

ENGINEERING INVENTIONS.

A balanced slide valve has been patented by Mr. Ashbel Welch, of Lambertville, N. J. This invention covers a simple, practical, and economical arrangement whereby all sticking of the valve is prevented, the cylinder may be relieved of water of condensation, and the uniform wear of the valve face and seat is assured.

A car coupling has been patented by Mr. Edward L. Raynsford, of Susquehanna, Pa. The coupling hook and drawbar are supported by a bearing plate kept in place by a collar and provided with cross head ends sliding in bearings attached to the car frame, the whole making an improved device to promote convenience and safety in coupling and uncoupling.

A coal chute has been patented by Mr. Joseph E. Clifton, of Geneseo, Ill. The invention covers an improved arrangement of the latch for fastening up the balanced apron of the coal chute, also of a brace attachment to the door in connection with the balanced apron, and an attachment to facilitate and insure the latching of the door, etc., the whole making an improved arrangement for coal chutes used for coaling locomotive tenders.

A car brake attachment has been patented by Messrs. Eli M. Holcomb, of Bay Springs, and Frederick E. Miller, of Eveline, Mich. The invention consists in the combination with a ratchet wheel and a beveled pawl pressed against the wheel of a vertically movable plate with a downwardly projecting wedge and a prong surrounded by a spring, which presses the wedge plate upward, the parts being protected from rain and snow, and the device enabling the brake to be quickly released.

A marine engine governor has been patented by Messrs. Alexander H. Bell and Aspinwall Fuller, of New York city. A two part spherical valve seat is placed in the shell, provided with flanges to keep it in place, and with perforations for the passage of steam and the valve stem, a spherical valve with perforations for the passage of steam and a weighted valve stem to control the valve, with a stuffing box and flexible connecting base to prevent steam from escaping around the valve stem.

MECHANICAL INVENTIONS.

A lifting jack has been patented by Mr. Erick J. Qvarnstrom, of Norway, Mich. The invention consists of improvements in the construction of screw jacks arranged to shift the hoisting screw after the load is raised, to move the load while supported on the screw, to simplify the parts, and make jacks that are substantial and reliable.

A vise attachment has been patented by Mr. Charles H. Eddy, of Auburn, N. Y. The under side of the vise has two jaws, one stationary and the other adjustable, both connected by a swiveled adjusting bolt, and with their inner surfaces suitably made to bite or hold on the opposite sides of the rim of the wheel it is desired to attach the vise to.

An oil cup feeder has been patented by Mr. James E. Worswick, of Montgomery, Ala. The motion of the machine where the lubricator is fixed causes a feeding pin to reciprocate in a tube, where it is loosely arranged, there being a removable collar at the upper end of the tube, and a removable perforated disk within the collar to form a bearing for the upper end of the pin.

A lumber trimming machine has been patented by Mr. Edward Heyde, of East Saginaw, Mich. It is an improved apparatus for raising and holding in position any one of a series of cutting off saws arranged in a bench, over which boards are carried to have the ends trimmed square and to specified lengths, the saws being arranged for trimming to several different standard lengths.

A motor has been patented by Mr. Jacob Heckenlively, of Eureka, Kan. A weight is so suspended from a drum that, in descending by gravity, motion is given to a train of gears, which drive a shaft carrying a cam wheel, with which a machine may be connected by a pitman, a governor device pressing a brake lever against the cam wheel to control the speed of the motor.

A lubricator has been patented by Mr. Henry R. A. Boys, of Barrie, Ontario, Canada. The invention consists of an arrangement of an oil feeding cylinder and piston and a gauge cylinder and piston, so the outward movement of the piston to feed the oil from the oil cylinder shall cause a corresponding outflow of the gauging liquid from the gauge cylinder to measure the rate of feed of the oil.

A pressure regulator has been patented by Mr. Francis J. Freese, of Manchester, N. H. The object of the invention is to make an improved device for automatically regulating the pressure of liquids, gases, steam, etc., a plunger moving in a specially constructed cylindrical casing, so as to enlarge or diminish the openings by which the flow of gas, steam, etc., will be automatically controlled.

An oil cup has been patented by Mr. Perry Small, of Guaymas, Mexico. It is an improved oil cup with glass drip chamber, the latter being made by a partition plate, which is integral with the glass cup, the frame surrounding the cup having openings above and below the partition plate, and having at its upper end a suitable cap, the whole being simple, cheap, and not liable to get out of order.

AGRICULTURAL INVENTIONS.

