

J. H. asks: What is the best method of painting upon glass, so that the coloring will resist the weather? A. First draw the subject on paper, and fasten it, face downward, by pasting it at the ends, to the glass. Turn the glass over, and paint with a camel's hair pencil, the pigments being mixed with varnish. Let the outlines dry before filling in and shading. The painting may be varnished over.

J. B. N. asks: How can I transfer pictures from paper to glass? A. Coat the glass with a varnish of balsam of fir in turpentine, then press the engraving on smoothly and evenly, being careful to remove all air bubbles. Let it stand for 24 hours, then dampen the back sufficiently to allow the paper to be rubbed off by the forefinger, rubbing it till a mere film is left on the glass, then varnish again.

H. H. asks: How are organ pipes constructed, and are they tuned in the shop or after the organ is set up? Do they ever get out of tune? If so, how are they made right again? A. Organ pipes are made of wood or metal. The wooden pipes are generally nearly square in cross section, varying in size of section according to the length. Metal pipes are of different kinds of pewter, the best being the sort known as spotted metal. Pipes can be tuned before being put in the organ or afterwards. Shortening a tube raises the tone, lengthening it lowers it.

R. H. S. asks: By what means can a barometer that has lost a portion of the mercury from the cistern be made to register correctly? A. It would probably be difficult to adjust it without using another barometer, unless the cistern is adjustable.

H. S. asks: 1. How does a chemist earn a living? A. Chemists make analyses, prepare reports of processes, etc. Some of them are professors in educational institutions. 2. Does he ever get rich? A. Good chemists often realize large profits from their profession. 3. What are the best books for a boy to study who wants to learn chemistry, supposing he knows nothing about it? A. "Towne's Elementary Chemistry," price \$2.75, will be a good book for you to have, and you will find in it information in regard to your other questions.

J. S. asks: 1. When in a rotary engine there are two or more pistons to but one abutment and steam port, after the second piston has passed the abutment and is receiving steam, does the steam between the first and second piston cause back pressure by expanding and pressing the two pistons apart? A. In general it does. 2. Are the compound brass fishing reels cast or stamped out of sheet brass? A. We believe the cheaper styles are stamped.

W. W. M. asks: How can I cover wire for insulating it? A. A disk having a large hole in the center, and carrying two spools on which the silk is wound, is made to revolve as the wire is drawn through the hole, the ends of the silk being first tied to the wire. By varying the relative speeds of the disk and wire, the silk may be wound on as closely as may be desired.

J. P. L. asks: How can I prepare bronze powder, to be used in a semi-liquid state upon wood? I want it to dry quickly. A. The best way is to coat the wood with glue or drying oil, and dust the bronze powder over it through muslin. But the bronze powder may be mixed with drying oil, and applied with a brush.

D. B. asks: 1. How can I make small portions of yellow and green bronze, and golden ink? A. For golden ink, see p. 102, vol. 30. Yellow ink can be made with a decoction of saffron. Green ink can be made by mixing indigo carmine with picric acid. 2. Do you know of a simple prescription to take taken off the face and hands? A. Cover the skin with cold cream. 3. Which is the better, to study civil engineering theoretically, or to study it by being the assistant of an engineer? A. The latter way. 4. Name some authors who have written on the "True and Beautiful." A. Ruskin, Taine, Goethe, Matthew Arnold, and the majority of the poets. 5. What is the salary of a United States coast surveyor? A. From one hundred to one hundred and twenty-five dollars a month, we believe. 6. What are the predictions of the coming spring? Will it be early? A. Probably it will be late, but this is a mere guess. 7. Whose work on civil engineering do you regard as the best? A. Professor Rankine's.

H. J. B. asks: Is there any kind of oil that will form an explosive gas by forcing air through it? A. Probably naphtha or some other of the hydrocarbons will answer your purpose.

W. asks: Why is it that, in hewing green wood, a spark of fire is often seen down in the wood next to the ax, where there could be no grit? A. The spark is probably due to the friction between the ax and wood.

R. G. asks: Why is it that a large boiler cannot carry as much steam per square inch as a small one? A. The strength of a cylinder, other things being equal, is inversely as the diameter.

