Phosphorus Steel Making.

M. F. Gautier, engineer of mines, France, gives the following useful sketch of the various methods for producing phosphorus steel, or, to use a more correct definition, phosphorus cast metal. This metal, says M. Gautier, cannot be employed in industry except on condition that it is nearly deprived of carbon, consequently every process which will yield extra soft steel will, with inferior materials, produce phosphorus cast metal.

I. THE BESSEMER PROCESS.—1. *The ferro-manganese process practised at Terre Noire.*—The silicious pig iron used contains but little manganese; the first stage, that which precedes the appearance of the yellow ray in the spectroscope, lasts about a quarter of an hour, according to the richness of the pig iron in silicon. There is no explosion, the flame is pure, without smoke; the completion of the operation is positively marked by the disappearance of all the rays of the spectroscope with the single exception of the yellow sodium ray. For the production of extra soft metal, the refining is prolonged for about twenty seconds, the blast is stopped, and the converter is laid on its side. Manganese iron, previously heated to redness, is then thrown in by means of shovels, taking care that the pieces pass through the scoria and enter the metal. The manganese iron used is an alloy containing a little carbon; the manganese in it reduces the oxide of iron in the converter, and the greater part of the carbon is converted into oxide of carbon in the form of brilliant flames. When the agitation ceases, the charge is drawn. The metal is even and quiet, without bubbles or other irregularities; and, which is of essential importance, the product is always equal and regular in practice. This is the method also which is adopted at the Seraing works, with the same manganese iron.

2. *Swedish method, with highly manganiferous pig iron.*—The pig iron used is without silicon, but rich in manganese, the proportion running from 4 to 5 per cent. The character of the operation is such that there is not what is called a first period; the yellow ray appears at once. There are abundant explosive projections, which would render the process ruinous if care were not taken to have enormous converters relative to the quantity of metal treated. The flame is veiled by smoke and gases, the principal of which is oxide of manganese. It is difficult to control the operation; for if the temperature be reduced by additions of small quantities of steel and iron, the object is not attained, for the heat must be retained in order to keep the metal in such extreme fluidity as will permit the oxide of iron to separate itself and arrive at the surface, for no addition is made of spiegel. The work is carried on blindfolded, for the intermittent flashes of flame are blinding; the heat caused by the explosions is annoying, and the spectroscope is misleading. From time to time samples of the scoria have to be drawn to find how matters are proceeding; after a certain amount of experience, the state of the metal is ascertained by the behavior of metallic globules under the hammer, and from the color of the scoria. But the results are uncertain, and have to be classified. The ingots, moreover, are liable to shrink and to become flawed. This mode is adopted at Fagersta, in Sweden; at Zwickau, in Saxony; and Maxhütte, in Bavaria; but it requires all the value that attaches to the production of extra soft steel to induce any one to continue a method so uncertain.

3. *English method, that of spiegeleisen by explosion.*—In this process, silicious pig, such as that of Cumberland, for example, is employed, and the operation is carried considerably beyond complete decarburation. In order to succeed, a certain quantity of oxide of iron, neither more nor less, must be produced in the bath, and which carries off by explosion the carbon of the spiegeleisen which is added. This instantaneous production of oxide of carbon is dangerous, a part of the metal, and sometimes the whole charge, being projected out of the converter, and endangering the operator and his men. Generally the product is soft, but it is liable to flaws, which are not much felt in sheet iron, but which unfit it for rails. Steel makers will choose whichever of these three methods appears to them the most advantageous for the production of phosphorus steel with pig iron of second quality. M. Gautier adds: The Bessemer process is destined to lose much of its importance in presence of the certain and unlimited extension of the Martin-Siemens process, which, he considers, will take the lead in future, and regulate prices. It is capable of using up old iron, and employing almost all kinds of ore, for puddling is still the only known method of practically getting rid of the greater part of the sulphur and phosphorus; while the Bessemer process, requiring silicious pig iron containing little sulphur, must always be of a limited application. The true mode of making phosphorus steel is then in the sole furnace.

II. THE MARTIN-SIEMENS PROCESS.—In this method the matter is more simple. In order to produce extra soft metal there is but one way, that is to say, to act chemically upon the oxide of iron in the bath. Manganese iron must be resorted to, as spiegel always gives hard products; the proportion is the same as in the Bessemer process, namely, 1 per cent of the whole, or about 2 per cent of manganese iron to 40 or 50 per cent of useful metal. When a sample is procured which bends perfectly when cold, the manganese alloy heated to redness is added, the bath is stirred slightly, and the charge run off.

An account, by M. Grüner, of the process followed at Zwickau and Maxhütte, supplies a striking confirmation of the fundamental properties of phosphorus steel; you may introduce phosphorus into cast steel on condition of eliminating the carbon, and the less the amount of the latter the greater may be that of the former. Practically, by the German method, which is really but that of Fagersta applied to ess pure materials, metal is produced which may almost be said to be without carbon, and, as no spiegel is introduced, there is no element of recarburation. It is not, then, astonishing that the metal thus obtained should be perfectly malleable and yet contain a notable proportion of phosphorus, that is to say, half the quantity which may be tolerated in a truly soft steel, when produced in a Martins Siemens furnace with manganese iron

Having a Hobby.

The question "is there money in it?" is said by some men to be the test by which everything is to be received or rejected. And those who offer this very mercenary gage claim to be the only "practical" men, and the true prophets for these times, and indeed for all times. The science of getting, the art of keeping, and the process of increasing are deemed by them to include all that is useful in the circle of sciences, the field of art, and the aims of thought. Most people concede in the abstract these pretensions of the mercenary philosophers, though the great majority in practice are better than their theory.

The maxim, roughly expressed, that "everybody should have a hobby," is a good one, provided that the "hobby" one rides should be a mental rather than a sensual one. It should carry the rider over the route of mental improvement to the development of his reasoning and analytical powers, and thus promote the growth of the attributes which distinguish him from the brutal and ally him to the divine. To go back to the question alluded to above, in regard to education, the first question asked may very well be: "Is there money in it?" But if this be the last question as well as the first, and the sole object of learning be mercenary, the seeker will find relief in bodily excesses, from his mental discipline. Or, classing drudgery of the mind with drudgery of the body, he will look for enjoyment where the intellect may be laid aside, like the tool of the artisan or the ledger of the merchant.