A potato digger has been patented by Mr. Hans Nelson, of Waupaca, Wis. A scoop is connected with the rear end of a downwardly and inwardly curved beam, with which is combined a clearer, and clearer vibrating cams or wings on the axle of supporting wheels, the scoop being readily adapted to work deeper or shallower in the ground, as may be desired.

A grain header and harvester has been patented by Mr. Peter E. Drouet, of New Orleans, La. The front board of the cart is made in adjustable parts, the side bars are pivoted at their rear ends on a

bar to which are secured the scraper roller, comb, reel, and driving mechanism, and as the machine is drawn forward the grain is removed from the heads of the stalks and received in the cart body.

A tongue rest, for supporting the tongue of a harvester and self-binder, has been patented by Mr. John Fisher, of Riley, Ind. In combination with the tongue is an upright frame in which is a slide with an inwardly projecting rod, around which a spiral spring is coiled, the whole making a device to relieve the horses from holding up the tongue and the weight thereon.

MISCELLANEOUS INVENTIONS.

A catamenial sack of improved form and construction has been patented by Mr. Charles H. Levy, of New York city. The frame can be made of metal, rubber, or bone, covered, and the pocket and pouch of rubber, leather, or waterproof fabric.

A telephone call and switch box has been patented by Mr. Edwin H. McFall, of Memphis, Tenn. This is a novel arrangement of switch and circuit in telephone boxes, having the object to maintain closed circuit at all times on lines connecting three or more instruments.

A hoisting device for vessels has been patented by Mr. Richard H. Purnell, of Roseale, Miss. This invention relates more particularly to a special form of brake for use in combination with hoisting devices used on steamboats for lifting and adjusting the gangway or stage planks.

A velocipede has been patented by Mr. Charles M. Schaffer, of Louisville, Ky. The wheel and frame are made with one open side, to facilitate ingress and egress and give better views of surroundings, to facilitate mounting and starting, and to improve the appearance of the machine.

A leather and cloth varnish has been patented by Mr. Walter C. Gifford, of Brooks, Mich. It is waterproof and gives a polish, the composition consisting of alcohol, gum shellac, white resin, oil of turpentine, kerosene oil, oil of cinnamon, and lamp black in certain specified proportions.

A mucilage cup or holder has been patented by Mr. Stephen S. Harman, of New York city. The invention consists principally of a handle or stick fitted in the cover, provided at its lower or inner end with a sponge fitted in a socket, or otherwise attached to the stick or handle.

A reflector holder for lamps has been patented by Mr. Daniel R. Williams, of Dallas, Texas. Different forms of clamp and clasp are so made that the reflector may be held in any desired position, and may be turned around the lamp as desired, while yet it will be firmly held.

A device for attaching and detaching horses has been patented by Mr. Cicero C. Ferrill, of Shubuta, Texas. It is intended to make it possible to dispense with the ordinary harness except a collar and a pair of hames, and for this purpose the thills have ferrules and spring actuated pins, and the hames have specially contrived loops and guards.

A watch protector attachment has been patented by Mr. Julius C. Grimmell, of Brooklyn, N. Y. The invention consists in a casing with two swinging stirrups, thrown from each other by springs, and from the free ends of which a hooked fork is suspended, the stirrups preventing the withdrawal of the watch from the casing.

An extensible clasp for books has been patented by Mr. Jacob Monch, of Offenbach-on-the-Main, Germany. The clasp is formed of two plates, one adapted to slide under the other, the lower one having a diagonal slot, into which a stud of a nut or block passes, so the clasp can be easily lengthened or shortened according to the thickness of the book.

A fountain pen has been patented by Messrs. Albert J. Kletzker, of New York city, and Charles H. Court, of Jersey City, N. J. The pen has a point section with an aperture below the pen, the aperture being closed by a loosely fitting plug with a tongue, and adapted to be vibrated by the pen during writing, and thus cause a flow of ink.

A saddle seat has been patented by Mr. Peter B. Hirsch, of Denver, Colo. This invention consists in dispensing with the bridge plate and the layers of leather, and employing in lieu thereof a single plate of metal shaped in dies to the desired form, and thus "building up" on the saddle tree a seat of such shape as wished.

A thill coupling has been patented by Messrs. Lorenzo D. Rundell and Perry Van Valkenburgh, of South Westerly, N. Y. The invention consists of an axle clip with two projecting jaws or lugs, each having inwardly projecting flanges on the ends, a fork being secured on the inner end of the thill, and having a recess in each side edge of the front prong.

