ENGINEERING INVENTIONS.

Mr. Thomas H. James, of Republic, Mich., has patented a simple car coupling which relates to the drawheads of cars in which the common link and pin are used as couplers, whereby it is made automatic in its action, and the parts are rendered accessible.

An improved railroad gate has recently been patented by Messrs. D. McNeely and J. A. Drake, of Princeton, Ind. This gate is automatic in its action, being raised by the action of the cow catcher upon upright arms, which arms serve to deflect bars at the side of the track, thereby elevating the gate. The gate is retained in its raised position by the action of the wheels of the cars upon the bars located at the side of the rails.

MECHANICAL INVENTIONS.

Mr. Charles L. Heisler, of Wapakoneta, Ohio, has obtained a patent for an improved vegetable cutting machine. This machine is provided with a cylinder having knives arranged in its outer surface, the whole so arranged as to be rotated in its bearings, and so constructed that the slices as they are cut will be deposited in the receptacle prepared for them.

Mr. J. O. Madison, of New York city, has patented an improved instrument for dividing lines into any desired number of equal parts. The invention consists in a series of cog wheels having different diameters and mounted on the same shaft, combined with a series of racks engaging with the cog wheels at diametrically opposite points, so that they will move in opposite directions when the cog wheels are rotated.

An improved fire escape has recently been patented by Mr. C. J. Lung, of Rochester, N. Y. It consists of an endless ladder of wire ropes arranged on grooved drums or pulleys at top and bottom, the pulleys being mounted in brackets projecting from the side of the building, and the ladder having an air brake contrivance connected with it, to regulate the descent of persons by the running of the ladder on the pulleys by the weight of the persons on it. Guides are provided to prevent the ladder from swinging forward and backward in case of being slack on the pulleys.

Messrs. L. H. Coburn, of Seneca, Kas., and E. D. Thompson, of Havana, Ill., are the patentees of an appliance for stripping and heading sorghum and sugar cane. This apparatus consists in a table or carrier for feeding the cane, a series of strippers and beaters or scrapers, and a suction fan or device and draught tube, which is adjustable for stripping the leaves from the cane and removing them, together with all dust, dirt, insects, and foreign substances. It also includes devices for cutting off and removing the heads from the cane The apparatus will largely economize labor, it is claimed, and should prove a valuable adjunct to the equipment of both large and small plantations.

A patent has been recently issued to Mr. Asa Lons, of West Manchester, Ohio, for a scoop balance attachment for weighing scales. The object of the invention is for automatically balancing the weight of the scoop, so that only the net weight will be weighed by the scale. It consists of a lever under the platform, whereon the weight of the scoop is balanced by means of a stud projecting from the center of the bottom of the scoop into a hollow space in the upper part of the platform standard, and bearing on a stud projecting up from the arm of an intermediate lever having a fulcrum on the main lever, and bearing at its other end against the under side of the platform; the levers being so adjusted that they bear upward against the stud of the scoop with a power equal to the weight of the scoop.

AGRICULTURAL INVENTIONS.

Among the recent inventions in harrows is the patent of Mr. A. A. Werts, of Big Creek, S. C. The invention consists in connecting together a number of small triangular harrows by suitable connecting bars. The harrows are adjustable according to the work to be done and the width of rows to be planted, and further they are reversible on their pivots, so that they may turn and yield to any obstructions that may be in the way. This machine may be used with either two or three horses; in the former case, two of the harrows may be removed in order to lighten the draught.

Mr. Walter G. Gray, of Ringgold, Tenn., has recently patented a corn planter constructed with a seed receiving box having a seed dropping slide, and provided with spring-pressed plates for controlling the removal of seed from said box. With the seed dropping slide is connected an elbow lever, a spring, a crank shaft, a bent hinged bar, and their connecting rods, whereby the seed will be dropped by the descent of the hinged bar into a cross furrow. With the seed dropping slide, the elbow lever, and the spring are also connected a crank shaft, a connecting rod, and a cord, whereby the seed can be dropped by hand.

A combined chopper and cultivator has been patented by Mr. Ellison A. Daniel, of Bluff Mills, Texas. The frame of the machine is V-shape, and the plows are arranged upon this in suitable position and relation, and all is so contrived that the driver from his seat may operate the plows to any required depth or may hold the plows entirely above the ground. The driver is also able to shift the plow frame directly backward or forward and also give the frame lateral play, so that the plows may be moved so as to avoid any plants which may have been set in the ground out of proper line.

Mr. Louis Gairaud, of Santa Clara, Cal., has recently obtained a patent for a simple device for marking off land to facilitate the planting of trees. The invention consists in a land marker constructed with two parallel bars provided with adjustable slides, carrying plow standards and plows, and with adjustable handles. Several plows may thus be secured at equal distances apart upon the parallel slides, and several lines drawn across the field simultaneously, one of the end plows being drawn along a furrow previously made, thus regulating the equal distances of the lines apart. After the field has been marked with parallel lines the machine is drawn across the field at right angles to the first marking, and the plants are set at the points of intersection.

MISCELLANEOUS INVENTIONS.

Mr. Lee Roy Artbur, of Glen's Falls, N. Y., is the patentee of a simple contrivance for turning small sacks, as the fingers of gloves and other like articles of leather or cloth that are required to be turned after being sewed up, so that the seams will come on the inside.

A very simple and effective coal sieve has recently been patented by Mr. J. G. W. Putnam, of Saratoga Springs, N. Y., which is so constructed that the coal and ashes can be sifted with very little labor, and the spreading of the dust is avoided.

