

(39) C. C. says: My furnace has a chimney 40 feet high; the number of tubes in boiler is 52, their diameter is 1 3/4 inches; the size of chimney is 14 inches square, inside. I can put the exhaust into the chimney or not, as I wish; but I cannot see any difference between the ways. I carry 60 lbs. pressure, but am short of power. The boiler is good all but firebox, and that is very thin in places. Can I carry any more pressure? A. If your firebox is weak, we advise you not to increase the pressure. From the data sent, we cannot help you much about the boiler. It may be that it steams well, and the engine takes too much steam. This could only be settled by experiment.

(40) J. B. asks: What size of screw wheel will an engine of 2 1/2 inches bore by 5 inches stroke drive, and what size of boat would be suitable? A. You can use a wheel from 22 to 24 inches in diameter, and of 3 feet pitch, and a boat 20 feet long, of 4 1/2 feet beam.

(41) P. H. D. asks: How does the method for finding the true meridian, given in No. 9, vol. 35, differ from that given in Davies' and other works on surveying? A. There was a time when they were right. We have examined some of the earlier as well as later works on surveying, and it appears that they have copied from each other. They have not taken into account the retrograde movement of Polaris of twenty seconds a year. At the present time, Alhoth, the first star in the handle of the dipper, is about 25 minutes ahead, while Mizar, the second star, is five minutes behind.

(42) J. R. M. asks: Do the government observers at the signal stations report the actual height of the mercury in the barometer, or are corrections applied? A. The readings are reduced to the sea level and also to a temperature of 32° Fah. by Guyot's tables. The first 900 feet makes about 1 inch fall in the mercury, so that if a person is 900 feet above sea level, his barometer will read about 1 inch below the signal reports, for that place.

(43) M. J. C. asks: 1. Is there any difficulty in using an object glass two or three inches in diameter as described on p. 283, vol. 35? A. No. Make the focus of the three inch lens 25 feet. 2. Would the instrument you describe be free from color? A. Not wholly. 3. Would not better results be obtained by using an achromatic objective? A. Yes; but it would be far more expensive.

(44) W. M. says, in reply to J. L. A., who asks how to destroy a human tooth, in or out of the mouth: Take the tooth (after it has been removed) and immerse it in muriatic acid for about 12 hours, when it will be dissolved.

(45) W. M. says, in answer to T. P. H.'s inquiry as to how to harden and polish dental plates: They are first vulcanized at 320° for a shorter or longer period according to the constituents of the rubber. Then dressed down with file, scraper, and sand paper, and then polished with prepared chalk and a brush wheel.

(46) R. E. H. says: 1. I have a Rhumkorff coil, with an 8 inch bobbin. It is fitted with a tin foil condenser, which is connected with the pillar by one wire and the vibratory hammer by the other. The coil will not work while this condenser is attached; but gives a brilliant spark at the contact breaker (using two small Bunsens) when the condenser is removed. Can you suggest a remedy? A. The condenser has evidently become defective; substitute a new one or have the old one repaired. 2. Though a brilliant spark is got at the contact breaker, but a very small one can be got by joining the terminals of the secondary circuit, and I cannot succeed in lighting up some small Geissler's tubes. These terminals will induce a spark from a thin insulated wire or from the knuckles, so that the tension seems considerable. A. An eight inch bobbin will not give a very long spark, but should be sufficient, with a good condenser, to illuminate small Geissler tubes. 3. Should I connect the ends of the secondary coil with thick or thin wire? A. It is not material, either will answer for ordinary purposes.

(47) J. M. asks: 1. By what means does working high steam expansively effect a saving in fuel? A. If the steam is used without expansion, when it is discharged from the cylinder it is capable of doing more work. If now we employ some of this energy, before exhausting, by allowing the steam to expand, it is evident that more work will be obtained by the consumption of a given amount of fuel. 2. Would the supply of a greater quantity of atmospheric air to the furnace of a locomotive be a desideratum? A. No.