A pocket knife has been patented by Mr. George Freund, of Durango, Colo. It is designed for miners' use, to facilitate the cutting and capping of a fuse; the knife has a notch in the handle case and one in the blade, the latter having a screw thread formed on its bottom to press a screw thread in the end of a fuse placed in the notch in the handle.

A clothes hanger has been patented by Mr. Louis Barkany, of Baltimore, Md. The hanger consists of a notched arm with a cross bar hinged at its free end, and a prop supporting the arm, the arm and prop being pivoted to a support, the contrivance being especially adapted to hold clothes open, while it can be folded compactly when not in use.

An umbrella and parasol rib has been patented by Mr. Asher T. Meyer, of New York city. The rib is made hollow, and reinforced at its outer end by a bar, with a head and flattened portion, and having an eye passing through both the rib and bar, the object being to simplify the construction of the lower or outer end of the parasol rib.

A pendulum scale has been patented by Mr. Henry C. Keeler, of Ogden, Utah Ter. This is an improved form of weighing scales in which pendulums with removable weights may be substituted for the bal-

ancing ball and weight, or the construction may be such that one of the beams and dials may be graduated for the scoop and the other beam and dial for the platform.

A flying target has been patented by Mr. Charles F. Stock, of Peoria, Ill. Combined with a fragile ring, having a flange on its lower inner edge, is an infrangible carrier ring, to be inserted within the fragiling, and held there by the flange, so the fragile portion will break more easily than solid targets, and there will be no failure to indicate a well directed shot.

An automatic winding signal for spring clocks has been patented by Mr. Edward Jungerman, of Gettysburg, Pa. The invention consists in combining with the main spring of a clock a shoe or yielding bar, which, when the spring expands from uncoiling, is struck by the spring and made to bring a signal into view, on the face of the clock or elsewhere, to give notice that the clock should be wound.

A hame clip has been patented by Mr. Charles W. Massenheimer, of Allentown, Pa. The invention consists principally in making the clip with a hook and hinged tongue or section, the hook being made integral with the side plates of the clip, the side plates being joined with a solid shoulder or bridge at their forward ends, so the traces may be easily attached and detached without ripping the tug.

A lumber rack has been patented by Mr. Joseph A. Aycock, of Whitesburg, Ga. The rack is formed of a series of vertical sticks held movably between top, bottom, and intermediate pieces of a frame, between which vertical sticks the planks or pieces of lumber are held a distance apart equal to the thickness of the stick, thus permitting the air such access as will season the lumber in a short time.

A churn has been patented by Mr. Anson M. Otis, of York, Neb. The churn body has a projecting screw at the center of its bottom, and a stationary shaft with a radially expanding and contracting dasher connected by hinged bars, a sliding tube, and a pitman with a crank shaft, gear wheels, and a hand crank, so the dasher is expanded and contracted radially by the revolution of a crank shaft.

A wiping and polishing apparatus for plate printing machines has been patented by Mr. Alexander Reid, of Brooklyn, N. Y. Combined with the reciprocating bed of the press is a roller having slots, webs, paying off spools, receiving spools, and means for rotating the spools and vertically reciprocating the roller, the whole being an improved device for wiping off surplus ink and polishing the plate before taking an impression.

A mercury vacuum pump has been patented by Mr. Charles G. E. Neveux, of New York city. A bulb is made near the top of one of two vertical pipes united at their upper end, this bulb having valves arranged to connect it with the vessel to be exhausted; then by a special construction the mercury can be made to drive all the air out of the bulb, when the valves will so open as to connect with the air vessel to be exhausted, and this operation can be repeated several times with little trouble, there being no loss of mercury, and the whole construction being simple and rapidly worked.

Business and Personal.

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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 \$3, 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) T. M.—It is almost impossible to identify a fiber botanically without specimens of its leaves and flower. We presume that the fiber comes from a variety of nettle called ramie (*Urtica neral*).

(2) W. A. C. asks for a correct analysis of suint. This is a fat, greasy, substance which is washed off of sheep's wool while getting it ready for manufacturing. A. Suint, according to Fuchs, consists of:

Potassium sulphate.....	25 per cent.
" carbonate.....	44.5 "
" chloride.....	3.0 "
Organic matter.....	5.0 "

The amount of potash salts depends upon the soil on which the food of the sheep grows. Other things being equal, it has been found that the merino wool contains the greatest amount of potassium salts, ranging as high as 30 per cent.

(3) F. S. S. asks: What is the difference between common bone black (animal charcoal) and ivory black? A. Properly speaking, ivory black should be derived from burning ivory chips or dust, in distinction from bone black, which is obtained from bones; but we believe the commercial article in most instances is simply a better quality of bone black.