Mr. Volkert Van Vleck, of New York city, has secured a patent intended to promote strength and durability in dental plates, and also to secure a more accurate fit and a more natural expression to the face than is practicable when the plates are made in the ordinary manner.

An improved animal shears have been patented by Messrs. L. D. Gleason and R. A. Holt, of Lebanon, Mo. This invention relates to shears for shearing sheep, and provides a pair of shears which holds the skin of the animal stretched during the action of shearing, to prevent the skin from puckering up between the blades of the shears.

Mr. Michael Sexton, of New York city, has recently received a patent for an automatic flushing tank constructed with a series of graduated tanks placed one above the other, and provided with connecting siphons and a vent pipe, whereby a fixed quantity of water will be discharged automatically and at regular intervals of time into the place to be flushed.

An improved stove pipe and chimney attachment has recently been patented by Mr. J. M. Egnor, of Catskill, N. Y. The object of the invention is to form an upwardly tapering jet tube, which guides the products of combustion to the center of the pipe and prevents the air through which said products are ascending from forming a downward cold current to the fire, thereby preventing what is known as a "smoking pipe or chimney," and making a more uniform and thorough burning of the fuel.

Mr. John E. Evans, of Spanish Fork, Utah Ter., has recently patented a barbed wire fence. It consists in an arrangement of stellate or wheel barbs within loops of the fence wires, said wheel barbs being mounted horizontally on a couple of pointed wires, each having one end looped for interlocking with each other and passed through or around the opposite strands of the loops of the fence wires, the straight, or perpendicular, and interlocked barbs forming the axis on which the wheel barbs freely rotate.

Mr. D. C. Baughman, of Albion, Ind., has recently patented a device for opening and closing the cocks or valves of gas burners from a distance by automatic means, more especially street lamps, so that the lamps of a given district or section can be extinguished at once, and also lighted simultaneously by electricity. The invention consists in valve chambers combined with the burners and connected by air pipes, so that by pressure of air the valves or cocks can be moved.

Messrs Alfred Roovers and Alexander Roovers, of New York city, have recently received a patent for an improved electric cane constructed with two tubular sections connected with each other and the lower section by non-conducting couplings, and provided with a battery and an induction coil connected by a screw, a rod, and wires with the metallic head and ferrule of the cane. The object of this cane is to provide a galvano electric machine for remedial purposes, which can be easily and conveniently carried.

Mr. Walter S. Phelps, of Wortendyke, N. J., has recently secured letters patent for a simple and effective device for placing torpedoes on the tracks of railways in case trains are to be signaled and stopped during foggy weather or at night. The invention consists in a box adapted to contain a series of torpedoes and provided with a sliding bar which grasps the torpedoes and carries them out of the box and holds them on the rail, to be exploded by the wheels of a passing train, to which bar torpedoes are fed automatically by a spring contained in the box. The torpedoes are fed through a spout on the end of the box toward the rails, the spout being provided with a hinged gate, which is automatically locked in position when no torpedo is held on the rail.

A patent has been issued to Mr. Homer E. Jenne, of Ben Lomond, Cal., for an improved interest indicator. This invention consists of a weighted disk provided with interest or other tables on its opposite faces, and journaled between two graduated stationary circular screens of the same diameter, provided each with a pointer and a slot, whereby the figures on the opposite faces of the disk and opposite the windows can be read. The circular screens are secured at their circumferences to a metal band provided with a hooked arm adapted to engage in the socket of a plate secured to a wall or other object, whereby the indicator may be turned around when desired, the metal band being provided with a brake to hold the disk in any desired position.

An improved steam cooking apparatus has been patented by Mr. James M. Johnson, of Northumberland, N. H. The invention consists in a cooking steamer constructed with a vessel having inwardly projecting beads near its upper and lower ends, and provided with a perforated lower partition, a close upper partition, and a water return pipe. The cover of the vessel has a conical top, and is provided with an annular trough and a water discharge pipe. Upon the top of the cover are two compartments, provided with wire gauze screens and discharge faucets. With this construction the cooking will be done with live steam under pressure, so that the substance being cooked will not become soggy or water soaked, and will be quickly and thoroughly cooked.

NEW BOOKS AND PUBLICATIONS.

ILLUSTRATED CATALOGUE. Poole & Hunt, Engineers and Machinists, Baltimore, Md.

In this catalogue the publishers have most attractively presented the many good features of their Leffel turbine water wheel. The book is copiously illustrated with fine engravings showing some of the many applications of their wheel. The subject matter consists of descriptions and valuable tables, and the publishers have set a commendable example by omitting all recommendations and certificates.

A TEXT BOOK OF INORGANIC CHEMISTRY. By Professor Victor Von Richter, University of Breslau. Translated by Edgar F. Smith, A.M., Ph.D., Professor of Chemistry in Wittenberg College, Springfield, Ohio. P. Blakiston, Son & Company, 1,012 Walnut Street, Philadelphia, Pa.

With its eighty-nine illustrations and a chart of the spectrum this volume is a valuable "text book" as its title indicates. The "special part" contains an epitome of natural philosophy as applied to inorganic materials, that is in itself a text book to natural phenomena; and the department devoted to metals is particularly full of hints, suggestions, and directions to metal workers. The book, which is in a convenient form, is at once an instructor and a technical guide. The composition of the metals and the uses of their oxides form no inconsequent portion of the volume.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) W. E. T. asks how to prevent nickel plating from rusting, and also how to restore its brilliancy. A. Nickel plating if well done on solid metal ought not to rust. If on cast iron which is porous, the nickel will be also porous if not thickly plated. You may oil the articles with linseed oil and heat to a little above the temperature of boiling water. Then polish with whiting, chalk, or electro-silicon. The oil fills the pores and prevents future rust.

