ENGINEERING INVENTIONS.

A railroad tie has been patented by Mr. William H. Knowlton, of Pottsville, Pa. This invention relates to a metallic tie of special construction, the form of which may be considerably varied, and which may be rolled in iron, steel, or other malleable metal, or cast.

A pile driver has been patented by Mr. Joseph W. Putnam, of New Orleans, La. It is of that class of pile drivers used for railway building, and therefore mounted on a truck or platform car, being so constructed and arranged that a pile may be readily driven vertically or obliquely, a pivoted platform being combined with hinged leaders connected by a double joint with a triangular iron frame, with various other novel features.

AGRICULTURAL INVENTIONS.

A cultivator has been patented by Messrs. Oliver S. Presbrey and Aaron Nall, of Moriah, N. Y. The teeth are attachable as desired, and are so held to their work by a clamp that they will yield on striking a large stone or other obstacle, and thus prevent breaking; they may also be so arranged in a group as to form a shovel plow.

A wheel cultivator has been patented by Mr. William P. Brown, of Zanesville, O. This invention relates to a former patented invention of the same inventor, in which the plow beams were provided with a resilient flexible joint, and with a lifting spring and draught connection that tended to draw the plows into the ground, and covers a further development of the idea and improvement in the construction.

MISCELLANEOUS INVENTIONS.

A camera stand has been patented by Mr. William H. Lewis, of New York city. This invention relates to improvements in portable tripod stands, and covers certain features of construction of the folding legs and means for retaining them in connection with the top or base that receives the camera.

A combined grain separator and smutter has been patented by Mr. Harry L. Martin, of Lancaster, Pa. This invention covers a novel construction and arrangement of parts for a machine to facilitate the cleaning of wheat and other grain, and promote thoroughness in such cleaning.

A folding barrel has been patented by Mr. George F. Knapp, of St. Louis, Mo. This invention provides means whereby the center of the barrel may be securely held while either end is adapted to be opened to examine the contents, and so the hoops may be locked securely or readily unlocked.

A feeding device for carding machines has been patented by Mr. Ernst Gessner, of Aue, Saxony, Germany. This invention provides a device for taking away or feeding regularly and evenly, from a receptacle or bulk box, wool or other fibrous material, carrying it forward to some desired place, or delivering it to another machine, in even amounts.

A rubber stamp hand printing machine has been patented by Mr. Robert Gaiger, of West Hoboken, N. J. It is made with end plates slotted to receive an inking roller, and connected by a socket bar with one or more spring-supported plungers carrying the stamp, and operated by cams with which are connected slotted arms carrying the inking roller.

A stock feeder has been patented by Mr. Elias R. Harman, of Lincoln, Neb. This invention covers a special construction and arrangement of parts for a stock feeder which shall have a separate trough for each animal, and so that all the troughs can be filled uniformly and rapidly, the troughs being easily kept clean.

A sheep stock has been patented by Mr. Francis M. Swartz, of Jacksontown, O. The construction is such that the weight of the sheep pulls on straps and causes hinged side boards to so close down upon him as to make him hold himself, when necessary, for tagging or other purposes, and so that if he struggles he will only be held the more closely.

A machine for sawing stone has been patented by Mr. Valentine G. Barney, of Charles City, Iowa. This invention covers improvements on a former patented invention of the same inventor, the improvements especially relating to devices for feeding the sand and water mixture upon the block of marble or stone, and devices for mixing the sand and water.

A clip for vehicle axles has been patented by Mr. Edmund N. Hatcher, of Columbus, O. The body or strap portion of the clip is of sheet metal of suitable thickness, and of a size to serve as a hood to exclude water and dirt from under the skein body, and to sustain the collar band against endwise pressure, the bolts for the clip bar being welded to the body, and the device forming a combined hood and clip.

A machine for heading bolts has been patented by Mr. John Stacker, of West Winsted, Conn. It is a bolt making machine with devices for upsetting the wires and forming the head in one heat, and for automatically pressing and pinching together the dies for holding the wire while it is being upset, for separating the dies afterward, and pushing out the completed bolt.

A shield for scarfs has been patented by Mr. Gustave Selowsky, of New York city. The shield has a raised central portion on its inner face, this portion being integral with the body of the shield, and having a button hole with a metal lining, so the shield can be used with buttons with different sized heads, and will adapt itself to the varying distance between the button and the top of the collar band.

A cooking stove has been patented by Mr. Charles F. Hanneman, of Ahnapee, Wis. This invention relates to baking ovens with a vertically adjustable bottom plate, and means for admitting steam into the oven, and provides improved arrangements for raising and lowering the oven plate, and improved construction of the steam generator and discharger, making an oven specially adapted for baking bread in the most perfect manner.