E. J. F. asks: 1. Will the magnet be less powerful in attraction under water than otherwise? A. We think not. 2. What is the best method of causing a magnet to retain its full power of attraction? A. Keep weights suspended from the armature. 3. Which is best, magnetite or iron merely magnetized, or is there no difference in the power? A. The latter is best.

T. S. V. says: I am using a 10x20 engine, running at 80 revolutions, with steam at 60 lbs., with a 3 inch exhaust pipe, and I would like to exhaust into the bottom of a tank containing six feet water. How much back pressure will it make on the engine? A. About two and three quarter pounds per square inch.

J. A. B. asks: Would a steam boiler explode with the same noise and throw pieces of the boiler as far if it exploded under hydraulic pressure at 150 pounds to the square inch as it would under the same pressure of steam? A. The explosion would generally be the most violent in the case of steam.

N. L. T. asks: 1. Why can a kettle of boiling water be held on the hand without inconvenience as long as it boils, but as soon as it stops the heat becomes intolerable? A. If such is the fact, it is probably because water in boiling requires so much heat that it is abstracted from surrounding objects. 2. Can heat be transmitted through a vacuum? A. We think so. 3. Why are rifle balls made conical at one end, and flat and sometimes concave at the other? Would they not be more effective if made tapering to both ends, as in that case no vacuum is formed after the ball, the air flowing in behind it instantaneously? A. They are made concave at one end, in order that they may spread, and fill the grooves of the rifle barrel.

O. K. asks: 1. Is the White House at Washington a wood, brick, or stone building? A. It is built of freestone. 2. Has it ever been rebuilt? A. We think not. Why is it called the White House? A. Because it is a white house.

W. B. N. says: A friend claims that, in setting logs for sawing, the eccentric blocks, making two motions for one inch, will not throw the log as hard as setting the log by one motion with the double rack and pinion. There is no back lash in either case, and the log is to be moved the same distance in the same time. I claim that, if there is any difference, it would be in favor of my plan with the double rack and pinion. He is sure that he is right, and will not let any one decide. I ask for your opinion. A. It is difficult to determine which is correct without a practical test with the two devices.—J. E. E., of Pa.

W. M. J. asks: What is the best kind of saw to saw plow beams, wagon felles, and wagon hounds? How many plow beams are a day's work for one man, cut from plank of the proper thickness for common two horse plows? Is cutting the lumber or logs into plank the proper way to get out plow beams, or would it be better to saw the timber or logs to the shape of beam, and then slit up to the thickness of beams? A. The logs are first sawn into plank to the proper thickness for the beams, and then to a pattern marked with the required shapes. A strongly built jig or band sawing machine is used for sawing the curves or the curved way of the beam. The first cost of a band sawing machine would probably be more than for a jig saw, but it would saw more rapidly. So much depends upon conditions that it is impossible to give an approximate estimate of a fair day's work.—J. E. E. of Pa.

W. J. says: 1. I have a theory that a balloon could be guided at will by attaching to it a conical shaped apparatus, made of light material and hollow, the open end large and to be fastened to one side of the balloon, the other end converging to a point. The theory is based on the principle that the balloon with the above attachment offers less sail-like surface to the wind, and consequently would be enabled to sail against currents of air. What is your opinion? A. We do not think that this arrangement will enable you to do what you propose. 2. Would not perpetual motion be possible if it were not for the law of gravitation? A. Possibly it would. 3. What is your opinion of the following proposition: If perpetual motion is ever invented, will it work by magnetism or attraction of magnetic force? A. No. 4. Has there been anything invented to condense all the steam from a steam engine and return it to the boiler. If so, what is the percentage of waste? A. Yes. There is no waste, if the apparatus is tight. 5. Does the patentee of an invention possess any certificate to show that his invention is patented? A. No. 6. Is there any instrument that will detect the presence of a metal in the earth. A. No.

