

From iron founding to the manufacture of gingerbread; in agriculture, in dyeing, in painting; indeed it would be very difficult to suggest a trade, occupation, or profession that does not depend more or less upon this most important substance. A friend asks over our shoulder, "Do you include lawyers and clergymen?" Most certainly we do. The paper upon which, and the ink with which lawyers and clergymen write, involve in their manufacture the use of sulphuric acid. Try something else. Hesitatingly—"boot-blacks." Out again. No blacking without the immediate or remote use of sulphuric acid. Once more. "No, I give it up if the two extremes are not exempt. I'll none of the means."

The processes of manufacturing sulphuric acid are various. The fuming *Nordhausen* acid is distilled from the sulphate of iron, popularly known as green vitriol. The acid as thus obtained is in a state of the highest concentration it can attain in a fluid form. A proper redistillation of this acid produces a white fibrous mass of a silky appearance—solid sulphuric acid. This is called anhydrous sulphuric acid, the term *anhydrous* meaning without water. This is a most remarkable substance. Notwithstanding it is the most concentrated form in which the acid can be obtained, it has no acid properties. It is tough, waxy in consistence, and may be molded in the hands without danger. The concentrated liquid acid would soon reduce them to a state resembling pounded raw beef-steak. Anhydrous sulphuric acid, or concentrated liquid sulphuric acid is a very thirsty substance. Its fondness for water is only equalled by the disgust which that fluid seems to excite in some individuals of the human species. If it cannot get water elsewhere the acid will absorb it from the air. The anhydrous acid thus becomes liquid after a time, and the liquid gradually becomes weaker by exposure. It is therefore necessary to keep it from the air. Advantage is taken of this property to dry certain substances from which it is difficult to extract water. An open vessel containing acid is placed under a bell-glass, together with the substance to be dried. Being thus imprisoned together, the acid appropriates to itself all the moisture which the bell-glass incloses, and so without artificial heat a substance may be perfectly dried. Its attraction for water is so great that when poured into the latter it hisses like a red hot iron. Strong acid exposed to the air will absorb water enough to double its weight. Mix four pints of this acid with one pint of water, and there will be considerably less than five pints of the mixture. This shows that the attraction of sulphuric acid for water is very strong indeed, sufficient to compress it more than a pressure of hundreds of tons to each square inch of surface would do if applied to that fluid separately. Were we not right in calling it a Goliath?

We have already said that very large quantities of this substance are used. In England alone over one hundred thousand tons are used annually, and its manufacture is conducted on a large scale in quite a different manner from the method above described for making the Nordhausen acid. That method is only practiced at Nordhausen, in Saxony, from which the acid takes its name. In order to understand the manufacture of sulphuric acid as it is conducted on a large scale, we must first know something of nitric acid. Nitric acid is composed of nitrogen and oxygen. These two gases mixed constitute the bulk of the atmosphere which we breathe, but when chemically combined in the proper proportions they form the nitric acid of chemistry—the aquafortis of the shops—an acid ranking next in strength and importance to sulphuric acid. The salt known as nitrate of soda is composed of nitric acid and soda. When sulphuric acid is poured upon nitrate of soda, the salt is decomposed, the sulphuric acid unites with the soda to form sulphate of soda, and the nitric acid becomes free. It is liberated in the form of a gas, and in this state it is used in making sulphuric acid. Remember its components—oxygen and nitrogen. When sulphur is burned in air the oxygen of the air combines with it, and forms sulphurous acid. This is also a gas, but like most other acid gases it is freely absorbed by water. One half more oxygen than it already contains would, if combined with it, change it to sulphuric acid. The process of making sulphuric acid can now be understood. First, sulphur is burned to form sulphurous acid; second, nitric acid is made to give a portion of its oxygen to transform the sulphurous acid into sulphuric acid; then the compound of nitrogen and oxygen which remains (deutoxide of nitrogen) seizes oxygen from the air (though not as much as was absorbed at first by the sulphurous fumes), becoming peroxide of nitrogen, only to be again robbed of its oxygen by the sulphurous acid, and so on *ad libitum*, the sulphuric acid, as fast as it is formed, combines with steam which is generated for that purpose, and is further absorbed by water. The engraving illustrates the apparatus by which this process is effected. A furnace in which the sulphur is burned; in the current of heated gas is suspended an iron pot, B, containing nitrate of soda and oil of vitriol. The nitric acid vapors are thus intimately mingled with the sulphurous fumes, and pass through flues into the chamber, FF. This chamber is of lead, and is supported on strong timber framework. Water two or three inches in depth is placed upon the floor of the chamber, D D, to absorb the acid. Jets of steam are admitted from the boiler, E, through the pipes, C C C. An exit flue, G, permits the escape of nitrogen and nitric oxide, the only gases which can escape in a properly managed chamber. Some modifications of this process have been invented by Gay Lussac and others, by which saving is made in the amount of the salt used, but the general principle remains unchanged. The leaden chambers are frequently of enormous size, some of them being three hundred feet in length by twenty in width and twelve to fifteen feet in height. The acid as drawn off from the chambers is too dilute for use in the arts. It is therefore concentrated in lead, glass, or plat-