A sealskin sack, dolman, and ulster block has been patented by Messrs. Phillip Weinberg, Louis Clark, Jr., and Egbert Winkler, of New York city. It is made with three or more boards secured to each other at their adjacent edges and attached at their ends to end boards, the adjacent edges of two or more of the boards being tapered, with other features, to facilitate the working of the skin as the edges are successively tacked to the block as the work progresses.

A vehicle shaft has been patented by Messrs. John Scott and Amos S. Scott, of Caln Township, Pa. It provides for three horses being hitched on shafts usually arranged for one horse, two thills having a triple tree pivoted on a cross piece of the same, a single tree on the middle and one on each end of the triple tree, and there being straps passed around the ends of the double tree and through loops on the sides of the thills.

A sectional non-conductive covering for tubes has been patented by Mr. William M. Suhr, of New York city. It is formed of two semi-cylinders of plaster of Paris, asbestos, and sawdust, covered on the outside with a layer of felt, which in turn is covered by a layer of thick paper, the covering being formed in sections and delivered dry and hardened ready for application, so a large quantity of pipe can easily be covered in a short time.

A sand and water pump has been patented by Mr. Valentine G. Barney, of Charles City, Iowa. The pump cylinder has a piston fitting closely at its upper end and loosely at the lower end, the piston having a series of apertures extending from the top to the loosely fitting part, to conduct water through the piston into the cylinder to form a sleeve of water around that part of the piston fitting loosely in the cylinder, to prevent wear of the piston.

A panel raising machine has been patented by Mr. Julius Lobnitz, of Madisonville, O. This invention covers improvements in contrivances for mounting, adjusting, and operating the cutter heads, also improvements in the cutters, in the table, and in the contrivance of the chip breaker and the gauges for controlling the work, the advantages being, among other things, to lessen the power required and make smoother work.

A door or window screen has been patented by Mr. Obadiah G. Newton, of Trenton, Mo. Netting is secured to the inside of the frame, and grooves are formed in the netting, in the bottom of which grooves are apertures through which the flies can escape, triangular blocks being placed in the ends of the grooves and in recesses in the frame, to make it easy for flies to escape from a room, but difficult for them to enter.

A mechanism for converting motion has been patented by Mr. Jethro E. Pencille, of Kendall, Pa. It is a lever mechanism combined with a piston and crank shaft, a short piston movement being made to operate a crank of much greater length, to give increase of leverage and power, the device being especially designed for use in connection with a steam engine, and generally applicable for converting rectilinear into rotary motion.

A boot or shoe has been patented by Mr. John Hansen, of Maryville, Mo. The upper is formed of three layers, the middle one consisting of oil tanned and crimped bladder; the bottom edge of the upper layer is turned outward to form a second welt, on which the usual welt is placed, and then sewed to the upper, and at the same time is sewed to the sole with the upper, the counter being placed on the outside of the back leather, and a back stiffener over it, which extends above the counter and over the side seams.

A coffee and tea pot stand has been patented by Mr. Charlie Gracey, of Summit, Miss. It is made to hold the pot securely, and facilitate tilting it, a basket being pivoted between two standards, with slots in the rear and front of the basket for receiving the spout and the handle of the pot, and with apertured lugs through which a pin can be passed, which is also passed through the pot handle to keep the pot in place, while a lamp can be held in the cross piece of the standards.

A guide setter for sewing machines has been patented by Cornelia T. Freeman, of Elizabeth, N. J. The graduated plate has a pivoted pointer for designating the position of the cloth guide, so in case the work is suspended, and the machine used for other stitching, the guide may be easily and accurately readjusted to resume work; the graduated plate also has a stud on its under surface to enter an orifice in the cloth plate for insuring the proper parallelism of plate and cloth guide with the feed of the machine.

NEW BOOKS AND PUBLICATIONS.

TUNNELING UNDER THE HUDSON RIVER. By S. D. V. Burr. Twenty-seven Plates. John Wiley & Sons, New York. Price $2.50.

Although work on this great enterprise has been suspended since July 20, 1883, there are probably as many who are confident of the final success of the Hudson River tunnel (to connect New York and Jersey cities) as there were, in all the early years of the undertaking, that the East River Bridge would be completed. There have been, altogether, some 2,500 feet of the tunnel actually built, at a cost of about $1,100,000, and, at the rate at which work was being pushed at the time of suspending operations, the whole tunnel could be completed, barring any further accident, in two and a half years. Just what has been done, with a description of the obstacles encountered, the experience gained, the success achieved, and the plans finally adopted for the most rapid and economical working, are lucidly described by Mr. Burr, while numerous plates of working drawings are given, which add to the value of the volume. The author's opportunities for thorough inspection were favorable from almost the very beginning of the enterprise. The general plans according to which the tunnel has thus far been built are new, and in this volume engineers have the opportunity of thoroughly understanding them.