(4) A. O. writes: I had the handles of a fine alabaster vase broken in several pieces. Will you please inform me of a cement or glue that will unite the pieces? A. Use the following: Add half a pint vinegar to half a pint skimmed milk. Mix the curd with the whites of five eggs well beaten, and sufficient powdered quicklime sifted in with constant stirring, so as to form a paste.

(5) Mrs. L. F. D.—Brass work can be polished by rubbing the metal with finely powdered tripoli mixed with linseed oil and applied with a rubber made from a piece of an old hat or felt. Or else a mixture of glycerine, stearine, naphthaline, or creosote mixed with dilute sulphuric acid can be used.

(6) L. M. W. writes: I have a very expensive linoleum carpet on my office, which is mopped every day, but soon becomes dingy. What can I varnish or coat it with which will stand a good deal of wear, and look bright all the time? A. Rub the oil cloth every two or three months with boiled linseed oil; rub it well in with a rag, and polish it with a piece of silk. Or else as it becomes hard rub it well with a small portion of a mixture of beeswax softened with a minute quantity of turpentine, using for this purpose a soft furniture polishing brush. In cleansing the oil cloth do not use soap or hot water.

(7) T. F. asks the difference between quicklime and common building lime. A. Lime or quicklime is obtained by burning calcareous stones in kilns or furnaces. It is the anhydrous calcium oxide, or oxide of lime. This when exposed to the air absorbs water, and crumbles into a powder, which is commonly known as slaked lime, or hydrate of lime. The latter is chiefly employed in the preparation of mortar for building purposes.

(8) H. D. P. asks for receipt for lacquering tin different colors. A. The following will probably meet your desires: Put 4 ounces best gum gamboge into 32 ounces spirits of turpentine; 4 ounces dragon's blood into the same quantity of turpentine as the gamboge, and 1 ounce annatto into 8 ounces of the same spirit. These three mixtures should be made in different vessels. They should then be kept for about two weeks in a warm place, and as much exposed to the sun as possible. At the end of that time they will be fit for use, and any desired tints may be obtained by making a composition from them with such proportion of each liquor as the nature of the color desired will point out. Or the coloring matter may be produced by dissolving any suitable aniline color in alcohol, and adding it to the conventional tin lacquer.

(9) C. A. N. asks the best method of reducing the precipitate to metallic silver, as the methods that he is familiar with fail to give good results. A. The silver is reduced by either evaporating the bath to dryness and then treating the residue, or by precipitating the silver by means of dilute hydrochloric acid or salt solution; in either case the residue is poured in a crucible with equal parts of borax and carbonate of soda. The metallic button which will form at the bottom of the crucible will be silver.

(10) R. P. B. writes: I have two boilers 15 inches in diameter, 8 feet long, three 3 inch flues in each. Fire box 3 feet by 2 feet, return flue; it won't draw the flames in the flues, and not the length of the boiler sometimes. The stack is 8 inches in diameter, 20 feet high above boiler; the ash pit door is 18x6 inches, close to the ground. What is the best to stop a leak in a boiler? A. If the fire box you give dimensions of is for each boiler, you have not more than one-fifth the area of return tubes you should have, and of the smoke chimney (8 inches diameter) is for both boilers, it should be 17 inches or 18 inches diameter instead of 8 inches.

(11) E. E. P. asks: 1. What is the combination or commercial name, if any, of the metal which expands in cooling? A. Bismuth, cast iron, and anti-mony expand in cooling. The first mentioned expands one-thirty-second in solidifying. 2. Is it chemically treated, or can it be mixed in any ordinary melting pot? A. Reference is made to the pure metal. 3. Does it lose this property of expansion by repeated heating and cooling if not melted? A. The property is not altogether constant; the molecular change brought about by repeated heating and cooling will, we think, interfere somewhat with its expansion. 4. Can you give its ratio of variation as compared with iron or steel? A. Its ratio of variation is greater than that of iron and steel, but we cannot give any exact figures on this subject.

(12) C. C. M. writes: I saw an instrument maker use a yellow substance put in a cotton cloth and dipped in water, for blacking banjo handles. Can you name it or something that will dye light wood black instantly? Would you give a receipt for a cheap and quick polish to be rubbed on with a pad? A. We infer from your description that you have reference to the following: Four two quarts boiling water over one ounce of powdered extract of logwood, and, when the solution is effected, one drachm of yellow chromate of potassium is added and the whole well stirred. When rubbed on wood, it produces a pure black. Repeat with two, three, or four applications, till a deep black is produced. See also page 1994 of SCIENTIFIC AMERICAN SUPPLEMENT, No. 125. Ground pumice stone mixed with linseed oil makes an excellent polish.