inum vessels, lead being used only for acids whose specific gravity is not required to be more than 1.720. This is the brown acid of commerce, and it usually contains many impurities. The concentrated acid of commerce is much stronger, having a specific gravity of 1.842, according to Bineau.

We have already noticed two acids, namely, sulphuric and sulphurous, formed by the union of sulphur and oxygen, as well as one formed by the union of sulphur and hydrogen—sulphureted hydrogen. There is still another oxacid, containing a small proportion of oxygen, called hyposulphurous acid. All of the oxacids combine with numerous bases to form salts extensively used in the arts. It would extend this article too much to specify these applications and describe them; they would fill volumes. But there is one class of these salts we must say something about, namely, the alums. There are several kinds of alums, of which the common alum of the shops is a type in its composition and its qualities. If you examine a crystal of alum you will see a white, partially transparent substance, which has a sweetish astringent characteristic taste. From such an examination you would hardly guess that it is composed of five different elements, yet such is the case. Two of these components are gases, oxygen and hydrogen; two of them are metals, aluminum and potassium; and the other is sulphur, which forms nearly one seventh of its entire weight. Throw your crystal upon a hot stove, and it will melt and froth and bubble, and finally become a dry, hard, white, and opaque mass. You have partly decomposed the salt by the process; it has lost  $\frac{2}{7}$  of its former weight. What passed off was only water, which is composed of hydrogen and oxygen; what remains is composed of four elements, and sulphur now composes nearly one fourth the entire weight. In this state it is called anhydrous alum. The alums are in large demand in the art of dyeing, and the manufacture of the common alum is a large and growing industry. At some other time we may describe the process of making alum in full.

Take a lump of charcoal and a roll of brimstone and place them side by side. Nothing, to one unacquainted with the wonders of chemistry, would seem more improbable than that these hard and opaque substances could unite to form one of the clearest, most limpid and colorless fluids known. That is so, however. Charcoal is nearly pure carbon. Sulphur and carbon unite to form the bi-sulphide of carbon, a fluid so clear and of so high a refracting power that it has been used, inclosed in a triangular glass box, for the prism of that most wonderful instrument, the spectroscope, of which you have heard and read much, and will probably hear a great deal more ere another decade passes.

Take a piece of the ordinary rubber sold at the present time in the shops; put it on a fire shovel and hold it over the coals; in a short time it will soften and fry, and presently it will commence burning with a blue flame. It is sulphur which burns with the blue flame, a very large proportion of the substance called india-rubber being sulphur. By a peculiar process this rubber can be rendered hard as horn, and in this state it is now used for combs, brush and knife handles, and even for the plates upon which dentists fix artificial teeth.

Sulphur is also largely used for bleaching, its fumes while burning producing that effect. Straw goods are thus whitened.

We might fill this paper with the enumeration of the uses of sulphur and its compounds. Any chemist will tell you that we have only skimmed over the surface of the subject. We have omitted to mention many of the properties of sulphur, some of which have given rise to much speculation. Sulphur is found plentifully distributed in the crust of the earth, but is most abundant in volcanic regions, one of the principal sources being the Island of Sicily, where it is found in an uncombined state. There is perhaps no other substance, unless it be iron, upon which the arts and refinements of civilization are more dependent. The world could infinitely better afford to lose all of the precious metals and precious stones, rather than be deprived of its sulphur deposits. The thought may serve to render the substance more palatable, when your physician prescribes it in the future.