(2) E. H. M. asks the meaning of all the figures in framing squares manufactured by Sargent & Co. Also if there are any fractional threads in pipes, and what is standard measure for any given size. A. For full explanation of the use of the carpenter's square, see the SCIENTIFIC AMERICAN SUPPLEMENT Nos. 88 and 89.

Iron pipe, ⅛ has 27 threads.
¼, ⅜ 18 threads.
½, ¾ 14 threads.
1, 1¼, 1½, 2 11½ threads.
2½ and up 8 threads.

For bolts the usual threads are:
¼, ⅜ 16 threads.
½ 12 threads.
⅝ 11 threads.
¾ 10 and 11 threads by different makers.
⅞ 9 and 10 threads.
1 8 and 9 threads.
1¼ 8 threads.

There has been much effort to harmonize the bolt threads among makers, but without success. Many machine shops have variations from the above.

(3) W. S. asks: What is malleable iron, and how made? A. Malleable iron is cast iron deprived of most of its carbon by burning out in melting; then casting as with ordinary cast iron; then annealing at a red heat for several days, the castings being embedded in an oxidizing material, generally pulverized hematite or anvil scales. Cast iron boxes are used for packing the pieces in, and for convenience of handling.

(4) W. K.—For staining wood black, see SCIENTIFIC AMERICAN SUPPLEMENT No. 207, page 3301. Brazil wood is used for producing red stains. Thus: Take 1 pound of Brazil wood to 1 gallon of water, boil three hours with 1 ounce pearl ash, brush it hot on the wood, and while hot brush the wood with a solution made with 2 ounces of alum in 1 quart of water.

(5) A. F. S. asks (1) how to finish mahogany wood in French polish, such as is usually applied in finishing photographic cameras; and can it be finished in a darker shade than the wood, where it is of light shade? A. We would recommend you to use a red stain such as the following: Boil 1 pound Brazil wood and 1 ounce pearl ash in a gallon of water; brush over the work until of proper color. Dissolve 2 ounces alum in 1 quart water, and brush the solution over the work before it dries. Take a gallon of the above stain, add 2 ounces more pearl ash, use hot, and brush over with the alum solution. Then polish until of satisfactory tint. 2. Also how to finish maple to imitate mahogany? A. Mahogany stain on maple: Dragon's blood, ½ ounce; alkanet, ¼ ounce; aloes, 1 drachm; alcohol, 16 ounces. Apply with a sponge or brush.

(6) J. R. asks (1) how to extract alumina from clay on a small scale. A. Aluminum is prepared in decomposing the double chloride of aluminum and sodium, by heating it with metallic sodium, fluorspar or cryolite being added as a flux. 2. How to extract metallic sodium from common salt? A. Sodium is obtained by distilling a mixture of sodium carbonate with charcoal and chalk in the following proportions: Dry sodium carbonate, 717 parts; charcoal, 175 parts; chalk, 108 parts. 3. How to extract magnesium from any one of its compounds? A. Magnesium may be prepared by the electrolysis of the magnesium chloride (fused) or by the reduction of magnesium chloride with metallic sodium. For details in regard to these methods, consult Roscoe and Schorlemmer's Treatise on Chemistry.

(7) W. K. A. asks (1) if gutta-percha plates will answer in place of glass ones in the Toper-Holtz machine. A. Gutta-percha, or rather vulcanized rubber, has been used for the plates of a Holtz machine, but it is neither as cheap nor as good as window glass. 2. If they will answer, do they need varnishing? A. If used, it would probably be well to varnish them with shellac. 3. What will cement hardwood to glass or gutta-percha? A. Owing to the shrinking and swelling of wood by hygrometric changes, an elastic cement is required. Equal parts of pitch, gutta-percha, and shellac will answer the purpose. Hard rubber or vulcanized fiber would be better than wood.

(8) C. M. asks: 1. Is electricity ever used for warming houses or for cooking food? A. Experiments have been made in this direction, but this method of heating is very expensive. 2. Is a shrill note, or a low, dull note heard at the greatest distance? A. Experiment shows that the lower notes are heard the farthest. 3. Has the experiment of warming houses and of supplying steam for other purposes by using boilers situated a long distance from the place of its use, been successful? A. Steam is conducted long distances for heating and power purposes. Companies have been formed in New York and pipes laid for supplying steam for manufacturing and heating purposes on this principle. 4. Would two cannon balls of equal size and weight, fired from a gun on level ground, using the same quantity and quality of powder, the gun to be elevated at an angle of 45 degrees—under such conditions, would the ball, thrown exactly in a westerly direction, reach the same distance as the other ball thrown in exactly an easterly direction? A. There would be no appreciable difference.

(9) W. T. A.—Hand punches such as watch makers use for punching springs will punch holes in hoop skirt wire. Drill in a small drill press if you wish to save drills. Probably you use too much pressure upon the drill. Any jeweler in your place could tell you all you require to know about drilling small holes.