It was well said in a recent address to young men, in the evening classes of the City of London College, that "they must extend their mental horizon by raising the level of their sight; that they had to adorn their lives as well as to sustain them; and that they had not only to be tradesmen but men." The speaker told them that they must not only pursue their technical studies, but, as a relief and recreation, follow themes calculated to raise the tone of their minds and carry them beyond the routine of their daily lives. He said that they had not only to live but to enjoy their lives. He recommended them to take up one subject, "to which they could devote themselves with such enthusiasm that it would become a pleasure and a relaxation." To a man immersed in any business pursuit, it is highly desirable that he should change the current of his thoughts and prevent his whole existence from being confined to one routine, which, without such relief, must inevitably dwarf his intellect and weary his body.—*Philadelphia Ledger.*

Steam Hill Climber.

A new locomotive for use on Ithaca Hill, N. Y., has made its appearance. The incline has five tracks, of which the two outer are of the usual width, used in the ordinary manner. When the engine starts up the hill, it rests upon a pair of rails just within the usual track and upon a set of double flanged small driving wheels which are upon the same axles with the big drivers—they being only about thirty inches in diameter; this inside track is raised about fifteen to eighteen inches above the outer one, and high enough so that the big drivers do not touch the track at all; the engine rests now upon the small drivers, and is independent of the outer ones; then in the center of the track is placed a wide cogged rail, which exactly meshes into the cog wheel which is between these small drivers, directly under the center of the locomotive. Thus it will be seen that, by applying power to the big drivers, in the ordinary way, the power is applied to the cogged wheel, which does the climbing. The cogs are about three inches from tip to tip, and the wheel is eight inches wide.

Bright Deep Blue on Wool.

The following is said to yield a tolerably fast color, of desirable luster, similar to that of dark vat blue: The wool or cloth is prepared by boiling for an hour in a hot kettle, with 2½ lbs. alum, ¾ lb. chromate of potash, 1½ lbs. sulphuric acid, and 2 ozs. tin salt in solution, for 40 lbs. of material. It is then opened out and well cooled, and allowed to lie for 12 hours. The day after, 8 lbs. of logwood are boiled in a fresh bath, and then 3 ozs. of aniline violet (the bluish, soluble in water) are added, and, as soon as it is dissolved, an other ½ lb. of sulphuric acid. The prepared articles, after being washed or rinsed, are placed in the bath at 122°, and, after half an hour, are worked at a boil for an hour. More aniline violet affords a stronger blue, more logwood a deeper blue. The color can easily be cleaned in cold water.

PRODUCTION OF OZONE.—Ozone may be easily and abundantly generated in any apartment by means of an aqueous solution of permanganate of potash and oxalic acid. A very small quantity of these salts, placed in an open porcelain dish, is all that is necessary, the water being renewed occasionally as it evaporates. Metallic vessels should not be used.

AT the Edinburgh Literary Institute, Professor Geikie stated it to be his opinion that his colleague, McCroall, had pitched upon the precise epoch in which the glacial era had taken place, and attributed it to a period of great eccentricity of the earth's orbit, which took place about 240,000 years ago and lasted about 160,000 years.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]
From February 2 to February 25, 1875, inclusive.

AXLE.—S. L. Harrison, San Francisco, Cal.
BALANCED SLIDE VALVE.—E. T. Smythe, New York city.
BEVEL, SQUARE, RULE, ETC.—W. Ascough, Buffalo, N. Y.
BOILER FURNACE.—H. A. Studwell, Brooklyn, N. Y.
BUSTLE, ETC.—A. W. Thomas, Philadelphia, Pa.
CAR SPRING.—G. Godley, New York city.
FERTILIZER.—B. Ackerman, New York city.
FILLING BOTTLES, ETC.—J. B. Bradford, Boston, Mass., *et al.*
FILTER.—J. Outerson *et al.*, Windsor Locks, Conn.
FREEZING, CHURNING, ETC.—W. Redheffer, St. Louis, Mo.
FURNACE GRATE.—J. B. Larkin, Pittsburgh, Pa.
HARVESTER.—D. M. Osborne, Auburn, N. Y.
HORSE SHOE NAIL.—J. R. Heard, Boston, Mass.
IMITATION LEATHER, ETC.—C. H. Knelles, New York city.
LOOM HEALD.—H. O. Whipple, New York city.
MOTIVE POWER ENGINE.—G. Westinghouse, Jr., Pittsburgh, Pa.
MULTIPLEX TELEGRAPH, ETC.—T. A. Edison, Newark, N. J.
NEEDLE.—W. Trabue, Louisville, Ky.
ORDNANCE.—G. H. Felt, New York city.
OVERALLS.—H. F. Woodward, New York city.
PATCHING BULLETS.—H. Borchardt, New Haven, Conn.
PORTABLE LATHE.—F. Scott, Bennington, Vt.
PRISM.—J. W. Queen & Co., New York city.
ROCK DRILL.—E. S. Winchester, Boston, Mass., *et al.*
RUBBER BOOT AND LAST.—I. F. Williams, Bristol, R. I.
SCREW PROPELLER.—A. C. Fletcher, New York city.
SHEARING SHEEP, ETC.—E. Chaquette, San Francisco, Cal.
STEAM ENGINE.—A. S. Cameron (of New York city), London, England.
STEP SURFACE.—G. A. Keene, Lynn, Mass., *et al.*
TREADLE APPARATUS.—G. D. Bows, Boston, Mass.

Recent American and Foreign Patents.

Improved Washing Machine.

Silas W. Holbrook, Catskill, N. Y.—The invention relates to an arrangement of yielding plates forming the continuous inner wall of the suds box, and being free to move at each end between parallel guide blocks. The clothes are put into the space between the ribbed spring plates and a ribbed cylinder, and are carried around through said space by the revolution of the said cylinder, and are washed clean by being rubbed against said plates, and by being carried around through the water.

Improved Seat for Extension Carriages.