#### Who Ate Roger Williams?

Steele's "Fourteen Weeks in Chemistry," says: "The truth that animal matter passes from the animal back to the vegetable, and from the vegetable to the animal kingdom again, received a curious illustration not long since. "For the purpose of erecting a suitable monument in memory of Roger Williams, the founder of Rhode Island, his private burying ground was searched for the graves of himself and wife. It was found that everything had passed into oblivion. The shape of the coffins could only be traced by a black line of carbonaceous matter. The rusting hinges and nails, and a round wooden knot, alone remained in one grave; while a single lock of braided hair was found in the other. Near the grave stood an apple tree. This had sent down two main roots into the very presence of the confined dead. The larger root, pushing its way to the precise spot occupied by the skull of Roger Williams, had made a turn as if passing around it, and followed the direction of the backbone to the hips. Here it divided into two branches, sending one along each leg to the heels, when both turned upward to the toes. One of these roots formed a slight crook at the knee, which made the whole bear a striking resemblance to the human form. There were the graves, but their occupants had disappeared; the bones even had vanished. There stood the thief—the guilty apple tree—caught in the very act of robbery. The spoliation was complete. The organic matter, the flesh, the bones of Roger Williams had passed into an apple tree. The elements had been absorbed by the roots, transmuted into woody fiber, which could now be burned as fuel, or

carved into ornaments, and bloomed into fragrant blossoms, which delighted the eye of the passer-by, and scattered the sweetest perfume of spring; more than that—has been converted into luscious fruit, which, from year to year, had been gathered and eaten. How pertinent, then, is the question, 'Who ate Roger Williams?'

#### MANUFACTURING, MINING, AND RAILROAD ITEMS.

The Agawam Nail Works, Mass., resumed operations on the 12th inst. The expense for labor upon the Holyoke dam, in Massachusetts, is \$800 per day. The consumption of flour in the city of Boston is said to be one million barrels per annum. Europe is said to own \$953,400,000 of American Railroad, State, and Government bonds. A firm at East Boston use six tons of iron per day in the manufacture of telegraph wire. It is stated that preparations are on foot to re-open the Schenectady and Athens route of the N. Y. Central Railroad. Middletown, Conn., has voted \$6,000 more stock in the Air Line Railroad. This brings its entire subscription up to \$260,000. There are sixty thousand people engaged in watchmaking in Switzerland. They turn out over a million of watches each year. The refinery of Messrs. Rockefeller, Andrews & Flagler, at Cleveland, Ohio, produces 1,100 barrels of refined petroleum per day. It is estimated that by 1870 there will be 50,000 miles of railway completed in the United States, enough to twice girdle the earth. The iron bridge over the Housatonic river at Great Barrington, Mass., is completed. It is an elegant and expensive structure. There are at present 557 woolen mills in Ohio, Michigan, Illinois, Indiana, Wisconsin, Iowa, and Minnesota, with a capital of \$5,500,000. The Directors of the Chicago and Northwestern Railroad have fully determined to resume construction upon the Winona and St. Peter line. The Chicago, Burlington, and Quincy Railroad Company is building a new freight depot at Quincy, to accommodate its increasing business. A single manufactory in Maine has this season packed 1,600,000 cans of green corn, and during the spring and fall has canned nearly 600,000 lobsters. The Bay City Iron Company have begun to build works at Bay City, Mich., in which they will carry on the foundry and machine business on an extensive scale. The town of Farmington having refused to loan its credit to the Connecticut Western Railroad the Company have changed their route and left Farmington out in the cold. The highest mine in the world is the Potosi silver mine, 11,375 feet above the level of the sea. The deepest is a salt mine in Westphalia, 3,050 feet below the surface of the ocean. A beet root sugar manufactory is about to be established in Buena Vista County, Iowa. The machinery is to come from France at a cost of \$100,000. Five thousand acres have been purchased upon which to grow the beets. A. M. Wheeler, of Halifax, has cut a hemlock tree from which was made twelve thousand shingles, all clear, first rate shingles, leaving timber enough for five or six hundred feet of boards, and lots of good wood for fire, beside three-fourths of a cord of bark. A watchman at the car shop in St. Albans, went to a drawer in search of a pipe the other night. Not finding it he lighted a match and fire from it dropped to the drawer which contained about a quarter of a pound of gunpowder. The consequence was an explosion, and the man's face, hands, and arms were badly burned.

#### Recent American and Foreign Patents.

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

**VARNISH.**—Isaac Ranney, Delaware, Ohio.—This invention has for its object the production of a very lustrous, durable, and economical varnish for general use.

**CARRIAGE STEP.**—George Panchot, Hastings, Minn.—The object of this invention is to provide a neat, simple, and cheap attachable and removable step for wagons and other carriages.

**BUGGY-TOP FASTENING.**—D. S. Early, Hummelstown, Pa.—The object of this invention is to provide a simple and cheap device for securely fastening the top of a buggy to the seat, which, by simply throwing down or up a hinge joint in the fastening rod, will instantaneously lock the top to the seat or loose it therefrom.