(10) M. W. T. writes: To settle a controversy, will you kindly give a comprehensive definition of momentum and inertia? The text books at hand are too indefinite upon the subject of momentum, saying simply that it is velocity multiplied by mass. Yet they say that it is "on account of" inertia that a ball keeps in motion after it has been projected from the hand. That, it seems to me, conveys an erroneous impression, for inertia is not a force which can carry a ball. By inertia we understand the incapability of a body to move itself while at rest, or to stop itself while in motion; that is to say, its incapability of doing anything; a purely negative quality, which is always the same in a body whether it is at rest or in motion. If mass is multiplied by velocity, the result is certainly a live force. The exertion of throwing a ball converts muscular force into motion, and this through the medium of the ball is delivered in the form of heat, etc. Thus the ball while between the points of impulse and impact is possessed of the force. What is the name of that force? It is not impulsive force, for that ends with the effort. It is not inertia, for inertia is not a force. A. According to Newton's law, "a body if in a state of rest or motion continues to be ever in a state of rest or motion unless acted upon by some extraneous force." In both these cases the body is in a state of inertia. To say that a body when once set in motion continues to be in a state of motion on account of inertia is simply to assert that it is obedient to Newton's law. It is set in motion by some extraneous force, but it continues in motion forever in a straight line on account of the absence of any force to deprive it of its motion, *i. e.* on account of inertia, "Inertia is that property of matter which cannot of itself change its own state of motion or of rest" (Ganot). We think that the difficulty you experience about momentum is due to your misapprehension of the meaning of the word. Momentum is not a force; it simply measures the force which has been communicated to a body. "Force is any cause which sets a body in motion or which changes the magnitude or direction of its velocity if in motion" (Ganot). We should say therefore, when force has been expended in setting a body in motion, that "between the points of impulse and impact" the body was possessed of energy. In what way this energy will develop itself when brought into relation with some other body or bodies, as air, body at rest, body in motion, etc., can only be determined by the conditions.

(11) B. W.—The black coating on the sample of zinc received we take to be bronzing. The following is used for that purpose: 1. Dissolve 5 drachms iron nitrate in 1 pint of water. 2. 5 drachms iron perchloride in 1 pint of water. 3. Dissolve 10 ounces arsenic chloride in spirits iron perchloride and 1 pint of water. 4. Japanning and japans; for full information on this subject see article with above title on page 5040 of SCIENTIFIC AMERICAN SUPPLEMENT, No. 316.

(12) C. H. S. writes: Please give me through your paper a receipt for bronzing castings. A. For bronzing brass castings—dip the articles in a bath composed of: Hydrochloric acid, 6 pounds; sulphate of iron, half a pound; white arsenic, half a pound, until black. Then wash in hot water. Dry in sawdust, polish to suit the taste with plumbago, and brush and lacquer.

(13) W. D. S. asks: In filing a meat saw, should the teeth be filed square across from one side, every tooth, or every other one? or should the file be inclined to the left? A. A meat saw should be slightly set, and filed from both sides on every other tooth, and not square, but slightly inclined, like a saw for cutting wood. The teeth should also lean forward more than a wood saw.

(14) W. H. M. writes: I would like to know how to prepare small pieces of wood so as to make them suitable for kindling purposes. It is now waste, and if I could bundle it and then dip in some cheap material that would light readily with a match, it would turn an almost useless article to some account. What material can be best used for the purpose above mentioned? A. Small pieces of wood that can be bundled should sell readily for kindling without addition of inflammable matter. It is a commercial article in New York. Kindling waste and sawdust united and pressed with an admixture of melted resin has been sold in New York, resin or pitch being a very cheap inflammable cement.

(15) F. A. G.—For your dialytic telescope make the object glass or front lens a plano-convex 4½ inches diameter, 39 inch focus, plane side next the eye, of crown glass. For the correcting lens, use flint glass 2½ inches diameter, 27 inch negative focus, plano-concave, concave side next the eye. Arrange the tube so as to move the flint lens a short distance for a final adjustment. This will give a focal length of about 6 feet for the telescope.

(16) F. A. W. asks how liquid India ink is prepared, *i. e.*, how the lamp black is kept suspended or in solution. A. A very black and indelible drawing ink may be made by dissolving shellac in a hot water solution of borax, and rubbing up in this solution a fine quality of India ink; this may be made by rubbing down a genuine India ink with good black ink until it flows easily from the pen. 2. Mix finest lampblack with a solution of 100 grains lac and 20 grains borax in 4 ounces of water.

(17) A. J. M. asks how and where anchor ice is formed—whether at the bottom or surface of a stream. A. Anchor ice is formed at the bottom of running streams. The agitation of the water prevents it freezing at the surface, although it may be at a temperature several degrees below freezing. The low temperature is imparted to the stones or rocks at the bottom. The water freezes in thin films by contact, and it continues to grow thicker by the constant contact, with the water below the freezing point.

(18) F. P. writes: I wish to build a ram and have a valve that will do for an outlet valve with an opening 4¾ inches diameter, fall 18 inches, elevation 10 feet, distance 200 feet, plenty of water. Please give me best size and length of feed pipe, best size of check valve, and how much drop for outlet valve. Please mention if the feed pipe must be a special size to suit ram, or if any size will do if large enough. I wish to make a square one of boards, and would like dimensions given accordingly. A. If your supply pipe is 4¾ inches diameter, the discharge may be 2¼ inches, and the check valve should be nearly the size of the supply pipe. Any size will do if large enough, but it must not be so large as to reduce velocity due to the head, less friction.

(19) W. F. R.—The water in a steam boiler is quiet, provided no steam be drawn from the boiler; but when steam is drawn off, the bubbling and boiling is the same as in an open vessel.