James V. Randall, Newtown, Pa.—The rear seat is made adjustable toward or from the front of the carriage, and the elastic front seat is pivoted and supported, so that the weight of the person or persons sitting upon it will spring its center down slightly, which tends to throw the lower ends of the standards outward, and thus holds the gudgeons securely in their sockets.

Improved Lamp Burner.

Walter McKinley, Tremont, Ohio.—The object of this invention is to provide a lamp burner of improved construction, which shall be simple and detachable in all its parts, and, in consequence of the same, more convenient to clean and easy to keep in repair. It consists in a burner cap provided with a groove, in combination with a detachable wick tube, a detachable set of spur wheels for adjusting the wick, and a detachable shaft for operating said wheels. It also consists in the peculiar construction of the spur wheels, and in the manner of fastening the devices together.

Improved Ditching Machine.

Senator Theodore F. Randolph, Morristown, N. J.—Ex-Governor Randolph has for some time past been engaged in developing the novel form of ditching machine which forms the subject of this patent. The device now completed presents many excellent points of merit, and, in the opinion of the inventor and many of his friends, is the most practical and efficient of the many machines for ditching purposes now before the public. Its construction is such that it will work equally well in clayey or sticky soils and in sandy or loose soils. It may be readily adjusted and controlled, so as to sink a vertical ditch upon inclined or uneven ground, and the ditching wheel may be readily fed down as the ditch increases in depth. There is a novel combination of parts for adjusting the angle and hight of the shoe with relation to the ditching wheel. By suitable construction, the wheel and frame can be raised and lowered without affecting the axle, and the axle can take any inclination the surface of the ground may require without affecting the ditching wheel and its frame. The rear axle may be inclined in either direction to accommodate it to the surface of the ground. The edges of the flanges of the ditching wheel are made sharp, so that they may be sunk into the soil at the bottom of the ditch by the weight of the wheel and frame, so as to separate the sides of the slice of soil to be raised from the sides of the ditch. As the soil passes over the top of the wheel it is delivered into a chute, by which it is discharged upon the side of the ditch, and which is provided with a tongue, which enters the channel of the wheel and serves as a scraper to disengage the soil from said channel. The frame and ditching wheel may be held in a vertical position, while the axle is inclined in either direction by its wheels in passing over uneven or inclined ground. By this construction, all the necessary adjustments can be made without stopping the machine. Knives shave off the sides of the last previous cut to widen the ditch, and enable the ditching wheel to work freely and without binding.

Improved Sheep Holder for Shearing.

Joseph R. Virgo, Texas, Mich.—This consists in an adjustable shearing table, having an adjustable stand and plates for holding the legs of the sheep. When a sheep is fastened on the table, it is in an easy position and convenient for the shearer, and can be turned by turning the table to the right or left, as may be required.

Improved Fifth Wheel for Vehicles.

George F. Putman, Fonda, N. Y.—The head block or axle is provided with guard plates at both sides and opposite points of the fifth wheel, for protecting king bolt and wheel.

Improved Parlor Fountain.

Herman Wenzel, New York city.—Air is forced by the upward pressure of water in the base through a pipe, over the water in a chamber below, and, by its compressive force, ejects the liquid through the nozzle. A pump operated by a treadle is arranged within the base, and connected with the lower chamber of the basin by a pipe, so as to enable the water in the base to be forced into the lower chamber of the basin, and kept there in full supply.

Improved Combined Fluting and Sad Iron.

Charles Raymond Rand, San Francisco, Cal.—This invention relates to an improved fluting and sad iron which is heated internally with gasoline or other volatile distillate of petroleum. It may be readily used on different sides, either as a sad iron or for fluting. A detailed illustrated description will be found on p. 150 of our current volume.

Improved Bridle Bit.

Peter Casey, Newport, R. I.—Side pieces pass through mortises in the ends of a movable bar. The side pieces, in order to render them adjustable, are provided with holes, which receive the ends of set screws, so that the bar is securely held in place. The driving lines are attached to the loops of the bar.

Improved Wagon Jack.

Samuel Chard, Mianus, Conn.—This invention consists in a cramping band and pillar, with a hoisting lever having a fulcrum pin and holding hook. The long end of the lever being depressed, the weight will be thrown upon the fulcrum pin, which will cramp the band on the stand and prevent it from slipping.

Improved Range.

Edwin O. Brinckerhoff, New York city.—The arrangement of the flues in this range is such that it may be thoroughly and uniformly heated for baking purposes, that it may be used for boiling purposes without being wholly heated, may have a strong draft, and may be easily manipulated to control the heat.

Improved Saw Mill.

Charles Lindner, Hockley, Tex.—The intermediate wheel for running the carriage back is mounted on the lever, which is pivoted to a fixed pivot, so as to have a little end motion. It is connected at the other end by a link to lever, in which the shaft is journaled, and which is so pivoted that, whenever said lever is shifted to gear the feed, it throws out the running back gear; and when it is shifted so as to gear the running back train, it throws out the feed.

Improved Shoe Blacking Case.

William H. Morse, East New York, N. Y.—A foot-rest bar rests in notches in the inner sides of the box, and is kept from rising by a plate or tenon, which enters a groove. In a block which fits in the box is a round hole to receive the box of blacking, which is secured in place by a curved spring. The cover is supported, when turned down, by a wide cleat, which, with another cleat, serve as handles for lifting and carrying the case.

Improved Hay Gatherer.

Chesley Thomas Noell, Clarksville, Mo., assignor to himself and Uriel Griffith, of same place.—This invention consists in a toothed rake provided with pulleys to which the traces or draft appliances are connected. When the load of hay has been drawn to the place of stacking, the rake may then be drawn from beneath the hay and another load gathered.

Improved Fanning Mill.

Asa Y. Felton, Plain View, Minn.—The sieve is of sheet metal, the perforations being of the same size and farther apart in the upper portion, where the grain is received on it, than in the lower portion. This causes a larger portion to slide along the sieve before falling through, and spreads the falling grain more evenly throughout the area of the sieve, so that the air will act to better advantage. The sieve supports are shifted up and down in the side boards of the shaker, and fastened at any point to hold the sieves in the proper descent by slide bolts.

Improved Die for Making Chain Swivels.