**CAR COUPLING.**—J. P. Freeman, Dalton, Whitfield, Ga.—This invention has for its object the construction of a simple and efficient coupling for railroad cars, which shall combine with the old-fashioned method of coupling by hand, an automatic coupling of new and greatly improved construction and operation.

**HARVESTER.**—Isaac H. Palmer, Lord, Wis.—In this invention, the platform, upon which the grain is delivered by the reel, is placed directly behind the cutter, and is tilted at every revolution of the reel or of one of the draft wheels, so as to deliver the sheaf upon the ground and set the platform again to receive another sheaf.

**FENCE.**—Obadiah Love, Saxenburgh, Pa.—The object of this invention is to obtain a neat, light, cheap, and portable wooden fence, which is capable of being easily converted into a temporary shelter for sheep and other animals. Simply doubling the panels and interlocking their ends is all that is required to hold them together.

**MANUFACTURE OF SHOT.**—Wm. Glasgow, Jr., and John G. Wood, St. Louis, Mo.—The object of this invention is to do away with the high lofty towers now used in the manufacture of shot, which is accomplished by dropping the lead through a denser medium than air, such as mercury, glycerin, sirup, oils, etc., the temperature and density of which will be regulated according to the size of shot to be made.

**MACHINE FOR DRESSING MILLSTONES.**—Wm. Bold, Sheboygan Falls, Wis.—The object of this invention is to accomplish the cutting or dressing of the "lanes," so called, of millstones, in an easy and expeditious manner.

**CORN HARVESTER.**—John D. Hampshire, Paper Mills Post Office, Md.—This invention relates to a new and improved machine for harvesting maize or Indian corn.

**RAILROAD SWITCH.**—Hiram Beckwith, Grass Lake, Mich.—This invention relates to an improvement in the method of operating railroad switches, and it consists in the method of securing the switch lever and holding it in place.

**KING-BOLT AND WHIFFLETREE PLATE FOR WHEELED VEHICLES.**—Levi Adams, Amherst, Mass.—This invention relates to a new and improved king-bolt and whiffletree plate for wheel vehicles, whereby several advantages are attained.

**PUMP VALVE.**—J. A. Nichols, Paterson, N. J.—This invention relates to an improvement in the method of constructing pump valves, being more particularly designed for steam fire engines, but which may be applied to other pumping engines.

**LUBRICATING DEVICE FOR STEAM CYLINDERS.**—George Girty, Ranier, Oregon.—This invention relates to a new and improved device for lubricating steam cylinders, and it consists of a novel arrangement of valves, oil chamber, and lever.

**AUTOMATIC CAR COUPLING.**—Willard E. Bush, Damacons, Pa.—This invention consists in attaching spring catches to the coupling pin, to prevent its displacement by the motion of the cars, and in the form of the ends of the escaping link, and in the provision made for holding the link in place.

**APPARATUS FOR BOILING EGGS.**—Ira Dimock, Florence, Mass.—This invention consists, in general terms, of a chamber forming part of a stand or basket for holding eggs, to be immersed in boiling water. The chamber contains water, which becoming expanded by heat, actuates a rod communicating with bell mechanism, whereby the bell is sounded when the water has acquired a certain predetermined temperature. The chamber is inclosed by another, and the separating space between the two chambers contains air or other media to retard the transmission of heat to the water within the inner chamber, and thus allow sufficient time for the boiling process.

**WEEDING AND SCUFFLING HOE.**—Lewis King, Oriskany Falls, N. Y.—This invention consists in forming the hoe and shank in one continuous piece, the shank being bent and flattened to form a blade which, from its position at right angles to the handle and parallel with the ground, as ordinarily held, operates in a superior manner as a scuffling hoe.

**HORSE RAKE.**—Nicholas Selby, Flora, Ill.—This invention is designed as an improvement upon a rake patented by J. C. and E. D. Turner, of Bridgeport, Ill., in August of 1867. The improvement consists in providing a balanced or sulky frame, which is pivoted on two draft wheels and provided with a hinged frame which supports the revolving rake.

**WASHING MACHINE.**—G. A. Dabney, San Jose, Cal.—This invention has for its object to furnish an improved machine for washing clothes, which shall be simple in construction and effective in operation, doing its work rapidly and thoroughly.

**WEATHER BOARD GAGE.**—Worden E. Stoddard, Fort Edward, N. Y.—This invention has for its object to improve the construction of the weather board gage patented by the same inventor May 17, 1859, and numbered 124,066.