W. S. C. asks: 1. If the same pressure is brought to bear on every part of the interior of a steam engine and boiler, why are they made of different strengths? For example, the boiler is 1/2 inch thick, the live steam pipe is 3/8, and the steam chest and cylinder sometimes one inch and more. A. The strength of a cylinder, other things being equal, increases as its diameter is decreased, consequently small cylinders do not require to be made as thick as large ones. 2. How is it that a steam boiler can pump water into itself? It seems to me that there would be a back pressure on the pump piston head. A. The steam piston is larger than the water piston, so that the pressure per square inch on the water piston is greater than the boiler pressure. 3. If it takes 10 ordinary horses to run a machine at the required speed, what sized engine would do the same work? A. An average horse performs about half an engine horse power, when working in a gin or mill, so that an engine of five horse power would generally do the work of 10 horses. 4. Why can a horse pull more when he is hitched directly to the load than he can 100 yards from it by a rope, deducting the weight of rope? A. We are by no means certain that this is a fact.

C. H. W. asks: How is curd soap made? A. By using tallow for the grease and soda for the alkali.

A. B. says: 1. In February last, while plowing a piece of land, I found, at a depth varying from 3 to 6 inches, a large number of honeycomb insect nests. These nests were of various sizes, but, for the most part, varied from 2 1/2 to 3 inches in width, about 4 inches in length, and about 1 1/2 inches thick. These nests are somewhat oval, inclining to flat on the top and bottom, and have quite a number of honeycomb cells, varying generally from six to twenty-four, which contain the cocoon of the insect. These nests are made of clay, somewhat like the dirt doblers. Can you inform me what bug or insect could have made such a nest, what its habits are, etc.? A. The insect which you describe appears to be a kind of wasp, of which there are two descriptions, the social and the solitary. The solitary wasp sometimes builds its nest in the ground, while the nests of the social insect are sufficiently familiar to us hanging from trees and fences. Consult an encyclopedia, article "wasp." 2. What is the best method of mixing white lead or zinc for painting wood? A. White lead and zinc are mixed with boiled linseed oil to a proper consistency for paint. 3. In vol. 28, No. 26, you published a new specific for rheumatism. It will be valuable to many if you republish it. A. Propylamin is the specific referred to. Wertheim prepares it by the decomposition of narcotine and cocaine by alkalies. Dose, 5 drops in a tablespoonful of peppermint water every 2 hours.

C. S. A. asks: If a magnet were made in the shape of a ring, of the ordinary thickness, would not each molecule have polarity in the same directions as the whole magnet? A. In a bar magnet the magnetic power is most intense at the two extremities or poles, the middle portion showing hardly any or no magnetism. A circular disk or ring could be magnetized in the same way, the position of the poles depending upon the manner in which it was magnetized.

G. M. G. asks: Why is it that metronomes, for beating time in music, are not made in this country? A. Make one for yourself by taking a cheap clock movement, and substituting for the pendulum a wire with a sliding weight. Mark the wire with a file at the different points of graduation.

R. J. asks: 1. How can I make phosphate of calcium? A. By phosphate of calcium, we suppose, you mean calcium phosphate or phosphate of lime. The former term and analogous ones we consider both confusing and uncalled for in chemical nomenclature, although some chemists affect them. Phosphate of lime occurs naturally in the mineral apatite, and consists to a considerable extent in bones. In chemistry there are various phosphates of lime, depending upon the amount of base present. To form a basic phosphate, add a solution of basic phosphate of soda to a solution of chloride of calcium. 2. Can you tell me how to dissolve old rubber boots, etc., on a large scale? A. Bisulphide of carbon is a good solvent for india rubber. 3. Which is proper in speaking, to say "I can't" or "I can't"? A. The vowel a in "can't," abbreviation of "cannot," is sometimes pronounced with the short and flat, and sometimes with the broad and long, but never, properly, with any sound of o, as in "cont."

R. F. Jr asks: 1. Will you please give a practical method for testing the explosive nature of the several brands of burning oil? A. Oil that will not take fire when a lighted match is held to it may be considered tolerably safe. 2. In a recent number you gave a recipe for a paint dryer, which named gum lac as one of the ingredients. Is there any other name for that article more familiar to the trade? A. We think the name gum lac is applied to all the varieties in the market, namely, stick lac, the crude product, seed lac, in a granulated form, and shellac, which has undergone a purification.