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.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Information requests on matters of personal rather than general interest, and requests for **Prompt Answers by Letter,** should be accompanied with remittance of $1 to $5, according to the subject, as we cannot be expected to perform such service without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Minerals sent for examination should be distinctly marked or labeled.

(1) K. A. R. asks how to tin or galvanize small iron castings. A. Clean the iron castings (or forgings) from scale, sand, and other adherent coating; dip them in a bath of muriatic acid and water—one part by measure of acid and four of water—and immerse them in a bath of melted zinc (spelter); no tin is required. Take them out, and violently shake off the dripping metal. Some use a dip of powdered resin after the acid bath, and before the immersion in the liquid zinc. Block tin melted may be used in the same way as zinc, if you prefer it to zinc.

(2) A. G. H.—The stars twinkle when the atmosphere is disturbed by unequal temperature or the commotion of strata of the atmosphere having different temperatures. You may see a fair illustration of the reality of this phenomenon by looking at a distan light across a hot stove. The twinkle of a star to the eye is the same as the dancing of the star in the field of the telescope, which Newton failed to mention. Stars have their hardest dances in the largest telescopes, when the condition of the atmosphere is favorable. Planets of large visual size do not appear to twinkle, but their telescopic definition is destroyed from the same cause that makes the stars twinkle to the eye or dance in the telescope.

(3) F. L. asks for information: 1. As to the process of canning fruit without being boiled, such as we see in the large groceries put up in large bottles? A. The procesess of canning fruit when not dried all involve some sort of heating or partial cooking. The canners claim that there is nothing peculiar about it. With experience there comes a certain amount of skill which cannot be imparted by furnishing receipts. 2. The method of ironing collars and cuffs in the Chinese style? A. The Chinese method of laundrying is given in answer to query 2 on page 330 of SCIENTIFIC AMERICAN, for May 26, 1883. 3. The composition of the baking powders by parts, that is, their ingredients? A. Take:

Powdered cream tartar	30 oz.
Soda bicarbonate	15 oz.
Flour	5 oz.

All well dried; mix thoroughly, and keep dry.

(4) W. S. asks if there was any substance or composition known which would form a glaze for pottery or baked earth, vitrifying at a low heat (between boiling water and melting lead). A. Perhaps the following will answer: Take 100 parts washed sand, 80 parts purified potash, 10 of niter, and 20 of slaked lime, all well mixed, and heated in a black lead crucible, in a reverberatory furnace, till the mass flows into a clear glass. The goods are to be slightly burnt, dipped in water, and sprinkled with the powder.

(5) W. C. M. asks: 1. Whether or not ordinary bricks expand when saturated with water; and if so, the most simple means of ascertaining the fact and demonstrating the same to an unbeliever? A.

Bricks probably do expand very slightly under water as an effect of capillary attraction, but in such an infinitesimal degree that it would be difficult to show without very delicate measurements. 2. Where he can ascertain as to the action of moisture in its effect upon solids as an expansive force? A. We do not know of any special treatise on this subject exclusively, but any general work on physics has more or less bearing on the matter.

(6) E. C. C. writes: In the SCIENTIFIC AMERICAN of Dec. 6 is an article entitled "A Chance for American Inventors," with regard to cleaning the henequin fiber. There are a good many inquiries as to what henequin is; the nearest we can place it is from Hena. Will you say what it is, what it is like, its growth, etc., that will be of benefit to inventors, and perhaps growers of the plant? A. You are right as to origin of word; it is a species of hemp grown principally in Yucatan, and there called Sisal grass, though it is also a native of Mexico, Honduras, and Central America, and has been introduced in Florida. There are two varieties in Yucatan, the *yashgui*, of better quality, and the *sacqui*, giving larger yield. It is easily cultivated on dry and stony land. The annual yield of clean fiber is about a ton to an acre. The native mode of preparing the fiber is to scrape away the pulp from each side of the leaf with triangular strip of hard wood, then washing and sun drying, a very slow and toilsome process.

(7) M. A. M. asks for the form of application of steam in process of feather curling, also what foreign substance, if any, is used in steaming to keep them curled for a long time? A. The process of curling feathers consists in heating them slightly before the fire, then stroking them with the back of a knife, and they will curl. The steaming is for the purpose of cleansing the feathers, as it is necessary to first soften them; and we do not know of any substance used for holding the curl on good feathers, though many substances might be suggested for cheap ones.

(8) E. W. writes: A locomotive has six drive wheels connected to piston on middle or center wheel. Is there more pressure on the rail under center wheels by means of piston pushing down and lifting up while in motion? Or is the pressure all alike on six drive wheels? The wheels all connected together by rods. A. The push and pull of the piston rod is compensated by being attached to the frame of the engine. It lifts the frame when pushing down on the wheel, and *vice versa*, making a slight tendency to rock the engine. There is no perceptible variation in the pressure from the action of the rod. All the wheels bear as near alike as the set of the springs and evenness of track will allow.