(20) G. H. I. asks how the lettering is put on polished steel, such as razor blades or hand saws. I am aware he says that it is cut in with an acid, but could you possibly tell me how it is applied and what tools are used? A. The etching of razors and saw blades is done by drawing with a fine hair brush the design or letters in asphalt varnish; also cover all other parts with the varnish and dip in an acid bath. If the design is very small, a rim of beeswax may be set around the design or name. A few drops of the acid put within the rim will cut or bite the figure. Another way is to cover the whole with etching varnish or wax and scratch the design into the wax, and then bite with acid. For the acid: To 1 gill acetic acid or good, strong vinegar, 20 drops nitric and 20 drops sulphuric acid with half a teaspoonful of salt. You can make the asphalt varnish in a close bottle, using asphaltum and spirits of turpentine; set the bottle in warm water until the asphaltum is dissolved. Make it thin, so that a trial with the brush makes a fine, smooth line.

(21) T. H. H. asks the respective distances through which light and electricity passes per minute. A. The velocity of light is 190,000 miles in a second. According to Wheatstone's experiment, the velocity of electricity is 288,000 miles in a second, but the velocity of an electrical current through a wire, according to Kirchhoff, is far less; something like 192,924 miles in a second.

(22) A. W. asks the time in years it takes the magnetic pole to make one revolution round its circle, and the radius or diameter of that circle as near as it has been discovered. A. We do not know that the magnetic pole or poles, for there are four of them, or two north and two south—a strong pair and a weak pair, are moving as you describe. The strong north pole is in the vicinity of the head or north end of Hudson's Bay, in about 70° north latitude, 85° west longitude. It appears to be moving in what was at first supposed a great circle around the terrestrial pole, but probably only swinging in an orbit of unknown form and approximate diameter, which we cannot assign with our present knowledge.

(23) R. L. N.—For repairing mirrors accidentally scratched, clean the bare portion of the glass by rubbing it gently with fine cotton, taking care to remove any trace of dust and grease. If this cleaning be not done very carefully, defects will appear around the place repaired. With the point of your knife cut upon the back of another looking glass around a portion of the silvering of the required form, but a little larger. Upon it place a small drop of mercury; a drop the size of a pin's head will be sufficient for a surface equal to the size of the nail. The mercury spreads immediately, penetrates the amalgam to where it was cut off with the knife, and the required piece may now be lifted and removed to the place to be repaired. This is the most difficult part of the operation. Then press lightly the renewed portion with cotton, and the glass presents the same appearance as when new.

(24) A. M. asks: 1. Do not all boiler explosions proceed from a gas that is generated in the boiler? A. No. 2. If all parts of a boiler, including flues and crown sheet, which come in contact with fire, were kept covered with water on the opposite side, could explosions occur? A. Yes.

(25) I. H. M. asks: Is it possible to siphon water from a well 72 feet deep, with 8 feet fall from bottom of the well, with 1 inch pipe (which seems to be tight, but when it is turned on but little the water will run)? There are 30 feet of water in well. Would a check valve be of any use in the well? A. Eight feet fall would be hardly sufficient to overcome the friction in a 1 inch pipe of that length. You should use not less than 2 inch pipe, if you wish to get any quantity of water. A check valve would save the necessity of charging the siphon every time you wish to put it in operation.

(26) E. M. D. writes: I wish to run a 3 inch Cornish lift pump in a mine shaft 60 feet deep, and raise about 1,000 gallons water per hour. My mill and power are 700 feet distant. Can I run the pump by transmitting power by an endless wire rope? If so, about what power would be consumed, and what size wire rope (charcoal iron) would you advise? A. To raise this quantity of water requires but ½ to ¾ of 1 horse power. You can easily transmit this power by a wire rope; a diameter of ¾ inch or ½ inch rope running 1,200 feet per minute on a pulley 5 to 8 feet diameter will be ample to transmit the power.

(27) J. H. B. writes: I am putting up a great many engines ranging from 7 to 20 horse power, having a good deal of trouble with them. I cannot raise a working pressure of steam from 2 to 4 hours. Draught is poor. After getting it up, it cannot be kept up. Boiler, locomotive style, 30 to 40 two inch tubes, 6 to 7 feet in length. What is the best remedy for them? A larger smoke stack and longer one? Smoke stack is only 8 inches diameter, 12 feet long. A. You do not give the surface of grate. However, your smoke chimney is quite too small; it should be at least 16 inches diameter, and 18 or 20 feet high. You have also too little area through the tubes to get an active draught.

(28) R. J. H. writes I make for my own use nitrous oxide gas. I wish to compress it in an iron cylinder, say 100 gallons. Can you tell me what amount of pressure and degree of cold is required to liquefy it? A. Condensed to $\frac{1}{50}$ of its ordinary volume it liquefies at 0°; a pressure of 30 atmospheres (441 lb. per sq. in. absolute) is necessary. It boils at — 87·9° and solidifies at —115° to —140°—767·3 mm. pressure.

(29) A. D. O. asks: 1. Where can I obtain hydroquinone, mentioned on page 89 of the issue for Aug. 11? A. Hydroquinone can be obtained from dealers in pure chemicals in New York or through wholesale drug houses. 2. What is its cost? A. Its value varies from $1.50 to $2. 3. Please give the formula for using with gelatine bromide plates. A. As its use is not general as yet, no definite formula can be given other than to follow the recommendation of the SCIENTIFIC AMERICAN, to use it in the proportion of 1 to 2 of pyro.