Philander H. Standish, Jefferson City, Mo., assignor to himself and J. H. Bodine, of same place.—When the link blank and eye piece are put in their places in the dies, and pressed together, the overlapping ends of the link blank will be folded around the neck of the eye and welded together, and at the same time be shaped and finished in regard to form by one or two blows of the dies. The prongs of the eye piece are then heated and bent up, shaped, and welded in any approved way.

Improved Wheel Cultivator.

George S. Brower, George W. Brower, and Edwin A. Brower, Crawfordsville, Ind.—Devices are provided to swing the inside plows laterally to the row, for regulating them to the curvatures, and to correct the effect of irregular driving; and to so shift the plows, hangers are connected to cranked foot levers, which are to be worked by the driver's feet as he rides in the seat.

Improved Velocipede.

Walter Knight, San Andreas, Cal.—The feet rest on supports during the revolving of the front crank axle by the hands, and turn a lever and therewith turn the wheel to either side for guiding and steering the perambulator. The steady hold which is exercised by the simultaneous action of the feet on the fulcrum lever keeps the steering wheel in any desired position, so that the carriage may be easily guided in the required direction.

Improved Churn.

August Meyer, Port Washington, Wis.—In the cover is formed an air hole, in which is inserted a tube, to the upper end of which is attached a knob. The base of the knob is made of a larger diameter than the tube, so as to prevent the said tube from dropping through the cover. The lower end of the tube is flanged with stops, to prevent it from being drawn out of said cover. The lower end of the tube is open, and in the sides of its upper part are formed holes, so that, when the said tube is drawn up, the air may pass out and in freely, and when the said tube is pushed down the passage of air may be prevented. The milk is prevented from spattering into the tube by a guard plate.

Improved Draft Equalizer.

Edwin A. Beers, De Kalb, Ill.—By this invention, the draft of three horses, when used abreast, is equalized. A rod is attached to the front of the wagon, and the tongue is attached to the rod by braces. These braces have eyes which slide on the rod, and the tongue may be adjusted in any desired position by means of collars, in which are set screws. The evener is attached to the tongue at a point about one third of the length of the evener. A single whiffletree is provided for the right-hand horse. A lever is fastened by a joint through its end to the end of the evener, and a chain is attached to the lever at a point about one fourth the length of the lever from the loose end. This chain is attached to the rod by an adjustable slide. A whiffletree is attached to the loose end of the lever for the middle horse. A band is attached to the under side of the evener, and surrounds the lever and limits its action back and forth. Lastly, a whiffletree is attached to the evener for the outside horse.

Improved Window Ventilator.

Samuel W. Couch, Cold Spring, N. Y.—Two sets of plates are placed directly over the top bar of the upper sash, and the top bar of said sash is grooved upon its upper side to such a depth as to receive the plates when they are closed up. With this construction, when the upper sash is lowered, the plates descend with it or open out, and when the said sash is raised they are closed up and inclosed in the groove of the upper sash bar, so as to be entirely out of sight. The air passes in and out through the spaces between the plates.

Improved Spring Bed Bottom.

Joseph Fowler, New York city, and John R. Dewar, Bergen, N. J.—This improvement relates to connecting the slats of the bed bottom in pairs or sections, and also preventing endwise movement of the same, by means of notched blocks, which engage or lock with the springs that support the bed.

Improved Music Leaf Turner.

William H. King, Petersburgh, Ind., assignor to himself and Jerome Borer, of same place.—This is an attachment consisting of a cord fastened by a hook and elastic strap to the left side of the music rack, to be wound around the knob of the music leaf turner. It passes then over suitable pulleys to a lever pivoted to the under side of the piano, the front part of which is acted upon by a hinged plate with segmental ratchet, and operated by the leg or foot, turning the leaves, on raising the ratchet plate, by means of the elastic strap in one direction, and by means of the lever in opposite direction.

Improved Pawl and Ratchet.

Ralph Tomlinson and Joseph Smith, Boston, Mass.—The pulley is loose on the shaft, the ratchet is keyed to it, and the pawl is fixed on a pivot at or about the middle, and has a projection with relation to which and the pivot of the pawl the spring is so arranged that it will hold the pawl either in or out of connection with the ratchet, according to which way it is shifted.

Improved Revolving Spice Box.

Thomas W. F. Smitten, New York city.—This consists of two or more upright cases, with perforated tops for pepper and other condiments, pivoted on the vertical spindle of a stand, to swing horizontally around it. There are as many imperforated covers as there are cases, less one, so contrived that, the one case to be used being shifted to the place where it is uncovered, the others will, by the same operation, be brought under cover, so that the holes will be closed in all except the one to be used.

Improved Whip Tip Ferrule.

Edward B. Light, Denver, Col.—A short solid cylinder is fitted into the center of the ferrule, and secured there by a pin. A rod passes longitudinally through the center of the cylinder, and is rigidly secured. Upon each end of the rod is cut a screw thread. In using the device, the butt end of the tip is screwed into the ferrule until it strikes the end of the cylinder. The small end of the whip stock is afterward screwed into the other end of the ferrule until it strikes against the end of the cylinder. By different sizes of ferrules, a whip, when broken, can be cut into at the break and conveniently repaired, without the use of any tool.

Improved Level.

Christian C. Schwaner, Winterset, Iowa.—The case is made hollow, with a slot in the middle part and with semicircular projections upon its upper edge. Upon the front projection is formed a scale. The rod of a pendulum passes up through the slot, and has a knife-edged crosshead attached to its upper end. A pointer is pivoted to the pendulum and receives a pin, which serves as a fulcrum. The pin is bent at right angles, and is passed through a hole in another pin, which may be turned with a screw driver to adjust the pin first mentioned, which is secured adjustably in the hole by a set screw. The upper end of the pointer passes up to the scale, so as to indicate the angle of inclination of the object to which the instrument may be applied.

Improved Garden Rake.

Frederick B. Hedge, Greenport, N. Y.—This invention consists of a garden rake having a series of concave teeth or tines with sharpened ends at one side, and concave and larger teeth at the other side, for being used, as required, for breaking the earth or for drawing furrows.

Improved Motor for Light Machinery.

David Baldwin, Midland Park, N. Y.—This machine is a stool or seat, on which the operator sits and gives a rack the reciprocating motion instead of using his feet, the reciprocating motion being converted to a rotary motion. The motor is adapted to sewing machines and similar light mechanism.

