. The thin sheets of wood above referred to are now saturated with this mixture, and then placed where the water may evaporate therefrom, the glycerin still being retained by the wood and being absorbed by it so as to cause it to remain permanently soft and pliable. The amount of glycerin to be mixed in water may be increased according to the nature and degree of hardness of the wood to be saturated, but I have found the mixture produced by the ingredients in about the proportions first named to answer a good purpose, and glycerin alone may be used without departing from the spirit of my invention. I am aware that glycerin has been employed for saturating sponge to render it elastic for use as a substitute for hair and other material for filling mattresses. The application of glycerin for this purpose I do not, however, claim, but confine myself to the following, viz: the employment of glycerin for saturating thin sheets or laminæ of wood to be used as a wall covering or for other purposes, substantially as described.

Illuminating Gas Mixture.

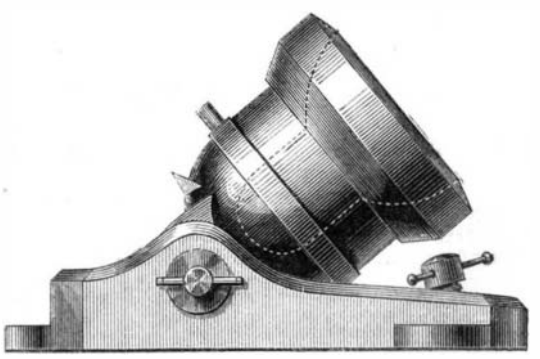
John J. Ensley, of New York city, has patented the following: I make common coal gas in the usual way, and by ordinary means. I also make separately a gas from any convenient vegetable substance or substances, such as wood, shavings, sawdust, etc., and mix the gas with the coal gas in any convenient proportions, according to convenience, or the relative abundance or cheapness of the two gases; or, I make a gas from any animal substance or substances, such as bones, offal, etc., and mix with the coal gas in convenient proportions say, of one part of the gas from animal substance to three parts of coal gas, or otherwise; or, I mix the gases, made both from vegetable and animal substances with the coal gas, in convenient proportions, no exact proportion of either being essential.

The object of this mixture of gases is threefold: first, by the mixture of different gases in this way, especially by the ad mixture of gas from animal substances with coal gas, I am more sure to produce good illuminating gas, by furnishing proper proportions of carbon and hydrogen; second, in the separate manufacture of gases made from vegetable and animal substances, I produce and utilize other products of the distillation, such as charcoal and bone black; and third, in many instances, by having an abundance of vegetable or animal substances, or both, at hand, and not otherwise of value, I can make use of them and thereby cheapen the manufacture of gas for illumination.

Mountain Mortars.

After all has been done to reduce the weight of mountain mortars to a minimum, it remains a fact that they are not portable in the highest degree, and it is not to be denied that in the endeavor to secure such portability as they possess much of their efficiency has been sacrificed. We believe that as a consequence of the existing prejudice against mortars a very valuable weapon has not been supplied to our Abyssinian troops, and, as none of the essentially military papers have called attention to the subject, we do so. About twenty-four years ago we carried on a war against certain of the aboriginal New Zealand tribes and a very troublesome, and, in its way, expensive little war it proved to be. At that time we had no rifled mountain guns, but we had little howitzers, intended to answer much the same purpose, and probably not much less efficient. These howitzers, however, proved to be next to useless. The natives entrenched themselves within pahs, from whence they could not be dislodged, and into which our troops could not get without great loss of life. The pah consisted of spaces inclosed by walls made of piles driven in two rows about four feet asunder, the space between being filled with clay after the manner of a coffer dam. The little howitzers in some cases could not be brought up to act against these pahs at all, and in others they could not breach the walls. "Toney Heckey," a native chief, constructed one of these pahs on the top of a hill, from which he could not be dislodged. In this emergency, Capt. G. R. Mann, R.E., proceeded to Sydney, and from his designs twelve little mortars, as illustrated in the accompanying engraving, were made by Mr. Russell, of Sydney.

Our engraving, for which, with this description, we are indebted to *The Engineer*, prepared from the original tracing made twenty-four years ago, illustrates their construction so clearly that no special description is necessary. The cast-iron base weighed but twenty-eight pounds, and was fixed to a piece of two-inch plank 24 by 16. The mortar, of gun metal, weighed only 65 pounds, and was, of course, still more portable. The charge consisted of 8 ounces of powder and a common 5-inch shell. It may be thought that as there was no length of chase, only half the shell being contained in the mortar, the range would have been very small. In point of fact, however, the range was 550 yards, quite sufficient for the required purpose. These little mortars were carried up



by a few men within a few hundred feet of the pah to be attacked, and pitched their shells with ease into the very heart of the camp. They proved perfectly effectual, and infinitely more useful than the small guns, not only in attacking pahs, but in dislodging the enemy from jungle, as they could be put down at a moment's notice, and used while troops were on the march. They certainly exceed in power any other weapon of equal weight, for a 5-inch shell, weighing some 12 or 14 pounds, and containing a heavy bursting charge, is no contemptible foe. The remarkable range of these little mortars is an excellent illustration of Lynall Thomas' theory of the percussive action of exploding gunpowder, and it is possible that with gun cotton the range would be still greater. Judging by the good service they have done, we cannot resist the conclusion that a few such mortars would prove a useful addition to our Abyssinian armaments.—*Mechanics' Magazine*

CHASSEPOT WOUNDS.—It appears from the testimony of surgeons who participated in the last Garibaldian campaign, that while a large number of troops are put *hors de combat* from the multitude of missiles which this fire-arm can scatter over the battle-field, yet by reason of the small size of the projectile, the number of fatal injuries is very small in proportion to the total number of wounded. It has also been ascertained that the Chassepot bullet rarely shatters a bone, but in the large majority of cases passes around it.