(48) C. S. A. asks: Has a noiseless steam ever been invented? A. Many well built steam engines run noiselessly. Does it make any difference if lightning rods are badly rust eaten in the ground, provided they go deep enough to strike the damp earth? A. No.

How is gas pipe made? A. From flat plates of iron, heated red hot, and drawn through plates till the curvature and lap are made. Then the lap is welded. In your explanation of the Bessemer steel process, you do not say where the blast comes from. Is it from a stone coal or charcoal fire? A. From a coal fire. Can there be such a thing as two lines approaching each other and never meeting? A. Yes. See p. 138, vol. 31. Is the work of tunnelling the North river progressing? A. No.

(49) H. Z. asks: How can I prepare a lithographic stone for Indian ink drawings? A. Rub it with sand, wash well, and then rub with powdered pumice-stone. Then wash again, and polish with a fine piece of pumice-stone. The finish thus imparted is unfit for chalk work.

(50) D. S. asks: How is a fine oil finish put on furniture? A. Take boiled linseed oil 1 pint, yellow wax 4 ozs. Melt together, and color with alkanet root to impart a reddish tinge.

(51) J. F. M. asks: Please give me a recipe for a liquid dressing for shoes? A. Take gum arabic 4 ozs., molasses 1 1/2 ozs., good black ink 1/4 pint, strong vinegar 2 ozs., spirit of wine 1 oz., sweet oil 1 oz. Dissolve the gum in the ink, add the oil, rub them in a

mortar until thoroughly united; then add the vinegar, lastly the spirit.

(52) J. C. B. asks: How can I fasten a thin strip of hard rubber to a similar strip of steel or other metal? A. Make a thin solution of glue, and gradually add pulverized wood ashes till you have a stiff varnish. Use this cement hot.

(53) J. F. G. asks: 1. What proposition in Euclid is known by the name of *pons asinorum*? Some maintain that it was the 5th of book I, namely: The angles at the base of an isosceles triangle are equal, etc., others say that it is the 47th of the same book. "The square on the hypotenuse of a right angled triangle is equal to the sum of the squares on the other two sides." A. The *pons asinorum* is proposition 5, book I; and the name is given to it by schoolboys, and is supposed to be an allusion to its being the first difficult proposition which the beginner encounters. Proposition 47, book I, is called the Pythagorean theorem, it, having been demonstrated by Pythagoras.

(54) F. R. asks: How can I calculate the weight of iron and brass castings from the weight of the wooden patterns? A. Brass castings weigh 17 to 19 times the weight of a pine wood pattern. Iron castings weigh 16 times the same.

(55) A. E. B. asks: How many lbs. to the cubic foot is the maximum that water can float? A. About 62 1/2.

(56) J. B. H. asks: Is there a clock made that winds itself while running? A. No. Such a machine would be a perpetual motion, which is impossible.

(57) I. R. & Co. ask: What is the process for making crocus or composition for polishing, used in nickel plating? A. Crocus is made by putting tin, as pure as possible into a glass vessel, and pour in sufficient nitric acid to cover it. Great heat is evolved, and care must be taken not to inhale the fumes, as they are poisonous. When there is nothing left but a white powder, it should be heated by a Hessian crucible, to drive off the nitric acid.

(58) M. G. A. asks: Where does rattan grow? A. The rattan (*rattan*, Webster) is a sprout from the sugar cane after the cane has been cut.

1. What is the length of the Suez canal? A. About 100 miles. 2. How long was it being built? A. About 10 years. 3. How many locks has it? A. None. The fresh water canal, made for supplying water to the laborers, etc., has locks; we do not know how many.

(59) A. J. asks: Can you give me a recipe for making a black composition in imitation of jet? A. The usual substitute for jet is ebonite or vulcanite, a patented preparation of India rubber.

(60) E. J. F. asks: How is the pattern produced on marbled paper? A. Use finely ground pigments, mixed with water to the consistence of paste. Make a square box about 2 inches deep, large enough to hold an open sheet of your paper. Fill it within 1/2 inch of the top with a solution of 1/2 lb. gum tragacanth to 6 quarts water. Strain the solution. Take a long water color brush, and put stripes of the desired pigments on the surface of the gum solution; pass a metal comb through the stripes in a zigzag direction, according to taste. Dampen the paper, and take 1 sheet of it by two opposite corners, and lay it evenly on the colors, flatten it gently with the hand, lift carefully off, and hang up to dry. When thoroughly dry, polish with a smooth piece of flint.

