

the tube be broken when the combination of the gases takes place? A. If the tube be a strong one, and has large openings at the mouths, it will not.

How can I make a paste or mucilage which will dry quickly, and not make the paper curl up? A. Use a solution of pure gum arabic in warm water, and mix a little refined sugar with it.

(28) G. A. Z. says: I am working an improvement on the common smoking pipe, and have to use some metal inside the bowl, in contact with the burning tobacco. Would brass be injurious to the smoker? Would nickel be more suitable? A. Nickel or nickel-plated brass would be the better for this purpose.

(29) G. B. B. asks: In your formula for amalgam for silvering hollow glass vessels, etc., what qualities of lead and tin are meant? A. Melt together 1 oz. clean lead and 1 oz. fine tin in a clean iron ladle, then immediately add 1 oz. bismuth. Skim off the dross, remove the ladle from the fire, and before it sets add 10 ozs. quicksilver. Now stir the whole carefully, taking care not to breathe over it, as the fumes of the mercury are very pernicious. Pour this through an earthen pipe into the glass globe, which turn repeatedly round.

(30) R. S. S. asks: Is there any advantage in having the brake block in front of a wheel, or would it have as much power over the wheel if placed behind? A. There would be little, if any, difference.

(31) B. C. & Co. ask: How can I separate tin from dross? A. The tin is melted and the temperature raised very considerably in order to render the slag as liquid as possible, so that it may not retain too much tin with it. It is also necessary to stir the melted mass in order to facilitate the separation of the tin. The clay is then raked out, and the melted tin run into a cast iron pan: where it is allowed to remain for some time, in order that any slag may rise to the surface; after which it is skimmed, and poured into cast iron molds.

(32) E. F. H. asks: 1. Which are the best metals for large stencil plates? A. Thin hard brass is the best for this purpose. 2. Can acids be successfully used for this purpose? A. No.

(33) S. R. C. asks: In dyeing with aniline colors, what can we use to set the dye on cottons, woollens, and silks? A. Perkin uses tannin as a mordant for fixing the colors upon cotton and calicoes, working in an acid solution of the coloring matter. A basic lead salt may also be used as a mordant. In calico printing, the colors are usually mixed with albumen, which, by coagulation with steam heat, fixes the color on the fiber. Wool takes aniline dyes from their aqueous (but not acidulated) solution readily at a temperature of 120° to 140° Fah. In the case of silk, all that is necessary is to steep it in the solution (the solvent being either alcohol or wood spirit) until the desired color is obtained.

(34) A. B. R. says: I have had 750 barrels of old cider on hand for three years. How can I turn it into vinegar? A. Add to each barrel a little fermenting substance, such as yeast or mother of vinegar.

(35) W. C. R. asks: I want to make oxygen gas in an iron quicksilver bottle. I want to screw on to it a cock and a nipple, and put a certain amount of chemicals into it, set it on the fire, and make the gas without letting it out of the bottle. In other words, I want to make a self-condensing gas cylinder. What amount of pressure will one of those bottles stand? Will 1 lb. chlorate of potash and 4 ozs. manganese yield too heavy a strain? I put in just half of the above quantities and screwed on the bottle a steam gage. It brought the gage up to 170 lbs., and would have gone higher, but I felt a little timid, and unscrewed the gage, and allowed the gas to escape. The bottle is 12 inches high and 5 inches in diameter, and about half an inch thick, outside measurement. A. As the volume of a gas is inversely as the pressure to which it is subjected, your bottle, with a pressure of 240 lbs. to the square inch, would hold a little over 2 1/2 cubic feet. The question is not what pressure the bottle will stand when cold, but with the bottom (in this case) necessarily heated nearly or quite to full redness. And as the rigidity of iron decreases rapidly as its temperature is raised, we are unable to give you the required figures. Your experiment was a very rash one, as many serious and some fatal accidents have occurred, to our knowledge, from like experiments. Besides, so small a quantity of gas (if used for the lime light) would last only a very short time.

(36) G. K. says: I want a cement that will harden in 45 hours or less, to be of the consistence of molasses. It is to be used to cement sandstone under salt or fresh water. A. Use Portland cement.

(37) E. E. S. asks: 1. What should be the relative diameters of the wheel on crank shaft, the pulley on saw arbor, and of the saw, in order to obtain the best effects in a foot power circular saw? A. We could not tell without knowing more particulars: but you will find a number of such machines in use, and you can observe their proportions. 2. Is there any advantage in placing a fly wheel on the saw arbor? A. The use of a fly wheel is advisable with such a machine. To your other question, there is a loss of power in the device you describe.