**BAG TIE.**—J. W. Bates, Glencoe, Minn.—This invention has for its object to furnish an improved device for tying bags, sacks, sheaves of grain, laths, pickets, and other such articles put up in bundles, which shall be simple in construction, inexpensive, easily and quickly attached and detached, and which will hold the bag or bundle securely tied.

**BOOK FOR BOOKKEEPING.**—John H. Gleim, St. Louis, Mo.—This invention has for its object to diminish the number of books required in conducting a business, whether wholesale, retail, or commission, and at the same time to combine and arrange the columns of the journal as to require less labor in making the entries, and generally simplifying the record of the business.

**MACHINE FOR WEIGHING AND TALLYING GRAIN.**—F. S. McWhorter, St. George's, Del.—This invention relates to the weighing and tallying of grain automatically. It consists in general terms of a belt of elevating buckets operating within a box or casing, whereby the grain is elevated and passed over into a vertical chute in which is arranged a sleeve which is provided with a device for choking the same to discontinue the flow or grain through it. The device discharges the grain into a rack held on a sack holder, which being connected with a steelyard properly weighted, the movement of the steelyard causes the choking of the sleeve by being connected with the choking device. Other devices perfect the operation of the whole, rendering it a simple and effective device, which is applicable to the discharge of grain from or into box cars, canal boats, vessels, and grain lofts.

**CHAIR.**—H. Buchter, Louisville, Ky.—This invention has for its object to furnish an improvement in the mode of securing the ends of the canes in forming the seats of cane seated chairs, by means of which the canes may be placed close together, so as to form a close seat, while at the same time the seats will last much longer and may be much more quickly formed than when made in the ordinary manner.

**WROUGHT IRON AND STEEL COLUMNS.**—George Walters and Thomas Shaffer, Phoenixville, Pa.—This invention has for its object to furnish an improved iron or steel column or shaft for use in the construction of buildings, bridges, piers, or stie work, compression chords, etc., which shall be simple in construction, strong, and solid, and which may be manufactured at a less expense than columns or shafts constructed in the usual manner.

**CORN SHELLING MACHINE.**—Joshua S. Rackham, Waterport, N. Y.—This invention consists in a vertical cylindrical shell made in sections, which are divided into segments hinged at one end, the other being allowed to swing outwardly against springs, which constantly tend to maintain them in a concentric position. A vertical cylinder is provided within the said shell, on an axis, and provided with teeth which act in conjunction with corresponding teeth upon the interior of the shell. The swinging segmental sections are designed to yield to the different sizes of the ears to be shelled. A screen and fan blower are also provided for cleaning the corn as it passes through the machine.

**COLLAR AND CRAVAT FASTENER.**—Emanuel Rau, New York city.—This invention relates to a new instrument for connecting a cravat, and the ends of a paper or other collar with the neckband of a shirt. The invention consists in the use of a pin, with a head on one end, and a projecting breastpin, all combined in such manner that the aforesaid result can most readily be obtained.

**MOWING AND REAPING MACHINE.**—H. Howe, Oneota, N. Y.—This invention consists in hanging on each end of the counter shaft a loose pinion, each pinion being connected with the counter shaft by means of a ratchet spring clutch. The pinion on the left hand side is smaller than the other, and it will, as it meshes into internal gear of the left hand driving wheel carry the countershaft around while the other pinion will remain idle, not being able to revolve with the counter shaft. The strain of the whole machine is thus thrown upon the left hand side and consequently taken away from the cutting side of the machine.

**METHOD FOR DESTROYING CATERPILLARS.**—H. A. Graef, Brooklyn, N. Y.—The object of this invention is to devise a means for destroying and exterminating the caterpillars, and more particularly the measur. worms (*ermos sub gnarata*), by which a great number of trees and other plants are injured. The invention consists in the application of diluted chloride of lime, which, when applied to these insects, will instantly kill them by merely coming in contact with their skins.

**LAMP BURNER.**—W. W. Jacobs, Hagerstown, Md.—This invention relates to an improvement on a lamp burner, for which letters patent were granted and dated Nov. 5, 1867. This burner is intended for burning oil without a chimney, by generating gas by the heat of the tube.

**METHOD OF GENERATING STEAM.**—Frank M. Horning, East Pike, N. Y.—The object of this invention is to utilize all, or nearly all, the heat produced from fuel in the generation of steam, and it consists in forcing the gaseous products of combustion, separated from the ashes, into and through the water in the boiler.