J. V. D. says: After getting up steam on a Monday morning, I went to start my engine when, after about five or six turns, there was a loud report inside of the boiler, which jarred the whole mill. In about two seconds there was another and louder one, and then the boilers went on all right. On the next Monday morning they acted similarly. In the first case, the steam fell from 70 to 30 lbs., and in the second from 40 to 20. What was the cause? A. It may be that the pipes connecting the boilers with the steam drum had been choked with ice or something else, which would account for the accident.

E. S. H. asks: How can I make a safety fuse, to burn at least 5 minutes? A. Soak a plated cord in a solution of saltpeter.

S. asks: 1. How may I prove meerschauum to show that it is not imitation? A. This is the work of an expert. 2. How may it be made white, after it has become colored? A. We think it can be done by heating.

H. S. asks: If I fill a cask with steam from water at a heat so that the pressure will raise a safety valve weighted to one pound to the square inch, and then allow the steam to condense, what proportion of vacuum will there be in the cask? What proportion of the cask would fill with water by suction caused by the condensation of the steam, if the cask is connected by a suitable pipe with a water in a well at the depth of 21 feet, the pipe being full of water? A. If the steam is condensed, there will be practically a perfect vacuum, and the cask will become filled with water from the well.

W. F. M. B. and N. C. R. ask: Is the law, passed some time between 1866 and 1869, requiring all persons in charge of steam boilers and engines to be examined by commissioners appointed for that purpose, still in force? A. The United States law applies only to engineers of steam vessels. There are local laws in most of the States. It is very questionable in the light of the working of the present United States law whether government regulations affecting all persons in charge of steam boilers would be desirable.

T. H. E. asks: In soldering two pieces of iron together (a pair of gun barrels, for instance), after they have been thoroughly cleaned, tinned, and fastened together with binding wire, and warmed so that a thin sheet of solder applied to the joint will melt, is there anything besides resin that will make the solder flow as it ought, to make a good job? Resin is disagreeable to the workman, besides leaving a dirty, black color on the iron, which is difficult to remove. A. To 2 ounces of muriatic acid, add small pieces of zinc until bubbles cease to rise. Then put in half a teaspoonful of sal ammoniac and 2 ounces of water.

H. E. F. asks: Is vulcanized rubber the same thing as gutta percha? A. No.

G. M. A. asks: Is there a garden gate which opens and closes automatically? A. Such a gate is described on p. 406, vol. 25. 2. Is there any method to cement mica to copper, tin, glass, or another piece of mica? A. The cement described in our answer to R. L., on p. 90, vol. 30, will answer the purpose.

W. L. asks: Is there any chemical that can be applied on glass, tin, or paper, which will be visible only through colored or stained glass? A. We are not aware of the existence of any such substance.

M. H. A. asks: If I take equal parts of block tin and quicksilver and unite them together by heat, could this be used for a polish for cleaning knives, forks, etc.? I propose to use muriatic acid and then apply the tin and quicksilver; would it adhere so that they could be used? Would there be any danger in using such articles? A. Your process might answer for tinning, and you can easily try the experiment, but amalgamated articles would be objectionable for culinary purposes.

M. B. asks: How can I make molds to cast silver, so that the silver will flow well and cast smoothly in casting small articles? A. You can make molds for silver similar to those which are used for fine cast iron castings. For a smooth facing, fine soapstone or plum-bago may be used.

A. A. S. asks: Has hydrogen ever been decomposed? A. We have seen no authentic statement to the effect that it has.

A. S. says: An engineer of some experience has been building engines with concave pistons and corresponding convexity of the cylinder heads, taking steam in the center of the pistons by an arrangement of ports cored out of the heads, claiming that he gains a greater effective pressure on the piston by that shape. He states that, on a 4 inch cylinder, he gains 2 square inches. I claim that, no matter what the shape of piston or head, the size of cylinders being equal, the pressure will be the same as in the common engine. A. We think you are right.