(38) G. L. N. asks: How can I deodorize kerosene oil? A. Digest it with chloride of calcium. This will leave it with a pleasant ethereal odor.

(39) L. D. M. asks: What can I size paper with, to prevent lard oil from striking through? A. Try dammar varnish.

1. What are the extra currents of electricity?

A. If a closed circuit traversed by a voltaic current be opened, a scarcely perceptible spark is obtained, if the wire joining the two poles be short. Further, if the observer himself form a part of the circuit by holding a pole in each hand, no shock is perceived unless the current is very intense. If, on the contrary, the wire is long, and especially if it makes a great number of turns, so as to form a bobbin with very close folds, the spark, which is inappreciable when the circuit is closed, acquires a great intensity when it is opened, and an observer in the circuit receives a shock, which is the stronger as the number of turns of wire increases. 2. What causes the electric light, and why can it not be used for illumination? A. The heating of the poles is due to the great resistance which the electric current encounters at these points, the carbon composing which is converted into vapor by the intense heat, forming a conducting bridge across the gap, over which the luminous transfer of electricity takes place. 3. How does the core of an induction coil affect the induction current? A. It induces a current contrary to that passing in the primary wire at every breaking of the latter, which comes under the head of extra currents, explained above. 4. Has there ever been patented an automatic repeater with simply two relays? A. We think not.

(40) E. A. W. asks: What is absinthe? A. A cordial of brandy, flavored with wormwood.

(41) R. G. asks: Can you give me a practical recipe for manufacturing potash? A. Caustic potash is generally procured by the action of caustic lime in a boiling solution of carbonate of potash. The lime unites with the carbonic acid of the potash, forming insoluble carbonate of lime, which subsides. The clear liquid, containing the potash in solution, is then drawn off and concentrated by evaporation. If the heat be continued to a point little short of redness, the liquid flows without ebullition, and may then be run into molds, where it solidifies on cooling, forming the small, grayish white sticks of commerce. The vessels used are either iron or silver.

(42) T. S. R. asks: Does it require more power to run a four-blade propeller than a two blade, the size being the same? A. Yes.

What is the best for an engine making 300 revolutions per minute, the propeller being 28 inches in diameter, and the engine 3 1/2 x 5 inches? A. The four-bladed screw will utilize most of the power.

(43) W. M. asks: What ingredients will prevent the explosion of coal oil, and not impair the light when used in lamps? A. We can give you no better recipe than that of distilling off the lighter portions of the fluid until the specific gravity of the remaining portion is about 0.75 to 0.80.

1. How can I clean and polish window panes, mirrors, etc.? A. Take a small soft sponge, well washed from everything gritty, just dip it into water and squeeze it out again, and then dip it into some spirit of wine. Rub it over the glass, which immediately dust over with whiting sifted through muslin; rub it lightly and quickly off with a cloth, then take a clean cloth and rub it well again, and finish by rubbing it with a silk handkerchief. 2. How can I clean lacquered frames? A. Use a soft sponge and warm water. For paints, use soap and water. 3. How can I clean plated ware? A. Clean with hot water, followed by a solution of equal parts of spirits of ammonia and turpentine; and after this, if necessary, prepared chalk, whiting, magnesia, or rouge.

(44) F. E. M. asks: 1. What proportion to the periodic time of the heavenly bodies would be the time in which they would fall to the center of force, supposing the tangential force suddenly destroyed? A. The planets will reach the sun with the same velocity spirally as if they fell direct. 2. If two masses, each of which would attract to its center a body in one second at the distance of one foot, be placed two feet apart, would they meet in one second? A. No; they would meet in two seconds. 3. Professor Tait in *Good Words* speaks of the tridimensional character of space, and he mentions that mathematicians have speculated upon a fourth dimension. What mode is alluded to? A. This speculation reaches to serene heights where mathematics become lost in metaphysics and fog.

(45) M. C. R. asks: 1. How can I make an electromagnet? A. Wind insulated copper wire around the two ends of a bar of soft iron, bent into the form of a horseshoe. 2. About what weight would a magnet made of 10 lbs. wire be capable of raising, and what size of wire is the best? A. Coarse wire is the best for making magnets if the object is to raise heavy weights. The question as to how much a magnet containing 10 lbs. wire would be capable of raising could not be properly answered without stating how much battery is to be used.