(13) F. De W. P.—Fluorine has never been isolated. The compound obtained was hydrofluoric acid. We would recommend you to avoid experimenting with fluorine, as the burns obtained with the compounds of this element are not only exceedingly painful, but also very dangerous.

(14) N. F. of Australia wishes to know the best dye for the hair. A. The least objectionable article is probably made from green walnut shells. Only the outside green portion should be used, cut small, and macerated for three or four weeks, then pressed and filtered and put in a bottle with spirit at 56° o. p.

(15) M. B. C. asks: How many horse power does it require to manufacture one barrel of flour in one hour? A. It is usual to allow one horse power per bushel of grain per hour, for the power required to grind the grain, and an additional horse power for driving the balance of the machinery of a flour mill. To simply reduce the grain required for a barrel of flour, to chop, in one hour, say five bushels, would therefore require five horse power. The conditions vary so much, that no exact rule can be laid down.

(16) J. E. B. writes: We cannot find an article that will thicken oils without destroying the lubricating qualities. A. We would suggest powdered graphite.

(17) A. S. asks at what rate light travels. A. About 185,000 miles a second.

(18) R. M. C. asks: Is the gas made from gasoline and generated by the Springfield gas machine as strong, when used for producing power in a gas motor, as the ordinary coal gas or that made from petroleum? A. It is used in some of the gas motors, and appears to be as "strong" as other gas.

(19) R. H. J. asks how the wires on the armature of the Brush machine are connected to the commutator. Are both terminals of each bobbin connected to the commutator, or only one? A. One terminal of each bobbin is connected with the commutator, the other terminal being connected with that of the bobbin located on the diametrically opposite side of the armature.

(20) H. K. G. asks: 1. The main school building here is 18 rods from the primary, and is heated by a 14 horse power boiler which will heat it well with 20 pounds steam. Is it practicable to heat the primary also, and in what manner? A. If your boiler is below the area to be heated, all you need do is to convey the steam to the primary and return the drip water in well protected pipes. If the boiler is above any of the rooms to be heated, a steam trap must be employed to let off the water or return it to the boiler. 2. What is a cheap mode of making a cylindrical or plate electrical machine? A. Consult the back numbers of the SUPPLEMENT. You will find in them descriptions of a number of machines.

(21) H. H. W. writes: I have a thermostat placed over a gas burner. The electrodes are of steel and brass, brazed. I want some metals which will heat and cool more quickly, *i. e.*, I want the thermostat to act more quickly. If you cannot suggest better metals for the purpose, can you suggest a simple method of cooling these more quickly? A. You can employ a very thin strip of wire of brass and multiply its expansion by levers, such a strip may be made to heat and cool very rapidly.

(22) C. G. asks for a non-poisonous liquid glue to take the place of a gum arabic mucilage, one that will not thicken in bottles when cold. A. Fill a glass jar with broken up glue of best quality, then fill it with acetic acid. Keep it in hot water for a few hours until the glue is all melted, and you will have an excellent glue always ready.

(23) J. E., Jr.—The answer was intended for you. You must adapt your battery to the purpose for which you use it. If you want to run single incandescent lamp, you must use a large number of cells connected in series. If you take the current through a small resistance, the battery will run down very quickly.

(24) M. I.—You can deaden the noise between rooms by nailing wall strips on the side of the beams and filling in with boards, and plastering with common mortar about two inches thick on top of the board filling. You will have to take up the floor to do this. You may accomplish the same thing by lathing between the beams from below, and plastering. Then lath and plaster upon the face of the beams, making two thicknesses of plaster. A second ceiling will answer the same purpose if you do not wish to disturb the ceiling or floor. This can be put on by nailing wall strips to the ceiling, and lath and plaster. Another way is to lay an entirely new floor with a second set of beams above the original floor, beams not touching the old floor.