(30) M. B. S.—Burning fluid used in the jet lamps is made with 95 per cent alcohol, 6 quarts; spirits turpentine, 1 quart.

(31) W. McC. asks: Will you please inform us what the characteristic (or designation) of "a ¼ bend" is, and the deflection—angle—of the same? A. One-quarter bend in the cast iron pipe trade is a bend of 90°, or a right angle. This is called in the wrought iron pipe trade an elbow. A bend in the wrought iron trade is a piece of pipe bent to a right angle.

(32) E. N. writes: If stagnant water containing glucose, refuse, or poisonous material freezes, does the ice contain any of the poison, and would it be safe to use? Does ice contain all the constituents (dissolved gases, air, etc.) of the water from which the ice was produced? A. Water in freezing separates to a certain extent from various salts, acids, and other chemicals in solution, as well as from air and gases to a degree. Gums, starch, and gelatinous substances in solution are more or less frozen with the water. Any granular or muddy substance held in suspension in freezing water is also held in the ice in too large a quantity to render it fit for drinking purposes. Ice from stagnant ponds, especially those containing glucose or starch refuse, is unfit to be used in refrigerators.

(33) M. G. B. writes: I have tried casting brass and have not succeeded. In pouring the melted brass in the mould, found it did not run properly; all full of holes. I would like to know if there is any special way of making mould so as to insure the brass running properly? It seemed to sputter too much. Is there any special degree to which the brass should be heated? Would you kindly tell me the yearly subscription price of *Engineering*? A. Probably your sand was too wet. If you have never seen the operations of a foundry, you may have to make a number of trials before you succeed in making a good solid casting, for sometimes experienced moulders make this mistake. We recommend you to obtain the proper sand (which should be a fine loam) from some foundry. By feeling of the sand that is used by moulders you can judge about how moist it should be for moulding. As a general rule, it should be very dry to allow the pattern to be drawn without crumbling the sand. The mould should also be well ventilated by scratching at the parting and also pricking the cope with a sharp wire. Do not heat the metal hotter than will run freely. The subscription to *Engineering*, postage prepaid to America, £1 16s., or about $9 a year.

(34) G. H. M. asks: Can a magneto bell machine, such as is used on a telephone line, be used to electroplate with, or could two of them be combined; and if so, how can they best be used—single or combined? should the bell magnets be removed? A. The current generated by a magneto such as is used in connection with telephones is alternating, and therefore not adapted to plating. A commutator might be applied so as to send the current away in one direction, but even then the machine would not answer, as it yields a current of great intensity. The remedy for this would be to wind the armature with coarse wire, say No. 22. The machine is too small for practical use.

(35) C. E. C. asks: Is there any difference between a sq. ft. or a ft. sq. (or 1 sq. ft., 1 ft. sq.)? If so, why? If none, prove. A. There is no difference between 1 ft. sq. and 1 ft. sq. Above one, however, there is a difference. Thus, 2 ft. sq. is in area twice as large as 2 sq. ft. Two sq. ft. is a square with sides 2 ft. in length, while 2 sq. ft. would be a rectangle, 2 ft. long and 1 ft high. Ten sq. ft. signifies an area containing ten squares of a foot each, while ten ft. sq. is a square having each of its sides ten feet in length.

(36) H. E. D. asks: 1. Whether an ordinary spark from a Ruhmkorff coil will explode hydrocarbon vapor mixed with air, or no? A. The spark from an induction coil will explode gas. The calorific spark is the most effective. 2. Please state the product of such explosion. Have been experimenting with it for a motor. I fear the hydrogen unites with oxygen of the air, reducing the elasticity too much. A. The products are principally carbonic acid and water. 3. In making a Ruhmkorff coil how many cells of Grove or other good battery will be required to make sparks sufficient to explode gas in a gas engine with coil? A. One cell would answer, but two would be better.

(37) J. W. asks: What material is the best at its cost as a preservative for pine shingled roofs? A. Dip, if possible, otherwise coat the shingles with linseed oil or crude petroleum. Sodium silicate, or water glass in combination with paint is rapidly coming into general use as a desirable substance for rendering articles fireproof.

(38) F. R. S. writes: Will you please inform me of the best method of waterproofing and making perfectly smooth, with the least weight, canvas on canvas canoes? A. Linseed oil is often used. Aluminum acetate is an excellent agent for waterproofing. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 317, for seven methods for waterproofing.

(39) J. M. B. asks for a good glue for pasting cigarettes together, which will not stain the paper. A. Use either gum arabic or dextrine, sometimes called British gum.

(40) W. C. asks for process whereby a print of any kind may be taken from paper on to a piece of window glass within a given time of 10 or 15 minutes. A. The print is first coated with Grecian varnish or balsam of fir, then attached to the glass, and the surplus paper removed by rubbing with a wet rag or with the moistened fingers.

(41) A. S. S. asks if there is anything he could put on a goat skin robe to take away the disagreeable smell which is peculiar to that animal? A. Hold the skin over a fire of red cedar boughs, and sprinkle with chloride of lime; or wrap the skin in green hemlock boughs, when they are to be had, and in 24 hours it will be deodorized.

(42) W. H. R.—The following compound is claimed to render wood incombustible without affecting its natural color:

Zinc sulphate	55 pounds.
American potash	22 "
American alum	44 "
Manganese dioxide	22 "
Sulphuric acid, 60°	22 "
Water	55 "

The solid ingredients are first placed in an iron vessel containing the water at a temperature of 55° C., and when they are dissolved, the sulphuric acid is added in small quantities at a time, until the whole is saturated. The wood is then laid, with half inch space between each space, on iron gratings in a suitable apparatus, into which the mixture is pumped until all the spaces are filled. Heat is applied, and the wood is boiled in the mixture for about three hours, when it is taken out and dried for use in the open air.