(61) G. F. E. asks: How can I impart a crystal-looking finish to brass? A. By using a steel scraper or a stick of wood covered with emery paper over the surface. Work it in a circular direction. A slip of Arkansas oilstone, dipped in oil, gives a good effect.

(62) F. D. asks: How can I strip bark from willow twigs, and how can I split the same for making baskets? A. Osier or willow twigs are peeled by soaking them in water till the bark becomes loose, and then stripping them. We believe they are split with a common knife.

(63) N. S., of St. Petersburg, Russia, asks: 1. How is the rudder of the non-heeling boat represented on p. 287, vol. 35, fixed, so that the after part of the frame does not interfere with it? A. The rudder is fixed to the stern post in the ordinary way. 2. On what theory is the Ocean Queen, shown in the same illustration, built? A. All the information we have on this subject is in the article and illustration.

(64) J. W. S. asks: Is tragacanth mucilage used for any purpose other than by shoemakers and druggists for pasting on labels? A. Yes. It is employed by water color artists, ink manufacturers, manufacturing chemists, and pharmacists, and is used extensively in the preparation of mucilage.

1. Can you give me the specific gravities of wax, paraffin, lard, and tallow, at their melting points? A. No, but they are all considerably less than that of water. 2. How can I cast paraffin in a metal mold? A. Coat the mold with a film of olive oil and the paraffin may be readily removed without heating. We think you will experience no difficulty in removing the cast from the mold as you suggest, but in this case the outlines may possibly not be quite so sharp as when removed, after cooling, from the oiled mold.

(65) A. B. T. says: Please inform me how to prepare picture canvas, so that it shall be pliable? A. The canvas cannot be well prepared by amateurs. The materials employed are whitening and glue size.

(66) H. J. asks: In your issue of December 2 is a recipe for hot waterproof cement, in which soluble acid and chromate of lime is to be used. I have been to several drug stores for the chromate of lime, but no one seems to know what it is. Is there any mistake? A. The chromate of lime is a by-product from the manufacture of the chromates of potassa, lead, etc. It may be formed by dissolving one part of lime (caustic) and four parts of chromic acid (by weight) in the smallest possible quantity of pure hot water, decanting the solution and allowing to cool slowly. Under these circumstances the pure salt will crystallize out; or boil the lime with 5 parts of bichromate of potassa dissolved in water, de-

cant the liquid, and dissolve the residue in two parts of chromic acid in water as before. You can obtain this salt by writing to one of the large dealers in laboratory chemicals and utensils in this, or other large cities. There is no mistake in the recipe.

(67) M. D. asks: Why must a smoothing iron be hot to iron clothes? A. To expel the moisture from the starch and convert it into a stiff glaze.

(68) A. A. M. asks: In what solution can I put a beef tongue for a short time, to peel the skin without cooking, and which is not injurious to the meat or the health? A. This cannot be accomplished.

(69) J. D. says: I have some glass curtain pins or knobs in my room; they are hollow, and coated with mercury in the inside. One of them was exposed to the sun and it has lost its brilliancy and reflective power. Was it the heat of the sun that destroyed it? If so, at what degree of heat did it do it? A. If the air in contact with the amalgam was at all contaminated by the products of combustion, which contain sulphurous acid or the exhalations from drain pipes or sewers, the continued heating of the mercury by the direct sunlight might easily determine the gradual formation of the gray film of suboxide or sulphide as the case might be. 2. If a mirror is placed in the sun will the heat destroy it? A. In pure air, sunlight or heat below 600° Fah. has no effect on pure mercury.

(70) H. Y., Jr., asks: Does chewing tobacco have any effect in reducing the flesh and weight of the human body, or does it otherwise make a man thin and soft? A. Yes, especially if he is of a nervous temperament. Its tendency is to injure the human system in various ways. Their injury is developed differently in different individuals.