(25) J. J. L. asks for information concerning the manufacture of milk sugar from the whey which is produced in cheese factories. A. Milk sugar, or lactine, is largely manufactured in Switzerland. It is also made in the United States to a limited extent. The process is, to strain or filter the fresh whey to remove all traces of curd. Then evaporate in pans at a moderate temperature, 150° to 175° Fah., until crystals begin to form, place in the pans small clean sticks for facilitating the process while the liquor is cooling. Let the cooling be carried as far as possible without freezing. Then draw off the liquor, and wash the crystallate with clear cold water by placing in a filter cloth and sprinkling the water over the crystals just enough to wash off the whey. Spread the crystallized crude sugar upon cloths to dry. For purification and bleaching, dissolve the crude sugar in boiling water considerably under saturation, and filter, through animal charcoal (bone coal), and also through a cloth filter, to remove all traces of bone black. Evaporate the filtrate at 150° to 170° Fah. to saturation, continuing the evaporation under a lowering temperature until the entire crystallate is deposited. Use small sticks of wood, preferably willow, to facilitate crystallization. Draw off the liquor, and dry on linen cloth.

(26) T. D. writes: I have a rubber thrashing belt 6 inches wide and 125 feet long, 4 ply. Will a 5 or 6 ply 5 inches wide, same length, give as much power as the 6 inch? I would like to use as narrow belt as possible on account of the wind affecting it. A. The heavy 5 inch belt will transmit as much power as the light 6 inch belt. It must be also run proportionally tighter than the wide belt. The thick belt under the greater strain will not wear as well as the thin one. You may also find trouble with the lacing if a quick speed is used. The journals also suffer with very tight belts. Better make all the pulleys larger by 20 per cent and use a 4 ply 5 inch belt.

(27) C. P. asks what ingredients to use for stamping on dark and light goods, from paper patterns, that will not rub off. A. Raw starch with a very small portion of gum sugar or even cooked starch mixed with it, with enough water to make it pasty, will make it stick; for dark goods. The same mixed with indigo blue will make a good stamping mixture for white goods.

(28) P. J. F. asks: Can you inform me how to construct a small battery sufficient to use for plating in silver, nickel, etc.? Have heard the Leclanche battery was best for this purpose, that is, for plating small articles, such as buttons, knife blades, etc. A. Use a bichromate battery with porous cell. The Leclanche is not adapted to electroplating.

(29) A. H. D. asks: Have you any knowledge of a preparation, which if applied to paper will render an electrical current visible on the paper? I have tried the following: in nitrate of ammonia, ferricyanide, glycerine, gum tragacanth, and water, but it does not give the desired results, as the paper must be wet, or it will not produce a color. A. We know of nothing for this purpose that can be used dry.

(30) J. D. R. asks about the largest locomotive in the New World—its weight, dimensions, when made, its running time, number of cars it draws, and where it runs. A. We believe the largest engines in the country are on the Central Pacific Railroad. Cylinder 19 inches diameter by 30 inches stroke, 8 driving wheels 34 inches diameter, weight in working order 123,000 pounds; built at railroad shops. Engines now building at the shops of same company: Cylinder 21

inches diameter by 36 inches stroke, 10 driving wheels 57 inches diameter, weight in working order 146,000 pounds.

(31) J. E. J. writes: I have been grinding lenses according to directions given in one of your SUPPLEMENTS, but find trouble in polishing. Is the rouge that comes prepared for the face the proper substance to use? (It is all I could get.) How long should the last emery used in grinding be suspended in water? How long should the operation of polishing a lens one inch in diameter last under ordinary circumstances? Would the lenses known in optical catalogues as cosmorama lenses if silvered one side be of any service as a reflector for a telescope? If so, would a 4 inch lens of 72 inch focus as a reflector have a focus of 36 inch lens, being doubly convex? Would it be achromatic? Could it be conveniently silvered by the process given in SCIENTIFIC AMERICAN of July 31, 1880? A. Face rouge is adulterated. Use the finest jeweler's rouge, which you may obtain from any jeweler or watch maker. The washing of the emery for fine grinding is very difficult. It should be washed from the finest flour emery. Place a pound in a glass jar (preserve jar), fill it with water, stir gently with a small stick made like a paddle, allow a little water to trickle into the jar, let the top screw run away, set the jar in a dish, and slowly stir while the water is running into the jar. From the pound of flour emery, wash over about one ounce for the finest. Then in another dish about two ounces for the next finest. The balance will be useful for a third quality. The time required for polishing a lens of 1 inch diameter depends entirely upon the fineness of the last emery finish. Half an hour to two and a half hours may be required. A cosmorama lens is unfit for an object glass or a reflector, and will not be achromatic in either case. It can be easily silvered, as stated in SCIENTIFIC AMERICAN.

(32) W. McC. asks if there is anything better than a boom derrick for hoisting a weight, say two tons. I want to swing it in a radius of twenty-four feet from the corner of a wooden building that is not over twelve feet high. We have plenty of steam power to work with, and would like to get something cheap. A. We doubt if you can do better than to use boom derrick. It is made with a mast, and a braced boom for lightness, using two sets of tackle for swinging in or out from the center. Drawings of a 30 foot hand derrick, which we think would answer your purpose, were published in SCIENTIFIC AMERICAN SUPPLEMENT, No. 380.