(9) B. W. G. asks how to fix an iron pump that has burst in the late cold snap; the crack is 12 or 14 inches long. A new head would cost about $12, so I wish to mend the old one. A. If only a split cylinder, it may be hooped with iron bands bolted on. Otherwise we could not advise without seeing the pump.

(10) P. V. S. asks how the large ocean steamers, for instance such as steamer Ems, of North German Lloyd, running between Bremen and New York, obtain during the passage their supply of water for the use of their boilers? A. Sea-going steamers use salt water. Many have surface condensers arranged for saving the steam used, by condensing and returning it to the boilers as fresh water.

(11) S. K. E. asks the value of the half dollar of 1824. A. The coin is worth 50 cents. 2. If there is any method by which to transfer the ink from small newspaper cuts, etc., to glass slides for magic lanterns? A. We presume you refer to the following, which was devised by Leclerc of Paris: Glass which is thinly silvered is coated with a very thin coat of asphalt. This is done by dissolving Syrian asphalt, such as is sold by photographic dealers, in benzine, and coating the glass with the solution without exposure to direct sunlight. A photographic cliche is laid upon the asphalt coat when dry, and the whole then exposed to the rays of the sun, which will render the asphalt, wherever the latter is exposed, insoluble. The protected asphalt coating is then washed away with benzine, and the silver coating below it with nitric acid, while the drawing or pattern will appear in silvered lines and figures upon the glass.

(12) L. L. F.—The melting point of lard is generally determined by melting it and placing a thermometer in the liquid; a reading is made when the first signs of crystallization appear. The acid test differs, and is determined by titering a given quantity of lard dissolved in alcohol with a standard solution of caustic alkali.

(13) G. H. H. asks: What chemicals or liquids can be put into quart bottle or small box to reduce the temperature in said box say to freezing or nearly so at any season of the year, and would last the longest without renewing or much attention? A. We do not know of any permanent freezing mixture. An excellent compound consists of equal parts water and ammonium nitrate. In the SCIENTIFIC AMERICAN for June 21, 1884, a table of freezing mixtures is given in answer to query 4.

(14) A. B.—To make candied banana the fruit is prepared separately, and allowed to absorb as much sugar as possible from a strong sugar sirup, then it is dipped from time to time into a concentrated sirup made from crystallized sugar, and afterward dried on wire screen. The dipping is continued until crystallization is satisfactory.

(15) W. F. S. asks (1) the number of horse power a 4x4 engine is rated at 300 revolutions. A. Your engine, with 50 pounds mean pressure upon the piston, or from 65 to 75 pounds in boiler, at the rate stated, will be equal to 4 horse power. 2. What size boat and size and pitch of propeller is it adapted for? A. Size of boat 25 feet long, propeller 20 inches, with 4 feet pitch. 3. Will a coil boiler pass inspection, and where can I get estimate of cost, or learn how they must be constructed? A. A coil boiler will pass inspection if properly constructed. Write some of our advertisers for estimates.

(16) W. L.—The motion given to one jumping from a moving car involves no paradox. The conditions are the same as in making a sudden stop when running, viz., bracing the body, and inclining it from the direction of motion. In the case of the rapidity of ascent and descent of a bullet fired into the air, the friction of the air constantly holds a retarding influence upon its velocity, both while ascending and descending, while gravity only retards its ascent and accelerates its descent. The friction of the air upon the bullet is in proportion to its velocity, no matter in which direction it moves.

(17) F. G. C. writes: 1. At a temperature of 50° Fahr. *below* zero, what would be the length of an iron rod which at 100° *above* zero is exactly 100 ft. long? Of a brass rod? Of a copper rod? A. A bar 100 ft. long from +100° to −50° will contract:

Iron.....1·18 in. and be 99 ft. 10·82 in. long,
Brass.....1·87 in. and be 99 ft. 10·13 in. long.
Copper.....1·72 in. and be 99 ft. 10·28 in. long.