(71) L. O. asks: 1. How shall I make nitrate of iron? A. Place in a suitable vessel a large quantity of clean iron in small scraps, and just cover it with dilute nitric acid (one of the acid to two of water). Heat nearly to boiling, and maintain at this temperature until there is no further evolution of gaseous nitric oxide. This gas should be conducted into a large chimney filled with fragments of brick moistened constantly with water. If the gas be kept from contact with the air it remains colorless and insoluble in water. It should therefore be mixed with a sufficient quantity of air before it is permitted to enter the condenser. When the evolution of gas has ceased, add a quantity of pure water equal to the volume of the dilute acid originally introduced, heat nearly to boiling and siphon off into suitable evaporating vessels, and concentrate the solution by slow evaporation. When the nitrate of iron begins to separate it should be removed from the solution as fast as formed, placed upon a suitable drain (a large covered funnel will answer very well)—and the superfluous fluid allowed to run off. The solution in the evaporating dish should have fresh portions of the strong iron solution added to it from time to time; the solution should never be allowed to approach dryness. The nitrate of iron may be purified by recrystallization from an aqueous solution, draining and drying. In order to avoid a loss of materials in the first operation, the iron scrap should be in large excess of the acid, and these conditions should be maintained during the process of solution. 2. How shall I make nitric acid? A. Introduce into a large glass or porcelain retort, the neck (beak) of which should fit snugly into the end of a glass condenser, equal weights of strong oil of vitriol and niter (nitrate of potassa) or nitrate of soda. The retort is seated upon a sand bath beneath which heat is applied gradually when the salt-peter is decomposed by the sulphuric acid, with the formation of nitric acid which distills over and sulphate of potassa or soda as the salt may be, which remains behind in the retort. We would advise you before beginning the manufacture of this acid to consult some good work on technical chemistry.

(72) W. H. H. says: 1. I want to construct a telegraph line, 1/4 or 1/2 mile in length. For insulators, can I use rubber loops to hang the wire in? A. Rubber loops will answer if a return wire is used, but the ordinary insulators are preferable. 2. Which is strongest, 6 half gallon Callaud batteries or 3 one gallon? A. The 6 small jars will answer your purpose best. 3. If I order a sander to be made for a 1/4 mile line, will it work equally well on a 250 feet or a 1 mile line, if number of batteries are changed? A. If changed so as to give the same strength of current, yes. 4. On how long a line can I use a simple sander without relay? A. That will depend on the resistance of the circuit. An ordinary sander will not work well with the usual battery power if the circuit exceeds 10 or 15 ohms resistance.

(73) S. A. H. asks: 1. How should I set a two flue boiler so as to make steam as fast as possible? A. You will find good methods explained on p. 339, vol. 33. 2. Should the grates be at the center or end of the boiler? A. Grates at the end will be sufficient.

(74) R. S. F. says: I have a magneto-electric machine, but the current is not strong enough. How can I increase it? A. If increased battery power does no good, the coil may be defective. It is difficult to give definite advice without seeing the coil.

(75) H. C. N. asks: Is there any chemical that may be mixed with plaster of Paris before setting (or any dip in which it may be immersed after setting) to cause it to stand heat almost to redness without cracking, warping, or crumbling? Are there any cements (for stone brick) that will stand this test? A. If the plaster be pure it will stand heating to full redness without cracking, provided this is done slowly and uniformly so as to first expel all the water. After once rendering anhydrous by the above treatment, it will withstand a bright red heat. This precaution must, however, be heeded: don't treat the substance suddenly. It is better to mix the plaster with a little lime (1 to 3) and fine sand before baking.