**SOFA BEDSTEAD.**—B. L. Southack, New York city.—This invention relates to a new sofa bedstead, which is provided with a folding back, hinged to a sliding seat, the back, when turned up, resting against the back edge of the arm rests or head boards of the same, so as to be in a proper position. The invention consists in such an arrangement of all parts, that the folding sofa back, which is hinged to the sliding seat, and which forms, together with the seat, the bottom will, when turned up, bear or rest against the back edge of the arm supports or headboards, to which it may be secured.

**PICK AXES.**—Morgan Gale, San Antonio, Mexico.—This invention has for its object to improve the construction of pick axes, so as to make them stronger, more durable, and less likely to become loose upon the handle than when constructed in the ordinary manner.

**SAWING MACHINE.**—F. M. Schaeffer, Blooming Grove, Kansas.—This invention consists of an improved arrangement of guides for the saw; also, an improved means for adjusting the saw to work either in a horizontal or vertical plane; also, an improved means for holding a log while being sawed to prevent the same from rolling, and also, in an improved means for supporting the block which is being sawed off.

**HEAT RADIATOR.**—George M. Woodward, New York city.—The object of this invention is to provide a heat radiator of that class in which steam is introduced at the bottom, said steam rising to the top of the heater and de-

scending, so as to escape again from the lower part of the apparatus. The steam, during its passage through the apparatus, heats the metallic or other sides of the same, which heat is radiated into the room or apartment in which the device is set up.

**CORN PLANTER.**—D. F. Taft, New Bedford, Mass.—This invention relates to a new seed planter, which is provided with a flexible or jointed spout, so that the marking and covering shovels attached to the lower end of the spout, can be easily raised out of the ground, whenever obstructions are in their way, or when the machine is not to be put in operation. The invention also consists in the use of a new device for operating the slide in the seed box, and for throwing the same out of gear.

**SAFETY VALVE FOR STEAM BOILERS.**—Wm. R. Malone, Mason city, W. Va.—The object of this invention is to provide a means for automatically checking the increase of steam in the boilers, when the desired amount of pressure has been raised, and it consists in providing means for conveying the steam or water which escapes through the safety valve, and the fire for checking it, whereby the increase of steam is checked. It also consists in an improved method of connecting the safety valve to the boiler.

**COUNTER SINKS.**—P. A. Whitney, Woodstock, Vt.—This invention relates to an improvement in counter sinks or reamers for metal, and consists in the arrangement within a hollow stock of the cutters, which is made of a piece of flat steel between two clamping nose pieces, through which it is fed downward by a feeding screw as it wears away.

**BIT STOCK.**—Benjamin Darling, Bridgewater, Mass.—The object of this invention is to construct a bitstock so that the shank of the bit or boring auger may be firmly held without the use of springs or screw nuts, and so that the bits or augers may be used without cutting their shanks or filing them in any manner.

**BEH HOUSE.**—Charles Decker, New Michigan, Ill.—This invention relates to a new and improved bee house, and it consists in the means employed for suspending the comb frames in the house.

**MACHINE FOR BENDING OR FOLDING SHEET METAL.**—A. W. Whitney and P. A. Whitney, Woodstock, Vt.—This invention relates to a new and improved machine for bending or folding sheet metal designs for the use of tinmiths and other artisans in sheet metal.

**WHEELS FOR VEHICLES.**—R. J. Bowman, Mansfield, La.—This invention relates to a new and useful improvement in the construction of metallic wheels for vehicles, whereby strength and lightness are obtained with a requisite amount of elasticity to avoid the transmission of jars and concussion to the body of the vehicle and the consequent wear and tear attending the same.

**SULKY CULTIVATOR AND SEEDING MACHINE.**—Frank A. Hill, Marysville, Cal.—This invention relates to a new and improved sulky cultivator and seeding machine, and it consists in a novel construction and arrangement of parts whereby the rider and driver has perfect control over the implement, both as regards the sowing of the seed and the adjustment of the shares or teeth.

**ROTARY CULTIVATOR AND SEEDING MACHINE.**—Stephen Mahurin, Clayton, Ill.—This invention relates to a new and improved device for cultivating the earth and sowing seed, and it consists of one or more shafts provided with teeth and having a rotary motion communicated to them by the forward movement of the machine.

**BUTTON HOLE CUTTER.**—A. J. Lytle, West Union, Ohio.—This invention relates to a new and improved method of constructing button hole cutters, whereby the same are more simple in their construction and more effective in their operation.