2. Is the decrease in length the same for every degree of decrease in thermometer? A. With copper and iron the contraction is supposed to slightly increase with the fall of temperature in the lower part of the scale, or below 212°. 3. What are the alloys, what *per cent*, and how is per cent determined (*i. e.*, by weight, bulk, or value), and of what value are the alloys in U. S. coins? A. Alloys are made by weight. The standard for gold and silver coin is 900 parts pure metal and 100 parts alloy in 1,000 parts by weight. 4. Why does the frost on window panes, no matter how many in a sash, always melt at the *top* first? A. Because the room is warmest at the top. 5. What causes the different forms of crystallization on windows, very large designs bordering on very small ones? A. Because of the different conditions of intensity of cold and moisture of the air of the room. 6. Does *dry* wood shrink or expand by heat and cold? A. Yes; almost infinitesimally. 7. Why is it that in heating a large room (40 x 60 x 20, with furnace), I find it quite difficult—almost impossible—to raise the thermometer above 50° Fahr., while to raise it from 0° to 50° is comparatively easy? A. Because from 0° to 50° is nearer the outside temperature than any required temperature above 50°. 8. Is solid ice affected by cold or *heat (not above 25° Fahr.)*, and if so, in what manner? A. Ice expands and contracts by change of temperature in the same manner as other solid bodies. 9. What is the heaviest substance known, and what is its specific gravity? A. Platinum; specific gravity, 21·5; hammered, 22.

(18) O. S. asks for a compound (metals preferred) that will melt under 150 degrees Fahrenheit. A. Tin.....12 parts.
Lead.....25 "
Bismuth.....50 "
Cadmium.....13 "
Mercury.....10 "

(19) J. C. B.—There is no difference in the length of the American and British standard yard.

(20) A. F. A.—French chalk has been used to draw figures on sheets of mica, and then when breathed on will show the drawing white; when the mica is dry it cannot be seen. The same process is probably applicable to slate.

(21) A. A. B.—The etching on railroad lanterns is probably done by the sand blast process. The ordinary process of etching on glass is described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 313.

(22) P. A. S.—A very fair imitation of cider may be produced by using the following receipt: 25 gallons soft water, 2 pounds tartaric acid, 25 pounds New Orleans sugar, 1 pint yeast. Put all the ingredients into a clean cask, and stir them up well after standing twenty-four hours with the bung out. Then bung the cask up tight, add 3 gallons spirits, and let it stand forty-eight hours, after which time it will be ready for use.

(23) A. C. S. asks how many metals there are that have a specific gravity more than that of gold, and their names and specific gravities. A. Gold has a specific gravity of 19·3, iridium 22·4, osmium 22·5, platinum 21·5.

(24) C. W.—Swansea in South Wales, and Cornwall in England, are the principal centers for reducing the low grade ores of copper, silver, and gold. The addresses of the various works may be obtained through our Consul at Liverpool or London.

(25) J. H. E. asks: Which size coal, used in a hot air furnace for heating houses, will give the most heat, same number of pounds being used—"furnace," "egg," or "nut?" Why? Which is the most economical? A. We do not know that there is any more heat in a ton of coal whether it be the furnace, egg, or nut. When there is no difference in price, convenience of attendance upon the furnace is a consideration in favor of the larger coal. The frequency of firing and waste through the grate of unconsumed nut coal with its larger percentage of dust is against its economy for heating furnaces. Which size is best in each instance depends on the furnace and the work it is expected to do.

(26) R. M. F.—Chloride of antimony has been much used for browning gun barrels. Mix with olive oil to a thin creamy consistency. The barrel to be made perfectly clean and free from rust spots or grease, then covered evenly with the mixture, and left until the proper shade is produced, when it may be washed with common soda and water, and rubbed smooth with boiled linseed oil.

(27) R. B. P. writes: I have a large amount of muslin that has been used with stencil colors for review exercises. Though the paints are water colors, they will not wash off. How can they be removed from the muslin? A. First wash with alcohol, then with dilute oxalic acid, followed by ammonia; this will suffice to remove all coloring material. A chlorinated solution of soda likewise will be found satisfactory for removing the coloring.

(28) C. S. C. writes: I have a small side wheel steamer, 40 feet long, 9 feet wide, 3 feet deep, flat bottom, sharp at each end, runs on 14 inches of water. What should be the diameter of wheel and what width bucket, and how many runs per minute? How deep should bucket dip? The length of bucket is 2 feet; engine, 8 horse power. What speed will she make? A. Wheels 9 feet diameter, 3 feet bucket, dip 1 foot at light draught. We could not predict the speed with any certainty; 5 or 6 miles per hour may be accomplished.

(29) E. L. H.—Metallic silver with a frosted surface is the nearest approach to a pure white substance that is a good conductor of electricity, what you require, that we know of. The bisulphate of mercury battery and the chloride of silver battery are both powerful and constant. The bichromate of potash battery is powerful, but not so constant. For light currents the Trouve battery, which is practically dry, is very successful. There is no metal that will prevent the formation of a spark in the commutator of an electric motor. The spark depends in a great measure upon the construction of the motor. In motors made on the principle of the continuous dynamo, there is very little spark.

(30) S. S. W.—Your inquiry has already been answered in the SCIENTIFIC AMERICAN, but, in addition to the reply then given, we would say that a common method of removing paint and varnish from wood is to soften it by means of a flame (gas or alcohol), or by means of a hot iron held near, but not in contact with, the wood. When the paint is thus softened, it may be readily removed from the surface of the wood by means of a broad, thin scraper.