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

W. L. M.—They are small quartz crystals, the angles of which have been only partially destroyed by corrosion.—C. K.—Your samples are all iron pyrites—sulphide of iron.—O. P. (of Worcester, Mass.) should send us a large piece of his mineral.—T. K. & Co.—It is braunite,

or sesquioxide of manganese.—R. W. Co.—It is an argillaceous and calcareous sediment, containing much organic matters.—C. A. McO.—It is galena-sulphide of lead.—J. W. B.—No. 1 is an impure limestone colored by sesquioxide of chromium and iron. No. 2 is a feldspathic rock. No. 3 contains amorphous and crystalline carbonate of lime, elate-slate, and iron pyrites.—R. E. M.—It is asphalt (bitumen), of some value if in large quantities. Its solutions in naphtha or turpentine are largely employed as a protecting varnish for exposed metal and woodwork, particularly the hulls of vessels. Large quantities of it are consumed in the preparation of asphaltum pavements and roofs.—T. K. & Co. (H. J. M.)—It is braunite or sesquioxide of manganese.—The specimens numbered 1, 2, and 3 in large tin box (painted blue) are sulphide of nickel and iron. Valuable if in large quantities. There was no name or address on the package, and the postage stamps were 24 cents short.—H. H.—It is what is known as "spongio-piline," a kind of felting made from sponge. It is used to some extent by medical men.—J. A. S.—It is arsenical iron pyrites. If in large quantity, it may be worked as a source of arsenic.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

- On Emigration to New South Wales. By A. E. B.
On the Lumber Trade of Pennsylvania. By W. T. L.
On Subjects for Discussion. By J. H. A.
Also inquiries and answers from the following:
R. R.—C. W. T.—J. S. A.—W. G.—J. H. R.—W. H. N.
—J. R. Q.—W. T. H.—E. P.—J. K.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Inquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who sells prisms, fit for use in a camera lucida? Who sells a small steam engine, suitable for driving one sewing machine? Who sells parts for working models of locomotive engines? Whose is the best surveyor's levelling instrument? Where can phosphor bronze be bought? Who sells mineral specimens for the cabinets of collectors? Whose is the best microscope for scientific investigation? All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH Letters Patent of the United States were Granted in the week ending

November 28, 1876.

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

Table listing various inventions and their patent numbers, including items like Acetic acid, Animal trap, Baling machine, Bandsawing machine, Barrel cover, Beer, utilizing waste of, J. J. Suckert, Belt shifter, F. B. Miles, Belt-shipping mechanism, G. E. Taft, Bilge water ejector, R. S. Little, Bill file, B. J. Beck, Blowing toy, H. J. Green, Book sewing machine, G. W. Glazier, Book sewing machine, J. C. Smyth, Brick and peat machine, D. Woodbury, Brick kiln, E. W. Bingham, Burglar alarm, J. B. Underwood, Calendar clock, A. Phelps, Car berth supporter, T. Grant, Car coupling, E. M. Parrott, Car coupling wedge, W. B. Dunning, Car door, G. B. Kiteley, Car door hanging device, E. E. Pratt, Car spring, J. S. Lash, Car starter, A. Whittemore, Car truck, prismoidal, E. B. Dorsey, Carving fork, E. Cady, Case for toilet papers, E. W. Dennison, Caster bottle, Weber & Wilhelm, Charbon roux, making, G. L. Harrison, Jr., Check rower, J. W. Fawkes, Cheese press, T. A. Murphy, Churn dasher, Duval & Merton, Clamp for holding rail pieces, C. Lamb, Clamp for quilting frames, I. W. Doez, Clamp for wire rope, H. R. Taylor, Clock movement, F. Kroeber, Clothes drier, J. R. Rusby, Compensating pendulum, E. M. Gorwin, Compound engine, R. Bogardus, Compound tool, S. B. Mayfield, Corn husking machine, J. Lund, Corn planter, A. M. Southard, Corset, M. P. Bray, Cotton bale tightener, C. E. Boardman, Cotton sweep, H. C. Buhoup, Counting alammarratus, F. L. Burns, Culinary utensil, Kellogg & Lintner, Cultivating plow, McAllister & McDonald, Cultivator coupling, H. Feltman, Cup and ball toy, G. Schoen, Card mill, J. P. Bellinger, Curtain fixture, R. J. Pospisil, Cutting stone, I. W. Bradbury, Dental plugger, R. B. Donaldson.