**SAW FILING MACHINE.**—D. H. Iseminger, McLean, Ill.—The object of this invention is to provide a simple and effective and conveniently operated machine for filing the teeth of straight saws. It consists of the combination of saw clamps with a guide rod and file stock, the file stock being provided with certain wavel appliances to enable the file to be pointed and held parallel to itself at each successive tooth of the same. The machine is provided with other devices perfecting its operation.

**ATTACHMENT FOR SODA FOUNTAINS.**—J. C. Wharton, Nashville, Tenn.—The object of this invention is to provide an attachment for soda water fountains whereby a jet of water will be made to play upon each of the nozzles of the sirup foot cocks (which form a part of the fountain apparatus as generally constructed) and cleanse the said nozzles from any adherent drops of sirup thus preventing the obstruction of the same by the saccharine matter of the sirups collecting thereon.

**HAND SPLINT KNIFE.**—Samuel Friend, and John McCollom, Decatur, Ill.—This invention relates to an improvement in a knife for splitting or riving splints or splits from timber for making baskets and other purposes, and consists in a tool resembling a spoke shave in form and is worked by one man drawing it towards him without a carriage, instead of by pushing with several men in the manner of the splint machines in common use.

**HOSE AND MACHINERY FOR MAKING IT.**—Geo. Coles, London, and James Archibald Jacques, and Jao. Americus Fanshaw, Tottenham, England.—This invention consists in forming flexible hoses by plaiting or braiding the same around a core formed of rope or other suitable material and arranged so as to be withdrawn after the hose has been formed. It also consists in improvements in machinery for braiding the same.

**BRAKE FOR RAILWAY CARS.**—Martin H. Rumpf, Paris, France.—This brake consists in a lever with a block adherent thereto, suspended from an axis eccentric to the axis of the wheel and arranged so as to allow the block to bear on the face of the wheels together with other parts accessible thereto.

The principle of the system lies in the blocks being arranged in their dropping against the circumference of the wheels, to describe an arc of a circle, which intersects more or less obliquely the said circumference, so as to produce, of themselves, the blockage by means of the rotation of the wheels.

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 advertisements at \$1.00 a line, under the head of "Business and Personal."

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

**J. C. N., of Minn.**—"Will you inform me of the length of a rifle barrel having the greatest range, and also why a breech loading gun has a greater range than a muzzle loading one?" We cannot give you the absolute length of a rifle barrel that projects a ball the furthest, as there must be taken into consideration the weight and form of bullet, the amount of powder used, and the resistance offered to erratic movement by the thickness of the walls of the tube or barrel. On all and each of these points experts disagree, not however, on general principles, but on the difference of their experience. It is certain, however, that the barrel and its rifling are intended to give direction to the bullet and to confine the power imparted by the liberation of the gasses, until this direction is assured. When these are assured the benefit of the barrel's length ceases. In common use it is found that a barrel of twenty inches is as good as one of thirty-two inches in length. We have seen the ordinary Colt's pistol, navy size, barrel eight inches in length, project a ball accurately a distance of three hundred yards. Would a barrel of thirty-two inches do better? In regard to your second question, the breech loading gun has a greater range merely because there is less "windage," as the ball has not been loosened by being forced down the grooves it must again traverse.

**J. P. C., of Ohio.**—No step or foot bearing of metal is equal to good oak or rock maple for a turbine wheel. These woods are used as steps for turbines which develop a power six hundred or seven hundred horses. Wood bearings are also used for the stern supports of propeller screws.

**P. P. C., of R. I.**—"What constitutes the difference in the quality of cast steel, the original materials or the after working?" Both, but largely the latter. We have three specimens of cast steel on our table now, made by the American Tool Steel Company in Brooklyn, N. Y., each broken from the same bar and from the same end of the bar, yet so differing in appearance of fracture that one would be impelled, from the evidence of his eyesight, to declare they were three different grades of steel. These differences in texture, not in appearance only, but in fact, were brought about simply by the degrees of heat to which the pieces were subjected, no hammering being attempted. Now if such marked variations in the quality of steel from the same bar may be obtained simply by heating and hardening in clean water, why should not still greater differences and qualities be produced by judicious forging? By this means a course grained steel may be wrought into a delicate spring or a fine tool, having a good cutting edge. Too much, however, in this case is left to the skill of the forger, and it is safer to use the best material if the best results are desired.