(31) J. G. H. asks: What speed should a 7 inch emery wheel have while truing it with a diamond? A. Thirty to 50 revolutions per minute for a 7 inch wheel.

(32) J. T. asks: 1. Has electricity any difference of action (conductibility excepted) upon wool, jute, and linen? A. We believe not. 2. Has anything been published upon it? If so, where can it be procured? A. See any recent works upon electricity or physics.

(33) H. C. R. writes: I wish to make an iron die to stamp sheet brass. Can I make a deposit of iron on a plaster form coated with plumbago, and then back the deposit up with brass or other metal? If it can be done, what kind of battery should I use, and how should I make the solution? A. We think you will be unable to make iron dies in the manner proposed.

(34) G. F. H.—We think that there is very little difference between the dynamos of lamps of prominent makers. We advise you to write to all of the manufacturers and get their descriptive circulars.

(35) R. L. G.—The opaque lantern or wonder camera is simply an ordinary magic lantern adapted to use ordinary pictures and solid objects instead of the transparent views. The light is concentrated upon the face of the object, and the image is projected by reflected light instead of transmitted light. You will find description of the opaque lantern or wonder camera, and on making inks, in back numbers of the SUPPLEMENT.

(36) C. E. B. asks: 1. What composes the requirements of a locksmith, and what is the opening for one learning the trade? A. Locksmiths, nowadays, are not regarded as first class mechanics. Years ago, when intricate locks and keys were made by locksmiths, it was regarded as a very important and difficult trade; but now a locksmith is required to do little else than to repair broken locks or to fit ordinary keys. 2. How much of No. 16 cotton covered wire does it require to wind the magnets of dynamo machine described in SUPPLEMENT, No. 161? A. From two to three pounds. 3. How must I change the commutator to make a motor of it? A. If the commutator is arranged properly for a dynamo, it ought not to require changing when the machine is used as a motor. 4. Must there be a battery used to excite the magnets in starting machine? A. Generally no; but if the iron of the field magnet is absolutely devoid of polarity, the magnet must be either placed in the magnetic meridian or it must be excited by means of a battery.

(37) E. B.—We think that you will experience much difficulty in covering your boat frame with galvanized iron. Life boats are made of galvanized iron, but the strakes are pressed to shape with a powerful hydraulic press. We think you would do better with wood planking. Linseed oil is preferred for both framing and planking. Upon this you may paint any desired color, using boiled linseed oil only.

(38) G. T. E.—Brass springs must be made of what is called spring brass. If made of annealed brass, they cannot be hardened except by hammering.

(39) C. & C. write: If an engine is run 400 revolutions with 40 pounds pressure, will you have more power by running 600 revolutions with the same pressure? A. Theoretically, yes, provided the boiler will supply steam in proportion. To do this requires more fuel, that costs more money. As these high speeds are impracticable we do not recommend them.

(40) W. M. C.—No one knows whether electricity occupies space, in the sense that physical objects do.

(41) F. N. D. asks if a cast iron gas main will rust on the inside, when it is in constant use for supplying gas, if water that is made to absorb all the salt that it will hold is run through it? The water does not stay in pipe, but runs off at once. A. We think that the application of salt water in the manner proposed would not secure any beneficial result.

(42) J. F. C.—Balloons other than silk may be made of very fine muslin or paper for experimental purposes. Hydrogen gas will lift about 2 pounds to the cubic yard.

(43) G. H. W. writes: I have made an electric machine like the one described in SUPPLEMENT, No. 161; it works well as an electric machine, but I want to make a motor of it. I wound the armature with No. 20 wire instead of 18, because I had the wire. Will you please tell me how I can make a motor of it? I have changed the commutator and tried every way, used one battery to charge the field magnets and three on the armature, but no good. Would it be better to wind the armature with finer wire, if so, what number? A. Your armature would be better if wound with coarser wire, say No. 16, for a motor. You should connect up your armature and field magnet so that the battery current passes through the armature and field magnet in series; then a slight change in the adjustment of the commutator would probably enable you to succeed when using your dynamo as a motor. The commutator may be adjusted so that the dynamo will need no change when used as a motor.

(44) H. M. N. asks: What is the easiest method of polishing irregular curved surfaces of castings? How are copper or brass faucets, pipes, etc., polished? A. This kind of polishing is usually done by means of polishing belts and cloth wheels supplied with suitable polishing powder.

(45) Test for oleomargarine.—In the issue of January 31, answer to correspondents, No. 73, told how to tell oleomargarine from butter. The way is not handy to use as a test. Try this simple and infallible test: Stir a little—half a teaspoonful or less—of the suspected butter in enough sulphuric ether to dissolve it. By the time the grease is dissolved the ether will have been evaporated, and the residuum will show, to smell or taste, whether it is butter, lard, or tallow. Five cents' worth of ether will suffice for several tests.