Improved Street Sprinkler.

William Westerfield, New York city.—In the main tank is a valve tank, to contain the valves, and to which the sprinkling tubes are connected, the said tank being connected to the principal tank by a pipe. This valve tank will have a portion of the cover contrived to be readily removed to afford access to the valves, for adjusting them and for other purposes.

Improved Clothes Line.

Thomas S. Cary, Brooklyn, N. Y.—This invention consists in having a double pulley block attached at a window sill; and opposite it, near the other end of the same window sill, is a single pulley block set on a building opposite, through which the traveler rope runs. Thus, when fully extended, there will be two clothes lines full instead of one, as heretofore, thus saving time, labor, and space, both in extending the line and also in taking in the clothes.

Improved Feed Water Heater.

Horatio N. Waters, West Meriden, Conn.—The corrugated pipe through which passes the exhaust steam is attached to the head of the heater, and thus suspended within it; and a branch pipe extends therefrom, down through the bottom of the heater, to carry off the water of condensation. Said branch pipe is fitted in a stuffing box so as to have free vertical movement corresponding to the vertical expansion and contraction of the corrugated steam pipe under the variations of temperature. By this construction and arrangement of parts, the leakage incidental to the ordinary feed water heaters is effectually avoided, since the joints or other parts of the heater are subjected to no strain in consequence of variation in the degree of temperature.

Improved Sawing Machine.

John Gehr, Clear Spring, Md.—The invention consists in the main shaft of a sawing machine provided with ratchets, pawls, bars, and yokes, whereby light work may be done rapidly, and heavy work slowly, by hand, while horse or other power may readily be applied when desired.

Improved Car Coupling.

William Green, Hyde, England.—The invention consists in employing as a car coupler a pivoted hook closed by a rear spring and opened by a lever, thus entirely avoiding the use of pins that are so often lost or stolen, and dispensing with all complication of parts that render it liable to frequently get out of order.

Improved Bee Hive.

Julius S. Coe, Mont Clair, N. J.—This invention consists of a bee house and bee hives combined, and is so constructed and arranged that the room containing the hives is protected on all sides by a series of dead air spaces, and provided with thorough ventilation. The air inside may thus be kept at any desired temperature, quite independent of the exterior atmosphere. It is claimed that this device insures a certain crop of honey, fully protects and preserves the bees in winter, prevents the operator's being stung, and that, when thus constructed, a house and fifty hives will cost a third less than the same number of good outdoor hives, and yield a much larger and more certain profit.

Improved Hydraulic Packing.

John F. Taylor, Charleston, S. C.—This invention relates to an improved hydraulic packing, and it consists in a ring of rubber or other elastic material contained within a cup ring of leather, and attached to the same at one side and free at the other, and the whole disposed within a groove in the cylinder. The water enters the loose side of the cup ring and presses it tightly against the ram, the rubber serving to accommodate the unequal thickness of the leather, and keep the latter always in proper place.

Improved Wooden Barrel.

H. W. Fitzhugh, Bay City, Mich.—The invention consists in using straight staves having parallel edges, with constricted bands whose overlapping ends are fastened by a screw extending into the wood. This enables the barrel to be made entirely by machinery, and renders coopering unnecessary.

Improved Shirt Bosom Supporter.

James S. Edmunds, Princeton, Ky.—The object of this invention is to cause the shirt bosom to stand out prominently and evenly from the breast of the wearer. The device consists of elastic longitudinal metallic strips connected by ribs and plates.

Improved Fish Plate and Rail Fastening.

Joseph M. Kenny, Blairsville, Pa.—This invention relates to certain improvements designed to give greater security to fish plates and fastenings for railroad rails; and it consists in a bolt having a locking bit which, when turned, occupies the position transverse to the slot in the rail and plate. The rail is slotted to allow for expansion and contraction, and the bit rests in a space between the rail and the fish plate which receives the nut. The said plate is indented upon its exterior surface with depressions which prevent the nut from tuning, and the bolts are provided with diamond-shaped heads, by means of which the position of the locking bit upon the inside may be determined.

Improved Lamp Extinguisher.

Professor Wm. H. Zimmerman, Chestertown, Md.—The object of this invention is to provide a means for extinguishing lamps, in which the danger resulting from blowing down the chimney is avoided, and the habitually foul snuffing devices dispersed with. It consists in a hollow rubber ball, or other compressible air chamber, combined with the burner of the lamp by means of a flexible tube, so as to direct a blast of air upon the wick by squeezing the ball. The vents or quenching tubes are of a construction adapted to any kind of lamp burner; and the blast directed by them upon the wick being horizontal, or inclined upwardly if desired, the danger resulting from the old way of blowing down the chimney is avoided.

Improved Corn Planter.

Silvanus P. Evans, Ash Ridge, Ohio.—The invention relates to improvements in walking planters. The machine includes means for adjustment of the shafts and longitudinal beams, also a conical-shaped seed-spreading or distributing device which is pivoted within the seed spouts, so that it may swing and adjust itself to the vertical inclination of the seed spouts, and also to devices forming an adjustable connection between the seed spouts and bars or devices for covering the seed in the furrow.

Improved Gate Latch.

Robert C. Bernard, Rocky Mount, Va.—This invention relates to certain improvements in gate latches. It consists in the combination with a double catch attached to the gatepost, of a lever pivoted to the gate at one end and weighted at the catch, and a second lever pivoted in the middle and weighted at the end farthest from the catch, so that gravity causes both levers to latch the gate, one above the catch and the other below the same. These two levers are connected by a vertical bar, by means of which both levers are operated at once to open the gate, for the convenience of persons on horse back, in connection with which said bar and levers a knob is used for pedestrians.

Improved Hydro-Electric Lamp.