**J. A., of Mass.**—Acids act not only upon the edge of steel blades, but upon their quality. We know the reason for the first but we cannot explain the other phenomenon. The acid of fruits attacks vigorously the steel, especially when presented in a thin edge—almost all surface—and rapidly oxidizes it. But why a blade of steel long exposed to the action of acids refuses to receive the hardening attempted by the forger's hammer and bath we cannot say. The fact is one of the uncracked nuts in mechanics, but it is, nevertheless a fact.

**W. A. K., of Mass.**—Cast iron is capable of receiving a cutting edge. The only reason why it is not used instead of cast steel, much more costly, is that it will not retain that edge. Still, we have used a razor blade made of cast iron and found it shaved as cleanly and perfectly as one of fine steel. Cast iron hatchets are now manufactured and work well for a time. We cannot, however, recommend cast iron as a substitute for steel for edge tools.

**M. A. R., of R. I.**—The temper of tools used in cutting wood can easily be destroyed by being driven too fast. The fact that the wood is green or wet does not affect the result. Green wood will as soon deteriorate the quality of a cutter, whether bit, chisel, or gouge as the hardest quality of kiln dried timber.

**J., of**—an anonymous correspondent, such as we seldom notice, asks if steam is inflammable. The question may be of some general value, and we answer that it has the power of inflaming substances capable of being ignited by heat. It is not the medium but the temperature that produces fire or inflammability.

**P. C. W., of Mass.**—Carbonates of lime are acted upon by acids, therefore keep all acidulated liquids and fruits from your marble table. Preserve the varnished surfaces of your furniture from defacement by not allowing alcohol in any form to come in contact with them. The reason is obvious.

Business and Personal.

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

Wanted to know where to obtain a reliable liquid meter for registering petroleum. Address E. W. Faucett, Petroleum Center, Pa.

A. H. Scott, Concord, N. C., has a valuable new patent for sale, and wishes to communicate with dealers in patents in the several States.

New pictures for the zoetrope. Series No 5, sold by book-sellers, or sent for \$1, by Milton Bradley & Co., Springfield, Mass.

Paper mill wanted. Address T. S. V., Roslyn, L. I.

The best lathe for irregular forms, now exhibiting at Maryland Institute. Address, for particulars, during fair. A. R. Stewart, Maryland Institute, Baltimore, Md.

An interest in a valuable agricultural improvement is offered to any one who will furnish means to sell the right. Address "R." 231 F st., Washington, D. C.

To manufacturers.—Fine machinery of every kind designed and built by S. W. Gardiner, No. 6 Alling st., Newark, N. J.

Parties about to buy steam boilers should examine Root's wrought iron sectional safety boiler at 95 and 97 Liberty st., New York. See advertisement.

Inventors and owners of small patents send circulars to post-office box 111, Peekskill, N. Y.

The pew hat rack.—County rights for sale. Send for circular to E. S. Blake, Pittsburgh, Pa.

Peck's patent drop press. For circulars, address the sole manufacturers, Milo Peck & Co., New Haven, Conn.

American Watchmaker and Jeweler. By J. Parish Stelle. Jesse Haney & Co., 119 Nassau st., New York. Price 25 cents.

Millwrights can make favorable arrangements for sale of best water wheel in use. Address Peekskill Man'f'g Co., Peekskill, N. Y.

For sale—barrel machinery, nearly new, for whiskey and coal oil barrels. Address postoffice box 290, Cincinnati, Ohio.

For Blanchard's spoke lathes, address Exeter Machine Works, Exeter, N. H.

Portable pumping machinery to rent, of any capacity desired, and pass sand and gravel without injury. Wm. D. Andrews & Brother, 414 Water st., New York.

Adams' air cylinder graining machines for painters and all manufacturers of painted ware. Machine guaranteed. Send stamp for circular to Heath, Smith & Co., 400 West 15th st.

For descriptive circular of the best grate bar in use, address Hutchinson & Laurence, No. 8 Dey st., New York.

Manufacturers wanted to build Ball's Ohio reapers and mowers. For terms and territory apply to J. A. Saxton, Canton, Ohio.

N. C. Stiles' pat. punching and drop presses, Middletown, Ct.

For sale—the patent right, in Great Britain, for perforated saws. The manufacture of these saws is now firmly established in the United States, and they are rapidly taking the place of all other solid saws. Apply to J. E. Emerson, Trenton, N. J.

Prang's American chromos for sale at all respectable art stores. Catalogues mailed free by L. Prang & Co., Boston.

For breech-loading shot guns, address C. Parker, Meriden, Ct.

Winans' anti-incrustation powder, 11 Wall st., N. Y. 20,000 references. No foaming. No injury. 12 years in use. Imitations plentiful.