(46) E. F. K.—The running of the feed pipe through the fire chamber to the back end of the boiler is dangerous. When the injector is not running, the intense heat of the fire chamber generates steam in the pipe, forcing the water out and into the boiler, and allows the pipe to become red hot. In a short time it will split or burn out, and let the water out of the boiler when you can least afford it. Better run the pipe outside the setting and through the back wall, or if you wish to heat the water, make a small coil and place in the smoke flue, so as to take up some of the waste heat of the chimney. Put a check valve next to the boiler feeding at the front.

(47) J. F. S. asks (1) for some reference to published authority, and where obtainable, upon electroplating, such as will enable a good mechanic having some practical knowledge of electricity, chemistry, and batteries to make such batteries, tanks, solutions, etc., as are required in the business of electro-plating with gold, silver, and nickel? A. You will find considerable information given on this subject in SCIENTIFIC AMERICAN SUPPLEMENT, No. 310, under the title of "Electro-Metallurgy." Among the works one of the most recent and complete is "Galvanoplastic Manipulations," by W. H. Wahl. Price $7.50. 2. Is molybdate of ammonia the simplest and best test for sulphur? A. Molybdate of ammonium is generally used as a test for phosphorus. For sulphur, treat the solution with a little nitric acid, heat, and add barium chloride; a white pulverulent precipitate of barium sulphate is indicative of the presence of sulphur.

(48) L. S. asks if an engine 2x3 is suitable for running a canoe 14 feet 8 inches by 27 inches beam; how much power would such engine develop at 40 pounds steam? Would a boiler 12 inches diameter and 13 inches high, made of three-sixteenths inch galvanized iron with heavy copper heads and heated with gasoline, give enough steam for above engine, and would boiler be strong enough? If above dimensions are wrong, please set me right, also as to the make of a light and strong boiler. What size 3 blade screw is best? Also what would speed of canoe be? A. At 200 revolutions per minute, your engine would develop one-third horse power. Your proposed boiler is not large enough. Should be 14 inches diameter, 20 inches high, with twenty-five 1 inch tubes, with the outside of the shell covered into the heating chamber. Better make the boiler of plain iron three-sixteenths inch shell, ¼ inch heads. Tubes expanded in heads. A 12 inch screw will be as large as can be used to advantage. Knowing nothing of the construction or weight of canoe, we can only estimate speed at 5 miles per hour.

(49) C. G. B.—The sudden turning on of steam at high pressure to heating pipes is dangerous to the pipes and fittings. The pipes always contain more or less water when cold, and the sudden accumulation of water of condensation from the inrushing steam upon the cold pipes accumulates water that cannot be instantly drained away; and as water is comparatively a solid body, it dashes along the pipes under the force of the incoming steam, producing concussions like hammering upon the pipes, and in its confined condition produces great strain upon the pipe and fittings, often bursting forth.

(50) W. B. M.—You may return the water of condensation to the boiler under the conditions that you name. You will need 1¼ inch pipe from boiler to near the radiators, and distribute to radiators with 1 inch pipe. The return to boiler may be 1 inch pipe, with ¾ inch branches to each radiator. Only ordinary valves upon the radiators, with a check valve near boiler. If you have air valves upon each radiator and a small blow-out valve near the boiler, so as to get rid of the air in the return pipe when you turn steam into the heating pipes, you will need only one precaution in its management, viz., always remember that the water returns by gravity only, which makes it necessary to keep the steam at the full boiler pressure upon the radiators, otherwise the water will back up into the radiators until the proper gravitating balance is obtained. No throttling of the steam at the boiler valve will succeed with a gravity system.

(51) S. H. asks (1) how to apply loadstone to steel to give it the strongest attractive power. A. You can neither impart to a strong magnet a strong attractive power by the application of loadstone nor increase the power of the loadstone by the application of a strong magnet. 2. Is this the strongest attractive power known? A. An electro-magnet properly constructed and supplied with a suitable current exerts the strongest attractive power. 3. Does magnetic steel retain its power permanently? A. Yes, if it is vibrated or heated. 4. Does rubbing steel to a permanent magnet give it the same power as applying loadstone? A. Yes.

(52) F. A. McL.—Your motor operates by the attraction of the excited armature for the iron of the magnet, and the armature induces magnetism in the cores of the magnets, and as a consequence you get an induced current in the wire of your field magnet.