(46) D. L. M. asks: 1. What is the difference between clock time and mean solar time, and why is there such a marked difference at particular times? A. The equation of time is the difference of the sun's true right ascension and mean longitude. 2. Is the direction of the earth's axis to its orbit always in the same direction? A. The direction of the earth's axis is nearly uniform.

(47) L. E. O. asks: Will an anode composed of nickel five cent pieces answer for nickel plating on a small scale? A. Yes.

(48) G. C. P. Jr. asks: 1. What is the best way to make a solution of rubber? A. By far the best solvent for rubber is bisulphide of carbon. 2. Is it safe to heat naphtha over a spirit lamp to boiling heat? A. No; the naphtha may be heated by immersing the vessel containing it in hot water or hot sand. This had better be done in the open air.

1. What is the best method to adopt in order to polish amber tortoiseshell? A. Use putty powder. 2. When is it faded, can it be restored to its natural color? A. It cannot.

Of what is fool's gold composed? Is it of any value? A. It is a compound of iron and sulphur, Fe S<sub>2</sub>, and is of considerable value as a source of sulphur in the manufacture of sulphuric acid.

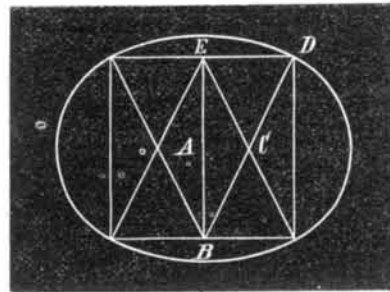
(49) C. D. H. asks: 1. In the construction of an induction coil 3 feet long, is it better to use a number of iron wires or a bar of iron for the core? A. Use a bundle of iron wires. 2. How large should it be? A. As long as the coil. 3. What size of copper wire should be used in the primary and secondary coils respectively? A. No. 4 in primary and 36 in secondary. 4. How should each be insulated? A. Cotton for primary and silk for secondary. 5. What is the best material for ends of the coil? A. This is immaterial. 6. What amount of battery would be required for a specific length of spark? A. Six cells will give a ten inch spark. 7. Would it do for an electric light? A. No.

(50) C. W. asks: 1. How can I make water colors in small cakes? A. Mix the colors into a thick paste with hot water containing a little gum arabic, and press into molds. 2. How can I make plumbago or black lead into cakes? A. Where pieces of sufficient size are obtainable, they may be sawn into the required shape. When in powder, it may be incorporated with a very small quantity of melted sulphur, or moistened with water and subjected to great pressure, when it coheres.

(51) W. L. D. asks: How can I make the linking rings which sleight of hand performers use? A. We are not acquainted with the manner in which these tricks are executed.

Can a person charge himself with electricity? A. Yes, by means of an electrical machine.

(52) H. C. N. says: I believe that the following method of drawing an oval is superior to many, and it draws a perfect oval. Take any



square, bisect it, and draw diagonals in the halves of the square. Describe the oval with the compass, using A, C, B, and E as centers.

(53) E. O. M. says: If N. P. B. will use the tang of an old mill saw file, he can turn his grindstone off true. When one side of the tang wears out, turn it over.

(54) T. W. D. says, in reply to J. H., who asked for a process in which to dye the skins of small animals, such as muskrat, mink, etc.? The green hull of the European walnut is turned to account in Europe for dyeing furs black, and the hull of our black walnut could probably be similarly employed. The walnut hull is crushed and the juice squeezed out from the pulp, with the addition of a little water. A small quantity of lime is added, and the dye is ready for use. The color is extremely difficult of extraction, and attaches itself very readily to any kind of hair, and it is used extensively as a hair dye. The coloring matter consists essentially of a soluble alkaloid lately investigated and known as regianine.