(43) A. F. writes: I have been using the following composition as a dip for matches (sulphur): glue, 3; white lead, 2; phosphorus, 1½; bolomy, ½. But I find it will not stand damp weather; the head becomes soft. What is the trouble? A. After the matches have been dipped in paraffine and in sulphur, either of the following mixtures may be used:

1. Phosphorus	4 parts.
Niter	16 "
Red lead	3 "
Strong lead	6 "
2. Phosphorus	9 parts.
Niter	14 "
Manganese dioxide	14 "
Gum or glue	16 "

Melt the glue at 212° F., gradually add the phosphorus, which must be well stirred into the liquid; then add the niter and coloring matter. Keep the paste at a regular temperature of 97° F., by means of hot water under the marble or cast iron slab on which it is spread, while the matches are being dipped. When glue is used, there is less tendency to injury by the dampness.

(44) C. H. T. asks for an indelible writing ink that cannot be readily washed out. One that flows freely and is suitable for ordinary writing and bookkeeping. A. Triturate 1·75 grammes aniline black with 60 drops strong hydrochloric acid and 42 grammes strong alcohol. The mixture is diluted with a hot solution of 2·5 grammes gum arabic in 170 grammes water. This ink does not attack steel pens, and is destroyed neither by minerals, acids, nor caustic alkalies.

(45) A. E. D. asks for a suitable device for holding and dropping strong acids, that will drop the acid quite slowly, say at the rate of six to ten drops per hour. A. This can readily be accomplished by the use of a glass tube of proper length (to suit your purpose) with its end drawn out to fine point, or else by means of a funnel plugged with asbestos, yet with sufficient room to allow the dropping in accordance with your wishes.

(46) M. B. asks: the composition of the "gelatine printing or copying pad," and also that of the blue aniline ink which is used for writing the original of the article to be copied. A. One pound of gelatine is soaked in water until it becomes flaccid, after which it is melted in a water bath with 6 pounds ordinary glycerine, the heat being maintained for several hours so as to drive off excess of water. The mixture is then passed into zinc trays one-half inch deep and allowed to set. Another composition is:

Water	120 parts.
Barium sulphate	75 "
Gelatine	30 "
Sugar	30 "
Glycerine	180 "

The ink is made by dissolving 1 part of aniline violet (blue shade) in a mixture of 7 parts water and 1 of glycerine.

(47) W. I. asks how to prepare rubber cement. A. Rubber may be dissolved in carbon disulphide, benzine, or chloroform, or perhaps best of all in a mixture of methylated ether and petroleum spirit. See SCIENTIFIC AMERICAN SUPPLEMENT, 158.

(48) W. H. M.—On page 2510 of SCIENTIFIC AMERICAN SUPPLEMENT, No. 158, will be found a number of recipes for cements, several of which will answer the purpose you desire.

(49) A. G. W. asks: 1. At what time are the scales found on the crown sheet of a horizontal boiler formed there? A. More or less from the time the boiler is put in use. The rapidity of the formation depends upon the character of the water and rapidity of evaporation and pressure. 2. Are these scales collected there as they are formed in the boiler or do they collect there at the time the boiler is being blowed off? A. During the operation of the boiler. 3. What is the cause of always finding them on the crown sheet when the man plates are taken out? A. They adhere to the heating surface, and blowing off does not remove them as it does where they do not adhere.

(50) J. F. G. asks: 1. What size boiler will it require for an engine 1 inch bore, 2¼ inches stroke? A. Should have about 3 feet heating surface. 2. What thickness of sheet? A. If not more than 10 or 12 inches diameter, three thirty-seconds of an inch thick will be sufficient if the joint is properly riveted. Do not rely upon brazing.

(51) H. L. B. asks if there is any instrument that will detect the presence of gold or silver coin four feet underground by passing over the surface with the instrument. A. There is no such instrument or contrivance.

(52) E. M. asks why a pump in perfect order will not drive water through a heater ten feet long, with eight turns of pipe, to the boiler. It will work well for a while, and then all at once it will run away, whereas it will throw water 18 feet above without any trouble. A. We do not know all the facts. Listen along the suction pipe; you may hear air drawing in. Examine the valves and see if they are free and not liable to stick when up.

(53) J. G. asks which is the highest church tower in America, and what is the height. A. Trinity Church, New York; height, 286 feet. The new cathedral, New York, was intended to be the highest, 325 feet, but is not yet finished.

(54) J. H. P.—There is no way of making artificial marble by breaking up a cement that will hold a polish or stand the weather. You cannot expect to split fossil limestone into the shapes that you require. You must saw it. In this way it will slab the same as marble. 2. 270 cubic feet of new mown hay will weigh a ton; 216 to 243 cubic feet of old hay in stacks will weigh a ton.

(55) G. Brothers. ask: What is the best method of bleaching a mixture of fish oil and tallow in order to give it a fine yellow color? What is the best treatise on the subject? A. The simplest method of bleaching oils in a small way is as follows: For ten ounces of the oil take sixteen grains of potassium permanganate and dissolve in 1½ ounces water. Warm the oil to about 100° or 120° F., mix it with the permanganate solution, and shake the whole violently for some minutes. Let the mixture stand a few hours in a warm place, draw off the water, and finally filter the oils. There is no satisfactory work on the subject; it is entirely fragmentary and can only be obtained by consulting periodicals such as the SCIENTIFIC AMERICAN, SCIENTIFIC AMERICAN SUPPLEMENT, *Oil, Paint and Drug Reporter*, and others. Spons' Encyclopædia of the Industrial Arts contains a description of the various fish oils, but it is only in a general way that the subject is discussed.