Professor Wm. H. Zimmerman, Chestertown, Md.—The object of this invention is to provide a safe and practical self-lighting lamp, and it consists in a hollow lamp pedestal filled with sulphuric acid and water, or some other suitable exciting fluid, and containing an inverted bell jar with suspended bits of zinc in the same to form a Döbereiner apparatus. To said pedestal are attached two brackets, in one of which is supported a small galvanic battery, and in the other an ordinary coal oil lamp having in its burner a tube connecting with the hydrogen generator, which directs a jet of hydrogen upon the wick of the lamp. Said jet passes over a piece of platinum wire conducting the two electrodes of the battery, which, when the elements of the battery are brought into operation, ignites the jet, the battery and the hydrogen generator being so connected that the depression of a single lever synchronously turns on the hydrogen, and brings the elements of the battery into contact.

Improved Lemon Press.

Henry Newberger, Fort Wayne, Ind.—The object of this invention is to press lemons so that the juice will be more thoroughly squeezed out and made to flow into the glass or receptacle without any admixture of dust or specks from the air. The device consists of a convex plunger which fits into a correspondingly concaved basin that receives the lemon or section of lemon, and has a med - an aperture through which the juice is expressed.

Improved Horse Hay Rake.

Benjamin Mellinger, Mt. Pleasant, Pa.—This invention relates to certain improvements in horse rakes, and it consists in a frame having a bent lever pivoted thereto, and provided with a stop hook, a traction rod with bifurcated ends and adjusting holes, and a cleaner attached to branched rods, all combined and arranged for the purpose of affording an improved means for lifting and manipulating the rake.

Improved Cartridge Belt.

David Taylor, U. S. A., Leavenworth, Kan.—The invention consists in a cross slotted belt provided with an interlacing strap, and a clamp having lower extensions bent backwards, and wings forwardly bent toward each other until the opposite edges nearly or quite meet.

Improved Motor.

John M. Cayce, Franklin, Tenn.—The object of this invention is to enhance the practical value of a gravity motor, by securing the best effects of the force of gravity, with a comparatively small expenditure of power for restoring the actuating weight to its original position for a continuance of the motion. It consists in the combination with a pivoted support bearing a weight, of a spring and rock seat, the latter rigidly attached to each other, and so combined with the support as to transmit the full power of the weight through the rock seat to the running gear, and yet to admit, through the auxiliary agency of the springs, of the shifting of the weight to the opposite side of its fulcrum by a smaller application of power than its own gravity. It also consists in the devices for shifting the said weight, and in means for adapting the principle of the motor to industrial purposes.

Improved Invalid Bedstead.

James Goodwin, Lennoxville, P. Q., Can.—This invention relates to certain improvements in invalid bedsteads, and it consists in an adjustable stretcher frame arranged above the bed and provided with hinges at the four corner posts, by means of which the whole stretcher may be adjusted inclinedly at one time, for adapting it to be used as a fracture bed. The stretcher is also provided with hinged head and foot frame operated by cords and pulleys for placing the patient in sitting posture. It also consists in a shaft under the bed provided with radial arms which are united at their extremities by a connecting rod passing through the hem of the sheet, by means of which the patient may be turned from one side to the other, the said device being operated by a windlass with a cord and pulleys.

Improved Blacking Brush.

Andrew McElrath, New York city.—The invention relates to a blacking brush constructed with a hollow back, which is adapted to receive the implements commonly required in the operation of polishing boots or shoes, such as a cleaning tool and brush, a brush for applying the blacking, a box of blacking, etc.

Improved Tea and Coffee Pot.

Louis Evans, Pittsburgh, Pa.—The invention consists in a coffee pot having a cone-shaped bottom, a perforated false bottom, and a cup, so arranged that, as the water percolates through the coffee and false bottom, all the essence thereof is carried into a separate chamber, all the internal parts being so connected that they can be lifted out together by a central handle.

Chief Engineer's Office, U. S. Navy Yard,
WASHINGTON, November 18, 1874.

Commodore Thos. H. Patterson, U.S.N., Commandant:

SIR:—In obedience to your order of October 5th, 1874, o carefully test the EMPIRE PORTABLE FORGE, manufactured at Troy, N. Y., I have the honor to submit the following report:

* * * * * * This is a very excellent and convenient forge. It works easy and with but little noise, and the power being applied with a lever, it can be worked without interfering with the manipulation of the fire.

I can recommend it as a very useful tool for work on ship board or shop use.

Very respectfully, your obedient servant,
[Signed] EDWIN FITHIAN,
Chief Engineer, U.S.N.

Business and Personal.

The Charge for Insertion under this head is $1 a Line.

Notes & Queries

W. H. A. will find directions for bleaching beeswax on p. 299, vol. 31.—W. M. will find a recipe for silver-plating solution on p. 299, vol. 31.—W. H. M. will find directions for coloring putty on p. 107, vol. 31.—R. C. J. can plate iron with silver by the process given on p. 314, vol. 24.—W. H. W. will find an explanation of sailing faster than the wind on p. 176, vol. 28.—R. H. H. will find directions for bronzing on iron on p. 283, vol. 31.—H. E. will find directions for case-hardening iron on p. 69, vol. 31.—F. E. H. will find a recipe for marine glue on p. 43, vol. 32.—E. E. W. will find the recipe for furniture polish and also for finish for black walnut on p. 315, vol. 30.—J. K. S. and J. S. S. should each consult a physician.—C. G. M. will find a description of the wonder camera on p. 26, vol. 31.—C. C. S. will find directions for preparing muriate of ammonia for inhalation on p. 315, vol. 31.—W. H. and many others are assured that there is not and cannot be an instrument for indicating hidden treasure.—J. D. will find directions for softening and toughening wood on p. 319, vol. 31.

(1) W. J. A. asks: Will nitro-glycerin explode through a capillary tube? A. If we understand your question, yes.

(2) C. D. B. asks: What kind of oil is the best to preserve shoe leather, and to keep it soft? A. You will find neatsfoot oil the best.

Will a compound of cologne, hartshorn, tincture of cantharides, oil of lavender, oil of rosemary, and oil of nutmeg injure the skin? A. Probably not if used only a few times, and not in excessive quantity. Cologne is mostly all alcohol, which has a very injurious effect upon the skin, if used frequently, by dissolving out the natural oils, leaving the skin harsh and dry. If in the formula you present the oils are in excess of the alcohol or cologne, then the cologne is of no use on the skin and can be dispensed with; if, on the other hand, the cologne is in excess, the oils are of no use, as the uncombined alcohol is free to unite with the oils and fats of the skin. Unless the skin is diseased, the best lotion is cold water.