(33) T. G. asks (1) how to make those wax crayons which are used to work one on top of the other without disturbing the under color. A. The wax crayons or pencils are made with paraffin or spermaceti, pipe clay, and the various colors. The clay must be white; just enough of the paraffin or spermaceti is used to hold the clay and colors, to be decided by experiment; we cannot give the exact details. They are manufactured and imported from France and Germany. 2. Also what is the composition used in making tiles or plates for coal burning stoves? A. Stove linings are fire brick or tiles made of fire clay.

(34) P. C. A. asks: 50 horse power Westinghouse engine using steam at 70 pounds pressure from 60 horse power, 12 flue boiler. Cylinder exhausts into a 36 inch by 8 foot boiler having twenty-four 3 inch flues 3/4 inch thick, and a rotary exhaust fan in chimney opening. Would the air drawn through the flues by the fan be sufficiently heated for economical use in a lumber dry house? A. According to your statement, we doubt the economy of your proposed arrangement. The temperature of the air delivered by the fan would be too low for rapid drying. If you can give ample time for drying, the arrangement will work well, and the effect on the lumber better than drying very rapidly.

(35) F. A. W. asks the date and most important facts of the trial of horse power *vs.* locomotive, that took place in Baltimore, Md., nearly fifty years ago, with assistance of Mr. Peter Cooper. I lost the illustrated sheet he gave me. A. The trial took place on 28th of August, 1830, in a run from Baltimore to Ellicott Mills, distance of 13 miles, time one hour and 15 minutes; shortest time for any one mile, 4 1/2 minutes. On the return trip, time was 61 minutes for whole distance. Shortest time for any one mile, 3 minutes and 50 seconds; one engine, 3 1/4 inch cylinder and 14 1/4 inch stroke. You will find full account in Brown's History of Locomotive in America.

(36) A. F. writes: I have a small vertical engine, 3x3; is it large enough to run a small boat? 1. How large a boat will it drive? A. With plenty of boiler, a boat 16 or 18 feet in length and 4 1/2 feet beam. 2. Can I drive direct on shaft, or will I have to gear off? A. Drive direct. 3. How fast would the engine have to run? A. 350 to 380 revolutions per minute. 4. What would the dimensions of boiler have to be? A. Boiler with not less than 58 square feet of heating surface.

(37) J. T. writes: A propeller engine cut-off cam is generally opposite the crank when on dead center. Now, what is the object in having it set behind the crank instead of the front? A. Probably to cut off later in the cylinder. We could not say positively without knowing the arrangement of your cut-off gearing.

(38) E. E. R. writes: If one has an engine (slide valve) larger than he needs for his work, which is the more economical—to take off pressure from boiler, or to keep the pressure as usual and slack the speed on the engine? And is there much difference between these two ways? A. Keep up the pressure, and arrange your valves to work more expansively, will be most economical. 2. And, taking any common slide valve engine run to its rated power and using a certain amount of fuel per horse power, what part more fuel (approximately) would it take per horse power when running the same engine to one-half its capacity? A. When running at one-half capacity, it will take a trifle more fuel per horse power, but the amount of difference will depend upon the surroundings, radiation of cylinder, pipes, etc.

(39) W. F. asks: 1. About how many and what kind of questions are asked in examination? A.

We cannot say, as it is entirely with the examiners. 2. How many kinds of boiler iron are there, and what pressure will each kind stand to the square inch? A. There are various qualities of boiler iron made. Their tensional strength will run from 40,000 to 60,000 pounds per square inch. 3. How can a very small leak in a boiler, in the seams, be calked best without going to a boiler maker? A. By careful use of the calking tool. 4. How many square inches ought a boiler of the following size to contain: Six feet high, single flue, and about 3 feet in diameter? A. We do not understand your question about square inches in a boiler. 5. I have charge of a double piston engine, and hoist brick. I pull an average load of 500 pounds a trip. To do this I must carry between 70 and 90 pounds of steam. The engines are very powerful, though small, being 4x8. I want to make the engines do the same work with sixty pounds. A. You can only make the engines do the work with 60 pounds steam by changing gearing (if you have gearing) so as to increase the speed of the engines without increasing speed of drum. 6. What kind of oil is best? I use black oil. A. There are so many kinds of oil in market, that we cannot say which is best. 7. What is best to do, and how can a slipped eccentric be remedied immediately without losing time? A. Set your eccentric right and mark eccentric and shaft, so that if it slips you can set it in place by the marks.