W. S. W. asks: How are Japanese scintillettes made? A. Japanese scintillettes consist of pencils of rolled paper, one extremity of which, to the extent of about half the length of the pencil, is filled with a composition which burns with a red flame. It is ignited by holding the fine extremity in the hand, while the other end containing the mixture is held for a moment in a flame. The composition may be made to suit the fancy, the chief ingredients being probably sulphur, meal powder, or chlorate of potash, etc.

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

S. E. W.—Your oilier sediment consists of some saline material. So far as we can judge without a chemical analysis, it is common salt. The water used is apt not only to form scale, but to corrode the iron. The remedy is to distill, and to use the water from the condensed steam as far as practicable.

L. T. H. asks: How can I make imitation ivory billiard balls without pressure?—E. E. S. asks: How

is moss prepared for finishing wax flowers? Can it be bleached and made to resemble white wax, to be put in white bouquets? How can small monopetalous corollas be made of wax, so that they will have the delicate fragile appearance of natural flowers? With what should the colors be mixed, so that they can be put on the wax as evenly as on paper? How can the bloom and flock be made to adhere to the wax?

COMMUNICATIONS RECEIVED.

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

- On the Spider's Web. By J. H. B.
On the Hot Springs of Nevada. By G. A. F.
On the Centralization of Matter. By A. D.
On Ventilation. By A. R. M.
On the Relative Attraction of the Earth and Sun. By A. R. Jr. and by E. W.

Also enquiries from the following: A. W.—G. A.—S. R.—G. B.—A. P.—J. W. T.—R. J. W.—W. H.—E. C. B.—E. N.—A. Th.—D. A. S.

Correspondents in different parts of the country ask: Who makes match splitting machines? Who makes balanced slide valves for use on locomotives? Who sells a hash machine? Who makes woolen machinery, such as pickers, breaker cards, and finisher cards? Who manufactures balloons? Who makes a machine which prints by touching keys, similar to a piano? Where are machines for making friction matches sold? Who makes movable calks for horseshoes? Who makes broom handle machinery? Who makes ditching machines? Where can machines for pressing coal dust into blocks be obtained? Makers of the above articles will probably promote their interests by advertising, in reply, in the SCIENTIFIC AMERICAN.

Correspondents who write to ask the address of certain manufacturers, or where specified articles are to be had, also those having goods for sale, or who want to find partners, should send with their communications an amount sufficient to cover the cost of publication under the head of "Business and Personal" which is specially devoted to such enquiries.

OFFICIAL.]

Index of Inventions

FOR WHICH

Letters Patent of the United States WERE GRANTED IN THE WEEK ENDING

January 20, 1874,

AND EACH BEARING THAT DATE.

(Those marked (r) are reissued patents.)

Table listing various inventions and their patent numbers, including items like Acoustic qualities, Alarm, burglar, Alphabet case, Animal matter, Auger, earth, Bale tie, Barrel staves, Basket, Basket making machine, Bed bottom, Bed warmer, Bedstead, Bee hive, Bell striking, electric, Billiard cue, Blasting compound, Blasting torpedo, Blind slats, Blowing machine, Boats, Boiler, Boiler, revolving steam, Boiler washing machine, Book support, Boot soles, Boots, Boring machine, Broom handle, Brush, flesh and bath, Buckle, harness, Bung bush inserter, Bung, cock, and tapping apparatus, Burner, gas, Bozert & Medlin, Burner, gas, J. Rigby, Can for paint, Can, oil, B. Eaton, Can opener, Candy, chewing gum, Car coupling, Car coupling, Car coupling, Car coupling, Car coupling, Carpet beater, Carpet rag looper, Carriage, child's, Carriage curtain fastening, Carriage step rail, Carriage top plate, Carriage running gear, Caster, furniture, Chair, folding, Chair hat holder, Cigars, applying stamps to, Clock keys, manufacture of, Cloth cutting mechanism, Cloth, machine for steaming, Cloth rolling mechanism, Clothes dryer, Clothes horse, Coffee roaster, Cork cutting machine, Cranberry gatherer, Crowbar, Cultivator, Curtain fixture, Dental impression cup, Digger, potato, Ditching machine, Drilling coal and rock, Egg beater, Elevator, Elevator, hydrostatic, Elevator, water, Engine, rotary.