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

F. F. H.—The tin has been acted upon by nitric acid of proper strength. The mineral is iron pyrites.—E. P. C.—It is black oxide of iron, mixed with quartz. It has too small a percentage of iron to be used as an ore.—G. S.—It is graphite or plumbago.—R. W. T.—It is iron pyrites, and (unless you find it in large quantities) cannot be made use of.—Y. M.—It is mispickel, and contains arsenic 46 per cent, sulphur 20 per cent, and iron 34. If you heat it strongly, the arsenic will be driven off with a disagreeable smell, and a piece of magnetic oxide of iron will remain.—A. E. J.—It is a secretion of carbonate of lime, and has no value.—J. D. B.—It is iron pyrites.—F. A. M. and O. E. F.—No. 1 is altered scapolite. No. 2 is white talc. No. 3 is aragonite. No. 4 is marcasite, or white iron pyrites. No. 5 is galena. No. 6 is asbestiform talc. No. 7 is a variety of talc. It may be used as a lubricant or to extract grease, or (when soft enough) as a French chalk. No. 8 is compact talc. No. 9 is talc. No. 10 is tremolite. No. 11 is ferruginous quartzite. No. 12 is chrysolite imbedded in volcanic tuff. No. 14 is iron pyrites in granite. No. 16 is an altered and decomposed pyroxene. No. 17. It is difficult from so small a fragment to decide whether it is pyrite or cobaltite. No. 18 is cupiferous amygdaloid. No. 19 is yellow oxide of iron. No. 20 is compound crystals, containing the cube, octohedron, and rhombic dodecahedron of iron pyrites.—I. F. D.—Nos. 1 and 2 contain some sulphuret of mercury, along with iron pyrites. From Nos. 3 and 6 we obtained no indications. No. 4 contained some iron pyrites in quartz; whether anything else were present could not be determined from the smallness of the amount.—G. C. R.—Both samples consist mostly of silex, with some alumina. The darker specimen was colored with oxide of iron. They both contained phosphoric acid, No. 2 having the larger percentage; and any fertilizing qualities which they possess are due to the presence of this constituent.—J. O. B.—No. 1 is magnetite, with some vitreous quartz, soda, felspar, and magnetic oxide of iron. No. 2 is lime, magnesia, and garnet. No. 3 is orthoclase. No. 4 is oligoclase. No. 5 is hornblende.—D. K.—Nos. 1 and 4 are sulphuret of iron in quartz and pyroxene. No. 2 is not an iron ore. It is a silicate of alumina,

lime, and magnesia, with some oxide of iron, but not sufficient for extraction. No. 3 shows shining scales of bitovite, a variety of mica, and the remainder is a mixture of quartz and felspar. No. 5 is not metal, as you say. It is a partly reduced sulphuret of iron, exceedingly brittle from presence of excess of sulphur.—H. W. F.—It is pyrrhotite or magnetic iron pyrites, and contains 39 per cent sulphur, 60 of iron, and traces of manganese and nickel.—F. M. S.—It is galena or sulphuret of lead, and contains 85 per cent of metallic lead.—E. J. M.—These specimens consist of carbonate of lime, and may have come from the skeleton or shell of some animal.

COMMUNICATIONS RECEIVED.

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

- On a New Numerical System. By F. E.
On the Sun's Orbit. By J. H.
On Stationary Engines. By J. C. G.
On the Currant Worm. By C. T.

Also enquiries and answers from the following.

- F. P. M.—R. H. S.—J. T.—F. H. W.—N. B. D.—R. K. W.—J. T. P.—N. F.—R. S. W.—N. W. H.—F. H.—N. 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.

Enquiries 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 enquiries analogous to the following are sent: "Who makes good washing machines? Whose is the best knife-cleaning machine? Who sells battery carbons? What are the prices of terrestrial globes? Whose is the best hominy mill? Who sells the best bone-crushing mill?" 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

April 6, 1875,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Table listing inventions and their patent numbers, including items like Alarm register, Axle skein, Bag holder, Bale tie, Basket, Bed bottom, Bee hive, Beer cask, Bird cage, Boiler covering, Boiler explosions, Bolt, Bolt, king, Book case, Book clamp, Boot and shoe, Boot clamp for boot blacks, Boot screw wire, Box heads, Brewer's mash machine, Broiler, Bronzing machine, Brush and mop holding device, Buckle, Burial vault, Burner, gas, Burner, laboratory gas, Burner, vapor, Calcimine, Can, sheet metal, Can flanged lids and collars, Car brake, railway, Car coupling, Car coupling, Car replacer, Car seat, Car, stock, Carding machine, Carriage axle, Carriage axle, Carriage bodies, Carriage spring, Carriage top, Carriage running gear, Cartridge-loading implement, Cartridge-loading implement, Cattle support, Centrifugal hydro-extractor, Chair, invalid, Chair rounds, tenoning, Chair seat, Chair, tilting, Chimney cowl, Chuck for making swelled tenons, Churn, T. B. Jewett, Churn, C. W. Patton, Cigar mold, R. Appleby, Cigar press, Sjoboda & Luxa, Clock, pendulum, Clocks, calendar movement, Cloth-frizing machine, Clothes frame, Clothes wringer, Coal separating slate m f o, Broadbent et al.