(3) F. S. asks: How can I use india rubber in either turpentine or naphtha without impairing its elasticity? A. Caoutchouc dissolves in bisulphide of carbon, coal naphtha, and rectified oil of turpentine. In these liquidsit first swells up very considerably, and eventually forms a ropy liquid, which, on evaporation, leaves the caoutchouc with its original elasticity.

(4) F. W. asks: How is nitro-glycerin made, and how is it exploded? A. See p. 91, vol. 32.

Is there such an invention as the screw of Archimedes for elevating water? A. The screw of Archimedes, called after the philosopher that invented it, is one of the simplest machines for raising water, and operates at only short distances. It consists of a tube wound spirally round a solid cylinder, the lower end of which dips beneath the water at an angle of about 35°, the upper end being supported by a suitable arrangement, and fastened on a crank, which serves to rotate it.

(5) R. S. G. asks: What are the ingredients of Seidlitz powders? A. Rochelle salts 1 drachm, carbonate of soda 25 grains, tartaric acid 20 grains. Dissolve the two first in a tumbler of water, then add the latter, and drink immediately.

(6) N. P. K. asks: 1. How can I prepare hard enamel? A. Mix 100 parts of pure lead with 20 to 25 of the best tin, and bring them to a low red heat in an open vessel. The mixture then burns nearly as rapidly as charcoal, and oxidizes very fast; skim off the crusts of oxide successively formed, till the whole is thoroughly calcined. Then mix all the skimmings and again heat as before, till no flame arises from them, and the whole is of a uniform gray color. Take 100 parts of this oxide, 100 parts of white sand, and 25 or 30 of common salt, and melt the whole by a moderate heat. This gives a grayish mass, often porous and apparently imperfect, but which runs to a good enamel when afterwards heated. 2. How can I bring a low quality of gold to the color of 18 carat gold? A. Alloy it with the proper proportion of silver and copper. 3. I have a quantity of silver melted with lead; it is so brittle that I cannot roll it. How can I get it in condition to work? A. The desired object may be attained by melting the alloy in a cupel formed of bone ashes. The lead is gradually oxidized, melted, and absorbed by the porous material composing the cupel.

(7) H. P. A. says: I am now using the sap part of the white wood tree, cut to the thickness of 36 to the inch. In order to cleanse it of the sap and woody taste, I boil and frequently change the water, yet do not get it tasteless. How can I cleanse it of the taste without injuring the strength of the wood? A. Try weak lye, and water afterwards.

(8) T. B. C. asks: Is there any way of restoring marble that has been spotted with lemon juice? A. Marble being a carbonate of lime, the action of such an acid upon it would be to enter into combination with the lime, expelling the carbonic acid, forming a different body from the original marble; and from the fact of its being a mealy powder, it was easily wiped away without notice, leaving behind it the blur or depression in the surface of the polished plate you speak of. We do not think it can be remedied.

(9) H. S. says: What is the simplest way to make an apparatus for blowing glass, such as is used by men that travel the conntry? A. What you require is a current of air forced upon a flame produced from a wide illuminating surface, as a large wick, or, better, a gas flame widened and then subjected to the current of air.

(10) A. C. B. asks: 1. Is there any way to harden coin silver? A. We do not know of any. 2. Is there any hard metal or alloy that can be used for fine work, and will not scale when heated? A. Try the alloy known as packfong, or German silver, a compound of nickel, zinc, and copper, in which the proportions vary considerably. A good alloy consists of 5 equivalents of copper, 3 of zinc, and 2 of nickel. Packfong is of a yellowish white color, and, when newly polished, closely resembles silver in appearance.

(11) F. C. asks: Will anything dissolve lithia carbonate except carbonic acid water? A. Yes, ammoniacal salt.

(12) H. H. asks: How can I make bisulphate of tin? A. You probably mean bisulphide of tin ($Sn S_2$), known also as mosaic gold; it forms a beautiful yellow flaky compound, which is obtained by preparing an amalgam of 12 parts of tin and 6 of mercury; thisis reduced to powder and mixed with 7 parts of sublimed sulphur and 6 of sal ammoniac. Thismixture is introduced into a flask with a long neck, and is heated gently so long as any smell of sulphuretted hydrogen is perceptible; the temperature is then raised to low redness calomel and cinnabar are sublimed, and a scaly mass of $Sn S_2$ remains. If the heat be pushed too far, part of the sulphur is expelled and the operation fails; the sal ammoniac appears by its volatilization to moderate the heat produced during the sulphuration of the tin, which would otherwise rise so high as to decompose the bisulphide.

(13) F. C. and others.—Most medical authorities agree that the rightside is the better to sleep upon; but this is not always the case, the number of persons who sleep upon the left being as many as those who use the right side. It is simply a matter of convenience and ease, it being folly to insist upon a person to use one side when it is a discomfort.

(14) J. W. asks: 1. What is the tenacity of gold? A. It will take 24·20 lbs. weight to break a gold wire having a sectional area of a square millimeter, if the gold be annealed. If the gold be drawn, it will require 61·60 lbs. to break it. 2. When gold is consumed by fire, what is the color of the flame? A. Molten gold exhibits a sea green color. 3. What is the color of light transmitted through a pellicle of silver? A. Bluish. 4. When silver is consumed by fire, of what color is the flame? A. The spectrum of silver is green. 5. How can cinnabar be converted into a yellow pigment? A. Continued pulverization will change the brick red color of cinnabar to an orange yellow.

(15) F. W. B. says: I have some white silk which has become yellow by washing. How can I restore it to its original color, without injuring the silk? A. Try steeping it for a short time in vinegar or lemon juice, after having perfectly cleaned it. Rinse in cold water.