(40) W. M. S. asks: Can an engine, having to draw its water, and thereby expending some of its own power, throw a more effective stream than when the water is forced into the pumps by outside forces? A. No; whatever pressure is thrown on the suction by an outside force is so much relief to the power required to work the engine under similar conditions.

(41) Azof, of Russia, writes: 1. *a.* I am putting down a cupola, using an old boiler shell, 3 feet 6 inches diameter; inside measure after lining will be 2 feet. I have two rows of tuyeres, 15 in each row, 4 1/2 inches by 3 inches, made by leaving out third brick in each row. What wind shall I require to work most advantageously? *b.* How much iron ought I to melt per hour? What should be the charges? Fuel anthracite. *c.* I have an English fan 25 inches diameter with 12 inches round discharge, calculated by the maker to run down 3 tons per hour at 2,500 revolutions. With this fan I wish to blow cupola and three smiths' fires. What speed should the fan have for smithy and cupola together, and what speed for smithy alone, and what arrangements of tubing would suit? *a.* A pressure of 7 or 8 ounces per square inch of coke is used, and with coal 12 to 16 ounces. *b.* Average not over 1 1/2 tons per hour with your dimensions of cupola. This may be increased by careful manipulation to 2 or 2 1/2 tons. Your blower is sufficient for three tons if the cupola were large enough. *c.* Your fan is ample for both cupola and three forge fires; 2,500 revolutions will be fast enough for all your work, and might be reduced one-quarter or one-third when forge fires only are in use, but the blast to fires should be regulated by a valve at or near the forge. 2. In using emery wheels, should the upper side of the wheel run to or from the workman? A. Run top of emery wheel from the workman. 3. What will be the horse power of a horizontal engine whose cylinder is 9 1/2 inches by 16 inches, revolutions 95 per minute, and will a boiler with one flue only 14 feet 6 inches by 4 feet 3 inches be large enough for this engine? A. With 50 pounds average pressure on piston, 21 horse power. If fired underneath shell and return through flue, it would answer; but if the furnace is inside the flue, it is too small. It would be better if increased in length 4 feet or 5 feet. We think you have at least three times the amount of tuyere opening into cupola that you should have, though in this respect much depends upon the kind of fuel. In respect to charging, we cannot advise you, as much depends upon shape and height of cupola and character of fuel. We recommend you to obtain a copy of Spretson on Casting and Founding, published by Spon, London, and West on American Foundry Practice. They will give you much information on the subject.

(42) S. F. H. asks: 1. What is the size that book binders use for putting on gold leaf? A. It is albumen, the white of an egg. 2. How is an electrolyte made from a relief plate in photo-engraving, or is the electrolyte made from a plaster cast, and how? A. A wax mould is taken from the relief plate, and then covered with very fine plumbago by means of a brush or air blast. The copper is deposited on the plumbago by means of a battery. When the shell is sufficiently thick, it is removed from the wax and filled in at the back with type metal.

(43) G. H. J. asks: 1. Will 3 cells of the Law battery answer for plating small articles, say a watch case? A. Better use a continuous current battery, like the Daniell or gravity. 2. Can I increase the power by using larger zincs? A. Not to any great extent in the battery referred to. 3. Can I increase the intensity by using some other liquid in the place of the salammoniac solution, and at the same time make the battery more constant? If so, what liquid? A. Better use some other form of battery.

(44) L. P. Jr., asks (1) if there is any cement that can be used on glass and is not soluble in bisulphide of carbon. A. Gelatin dissolved in acetic acid makes a cement insoluble in bisulphide of carbon. 2. Also, if there is any way to insulate a steel magnet so that it will retain its strength, if inserted in a piece of cast iron? A. There is no way to insulate the magnet.

(45) H. R. E. asks (1) how many cells of the plunge bichromate battery, size of carbons and zincs 3x6 inches, I require to produce incandescence in a lamp similar to Edison's? A. Six cells will operate a 3 candle incandescent lamp. 2. Also, how to make a medical magneto electric machine for family use? A. Consult any work on physics or electricity, or the back numbers of the SCIENTIFIC AMERICAN SUPPLEMENT. The subject is too extensive for our Note and Query columns.

(46) A. J. N. asks how the supersaturated solution of bichromate of potassium is made, the same as is used by M. G. Trouve in his illuminated jewelry? A. Dissolve bichromate of potash to saturation in hot