(56) F. S. R. asks to what extent copper ferrules are used on the ends of locomotive, marine, stationary, and portable boiler tubes? To what extent have they been discarded on coal burning boilers? Has it been found that the use of coal has a more injurious effect on them than wood? A. Copper ferrules are largely used in locomotive boilers, some in both ends and many in only the fire box end. We do not know of any being used in stationary and marine boilers. Coal is more destructive to ferrules than wood. But that is not the reason for not using them in stationary boilers. It is the vibration of a locomotive that seems to loosen the tubes without the ferrule. The present system of expanding the tubes in stationary boilers is as nearly perfect as possible, and requires no ferrules.

(57) P. M. asks what is the best battery for electrotyping small objects about 2 inches square? I want to plate them about an eighth of an inch thick. Also the cost of the battery? A. Use three or four cells of gravity battery connected for quantity. Cost, $80 to $90 per cell.

(58) J B. C. writes: Can you tell me through the SCIENTIFIC AMERICAN: 1. I wish to use a liquid electrical conductor that shall be better than acidulated water and not as good as mercury. A. We know of no solution that will meet your wants. 2. Also a solid conductor that shall have much more resistance than carbon. A. Try charcoal or a mixture of charcoal and clay. 3. How can gold be given different colors, as in the letters of a monogram? A. This is done on cheap jewelry by means of thin lacquers colored with the anilines. The finer grades of work are made from pieces of gold of different colors soldered together. 4. How is silver oxidized, as in jewelry? A. Silver may be oxidized by dipping it in a solution of sulphate of potash.

(59) A. H. writes: If a train of cars traveling east at the velocity of a cannon ball should have on board a loaded cannon the mouth of which is pointed west, about how far would the ball in the cannon travel west if the cannon be discharged? A. The ball would fall to the ground at the point of firing under the conditions you mention.

(60) D. F. D. asks: 1. What kind of cement or preparation will cause lead to firmly adhere to a smooth iron surface? A. For joining metallic surfaces where soldering is inconvenient, recourse may be had to a composition formed in the following way: Pure and finely divided copper, such as that obtained by the reduction of copper sulphate with zinc clippings, 20 to 36 parts, according to the degree of hardness desired in the cement, dissolved in a sufficient quantity of sulphuric acid to make a thick paste; with this is incorporated, by trituration in a mortar, mercury, 70 parts. The mass is soft, but hardens at the end of some hours. For use it is heated to 100° C. and powdered in an iron mortar to 150° C. It adheres strongly on drying, and is harder in proportion as it contains more copper. 2. In what way can a cement be prepared, say, thirty minutes, sufficiently hard to be used as a mould for metal. A. A cement which may be used to unite all metals consists simply of a mixture of commercial glycerine and finely powdered litharge. By mixing glycerine and litharge a paste is obtained which will harden in from ten to thirty minutes, according to the amount of litharge used. We would recommend you to try the last receipt for forming moulds, described in second question.

(61) W. H. L.—The size for preparing wood work for gilding is as follows: To half a pound parchment shavings or cuttings of white leather, add 3 quarts water; boil it in a proper vessel till reduced to nearly half the quantity; then take it off the fire and strain it through a sieve. Be careful in the boiling to keep it well stirred, and do not let it burn.

(62) M. M. B. asks how to redye seal skins. A. All of the sealskins sold in this market are prepared and cured in London, where the process is kept very secret, and no knowledge can be obtained on the subject. Some information is given on page 5510 of SCIENTIFIC AMERICAN SUPPLEMENT, No. 345, under head of "How Seal Skins are Dressed."

(63) J. A. C. asks: Which would be the best way to raise water from a drain mouth where a common outlet is not to be had? Would an Archimedean screw have any special advantage over a pump in a lift of 4 or 5 feet? Would a centrifugal pump be better than a common lift pump? Power to be a windmill. A. The best is the most simple and common lift pump (attached to wind mill). You can make one of wood or obtain one through the hardware trade from Chicago.

(64) A. N. Works asks how they can galvanize small castings without much cost. A. First dip your castings in a pickle of equal portions of sulphuric acid and water, and finally immerse in a bath of equal portions of tin and lead. We recommend you to read the article on "The Galvanizing Process," page 2798 of SCIENTIFIC AMERICAN SUPPLEMENT, No. 176.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

W. E. L.—Unfortunately in unpacking the specimens Nos. 1 and 2 became mixed. No. 3 is a black shale containing pyrite. No. 4 is a decomposed silicate, which is more or less weathered. None of the specimens sent, in our opinion, are of any value as far as their metallic constituents are concerned.—D. A. O.—The specimen is undoubtedly a fire clay, but its value can only be determined by chemical analysis. This would give the percentage of the worthless constituents. The expense would be $25.00.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

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October 23, 1883.

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Intestines, machine for cleaning, F. E. Davis 287,253
Iron. See Soldering iron.
Iron, apparatus for treating molten, R. H. Gordon 287,273
Iron from blast furnaces, analyzing pig, S. A. Ford (r) 10,395
Iron, process of and plant for producing cast, J. Reese 287,054