(16) J. H. L. asks: How can I illuminate tableaux with a strong light, and have changes of color without resorting to the use of disagreeable compounds? How can I prepare and use the calcium light for the above purpose? A. The magnesium light is sometimes used for this purpose. The method of obtaining it consists in burning maguesium ribbons which may be obtained from any chemist or dealer in theatrical goods. In the calcium or lime light, an ignited jet of the compound gas (oxygen and hydrogen) is caused to impinge against a small cylinder of caustic lime. In the apparatus used for this purpose, the gases are conducted by separate tubes to the burner, which they enter at opposite sides, a few inches from the tip of the burner. The burner or jet should be bent towards the vertical surface of the lime at an angle of about 45°. The lime should approach the tip of the jet within $\frac{1}{16}$ of an inch. The gases are kept in separate bags of india rubber. The oxygen gas is obtained by heating together, in an iron or copper bottle, chlorate of potash with one quarter its weight of peroxide of manganese. Hydrogen gas may be obtained by acting upon scraps of zinc in a large bottle with dilute sulphuric acid. The first portions of the gas, if obtained in this manner, should be allowed to escape, otherwise its mixture with the air in the apparatus forms a very explosive mixture. Ordinary illuminating or coal gas, if obtainable, will answer the purpose as well as pure hydrogen. Both the above gases are washed before being allowed to enter the bags. This is arranged as follows: A small bottle is obtained, which is partially filled with water; through a tightly fitting cork in the mouth of the bottle pass two glass tubes, one of which passes down and dips beneath the surface of the water, the other barely passes through the cork. In order to use this washer, the tube which dips under the water is attached by rubber tubing to the generating flask, and the end of the other tube, which just passes through the cork, is attached to the receiving bag. Thus arranged, the gas as generated is required to pass through the water. Care should be taken (in the generation of the oxygen) at the end of the operation that the water in the bottle does not run back into the generating flask, otherwise an uncontrollable quantity of steam will be generated from contact of the moisture with the hot metal.

(17) F. N. J. and others.—The statements made as to the preparation of musk are on the authority of a work recently published on perfumery, and presumably reliable.

(18) D. S. M. asks: 1. What effect will alum water have on flour when used for dampening wheat before grinding it? A. Probably the same as when applied after the wheat is ground, as is often done by bakers. 2. Will it toughen the wheat so as to give a better yield? A. We think not. 3. Is it injurious to health? A. Yes. This method of whitening the bread is prevented by heavy fines and penalties in England.

(19) S. C. B. asks: Does soap boilers' refuse contain anything unfavorable to its use for agricultural purposes? A. Not that we know of.

(20) W. O. P. says: We frequently find melted lead flowing from stove and grate in which we are burning coal. A boy once showed me a piece of what I presume was lead ore; I could cut it with ease with my pocket knife. A few days ago we heard a snapping report in the stove, and melted lead splashed out on the floor and burnt my brother's hand. Are not these facts indications of lead in quantity somewhere in the district? A. Yes. 2. If so, would it be found above or below the coal vein? A. It might be found below as well as above. 3. If there be lead, how could the vein be most easily found? A. By carefully examining the exposures of the rocks for the vein, and by surface indications of minerals containing lead.

(21) K. B. F. asks: Is carbolic acid a poison taken internally or applied outwardly? A. It is a poison in both cases. It acts similarly to creosote.

(22) S. T. asks: How are paper magnetic fish made, so that when they are put in the palm of the hand they will draw up and turn over as if alive? A. They are made of thin gelatin, called gelatin paper. Collodion films may also be used for the same purpose.

Will tobacco smoke have any effect upon soft rubber tubing? Will vinegar corrode it? A. Neither will have any permanent effect.

(23) J. S. & Co. ask: What is a good solution for tempering steel for drilling rock? A. Be careful not to overheat it in hardening and forging, and quench in salt water, drawing to a brown color.

(24) J. P. S. says: I recently came across a strange stone; it weighs 2 or 3 tuns, and is formed of small stones about the size of a hen's egg. It seems to have been ground off on the outside, for it is perfectly smooth. It lies half a mile from a small stream, and on a hill fully 100 feet above the stream. What is it? A. Such rocks are called conglomerates, and are quite common in some parts of New England and elsewhere.

(25) O. A. Jr. asks: How can I drill hard cast iron, without annealing it? A. Harden the drill to a straw color, and run it slowly.

Should an icehouse be set on or above the ground? A. See p. 251, vol. 31.

(26) W. W. B. says: An apparatus for gold and silver plating is constructed as follows: Bath: 4 ozs. cyanide of potassium and 4 ozs. carburet of ammonia, dissolved in 1 gallon rain water. Then add 12 grains gold (or silver), apply battery, and add blue vitriol until a blue color is obtained. Battery: Put nitric acid in the porous cup, and diluted sulphuric acid in the outer. Suspend a carbon plate in the porous, and zinc in the outer, with small copper wires. I use the gold solution hot. I am very careful to clean thoroughly the articles plated, but the work will not last six months. Can you inform me of a process by which I can do plating that will last one, two, or three years? A. To make a silver solution, dissolve the silver in four parts of nitric acid and one of water; the diluted acid is heated in a vessel and the silver added by degrees. After the metal is dissolved, put it in a large vessel and dilute with water. Then add a solution of cyanide of potassium so long as a white precipitate is formed. When the precipitate of cyanide of silver has settled, the clear solution is carefully decanted, and the vessel filled with water, which is again decanted as soon as the precipitate has settled. Repeat this three or four times, and then add a solution of cyanide of potassium until the precipitate is all dissolved. The solution is then ready for use, after filtering. Dilute the cyanide of potassium so that the plating solution shall contain one ounce of silver to a gallon. A preparation of solution of gold is prepared by dissolving gold in three parts muriatic acid and one of nitric acid, which forms the chloride of gold. This is digested with calcined magnesia, and the gold is precipitated as an oxide. The oxide is boiled in strong nitric acid, which dissolves any magnesia in union with it. The oxide, being well washed, is dissolved in cyanide of potassium, which gives cyanide of gold and potassium. A Smee or Daniell battery is better than a carbon battery for silver and gold plating.

(27) B. D. T. asks: How are plow castings chilled? A. Cast them in an iron mold, and let them cool in the mold.

(28) L. G. asks: 1. What kind of grease is best to use in the oil cups of engine cylinders? A. Tallow. 2. Which oil is best to use on engine slides? A. Lard oil.

(29) Y. P. says: I have made a nickel solution of 1 lb. sulphate of nickel, and 4 ozs. sal ammoniac or chloride of ammonia to a gallon of sul-