(53) W. S. W. asks (1) how heavy an object will the strongest magnet to be procured raise four inches, holding magnet that distance from object? A. We do not know that the limit of the power of an electric magnet has ever been determined. Probably with sufficient outlay for electric generators and for the material of the magnet, you would be able to raise several tons a distance of four inches. 2. What would be the size of the magnet? A. This would be entirely a matter of experiment. 3. Where can I procure the strongest horseshoe magnet, or is the horseshoe the strongest permanent magnet? If not, what is? A. The strongest permanent magnets in the market are what are known as the machine magnets. You can buy them from any of our dealers in electric supplies. 4. What metal would the magnet have the most attraction for? A. For a permanent magnet, chrome steel is considered the best; for an electro-magnet, there is nothing superior to the softest iron. 5. What would be the cost of such a magnet? A. It is impossible to say.

(54) E. E. D. asks: Is it a fact that if a tank of water be weighed, and a fish of say 10 pounds placed in the tank, the weight will not be increased? A. If the amount of water is undiminished, the weight of the vessel will be increased by the weight of the fish.

(55) F. B.—Brass is seriously affected by mercury; copper is less affected; and iron is not affected at all. A common way of transporting mercury is by the use of iron flasks.

(56) J. M. A.—Your experiment producing electricity from a cat is quite old.

(57) L. H. asks for a polish with which tool handles, stocking bulbs, and small turned woodwork generally can be quickly and cheaply polished while in the lathe. A. A mixture of boiled linseed oil 2 parts, alcoholic shellac varnish, 1 part, well shaken together and applied sparingly with a cloth to the revolving work, will produce a fine polish.

(58) G. W. H. asks: 1. Would a top weighing one pound while at rest, weigh less while revolving at the rate of 10,000 revolutions a minute? A. The top would weigh the same under all circumstances. 2. Would a one pound weight weigh less at equator than at the poles? A. The difference would be very slight.

(59) C. V. asks how to make a shunt between the armature and field magnets, on a plating dynamo. A. Connect the terminals of your field magnet with your brushes. Unless your field magnet has a high resistance it is not adapted to a shunt, as most of the current from the armature would pass through the wires of the field magnet.

(60) D. E. B. writes: Suppose a cone-shaped piece of steel be placed on the positive and negative ends of a horseshoe magnet, thus joining them and continuing to a point; will that point be negative or positive? A. If the magnet is perfectly balanced, and the armature is symmetrical and of homogeneous material, the point will be neutral.

(61) C. L. P. writes: I have two second-hand magnetos Will they ring bell on a line one mile long? Also, do they depreciate in efficiency by use? Suppose three magnetos in the houses A, B, and C; can any two houses communicate without ringing the bell at third house? Thus: B can call either A or C, but can A call B without calling C, or *vice versa*? A. Your magnetos should be capable of ringing bells on a line much more than a mile in length. If the magnets are of good quality, the machine should mantain its efficiency indefinitely. You cannot communicate in the manner suggested without having what is known as an individual call.

(62) H. W. B. asks: What size electro-magnet and with what size and quantity wire should it be wound in order to get the best results with five cells of gravity battery? A. Make the cores of your magnet ¾ inch in diameter and 6 inches long. Wind half the length of each arm with No. 20 wire to a depth equal to the diameter of the core.

(63) C. H. M. asks why a person will take cold quicker lying down on a bed than if sitting up—yet when they get into or go to bed, they are warmer than while sitting up. A. If you are correct in your statement, it is probably because more vital energy is put forth by people who are not lying down, and in bed one is generally protected by additional clothing.

(64) D. L. asks how to connect two electric bells (not magnetos) on one wire; the line is about ¼ of a mile long. Intend to use spring keys, but cannot figure out how to connect. When the key is pushed, the bell at the other side is toring, or both. A. Use what is known as back contact keys, and ground the ends of your line through the back contacts and through the bells; take your battery current through the lower contact. If you desire to use a closed circuit, you may place your battery keys and bells directly in the circuit. In this case the keys will be normally closed, as in the ordinary telegraph circuit.

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

E. N. J.—No. 1 appears to be a clay containing shiny particles of mica. No. 2 is a rock consisting principally of the mineral hornblende. No. 3 is a hard silicious rock containing iron silicates as coloring materials.—H. J. B.—The specimens are ordinary clay colored by means of iron oxide, and have no value in New York. In the absence of a better material in your immediate vicinity, it is quite possible that you might be able to utilize them.—E. H.—The sample appears to be gold bearing quartz. The sulphurets are of iron, and possibly lead and silver. The specimen we should consider of value. The expense of an assay would be $5.00.—H. S. D.—The specimen is calcite, or crystallized limestone, and of no commercial value.—H. P. D.—The specimen is too light for kaolin, and is not sufficiently plastic to be of value for the making of pottery. It is probably a mixture of magnesia with clay.—H. P. B.—The mineral sent is staurolite.—A. D.—The specimen is of no value; it contains too much iron. The white variety of long fiber is the most sought after.

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