ENGINEERING INVENTIONS.

A gas engine has been patented by Mr. George M. Allen, of Terrysville, Conn. The piston is moved in the working cylinder by the expansion of heated air and gases, and there is no explosion, the engine being practically a hot air motor in which the air is admitted greatly in excess of that needed for the combustion of the gas

A car step has been patented by Messrs. Clarence C. Baker and Odaville Yates, of Albuquerque, N. M. The object of this invention is to provide an improved folding step for freight cars or station platforms, the step and its hangers being substantially pivot jointed, for securing interlocking and mutual support of its parts, and being readily folded and unfolded.

A straightway valve has been patented by Mr. Alexander B. Rohney, of Montreal, Canada. The valve is made in U-form, with its head or bend serving as the valve face, and the side arms, affording a free passage between them, shaped as cams, to act against shoulders of the valve case in seating the valve, with other novel features, making a valve with few and simple parts, and which is durable.

MECHANICAL INVENTIONS.

A gear wheel has been patented by Messrs. Benjamin W. and Joseph L. Leeson, of Litchfield, Ill. The teeth are convex on their backs and concave on the front or driving sides, giving them a better hold with chain gear, and they have a rubber cap or covering fitting tightly around them, so that a chain or gear wheel thus made will run almost as noiselessly as a pulley driven by a belt.

AGRICULTURAL INVENTIONS.

A cotton planter and fertilizer distributer has been patented by Mr. Pleasant R. Houpe, of Oak Forest, N. C. The hopper is made with inclined angular sides, one of which is bolted flat against the inclined handles, which form a support for the bopper, and there is a stirrer within the hopper, with various other novel features.

MISCELLANEOUS INVENTIONS.

A weather strip has been patented by Mr. William J. Devers, of Providence, Pa. The invention relates to that class of weather strips in which the strips are secured to the door along its edges, and consists in a novel construction and arrangement of parts.

A fire kindler has been patented by Mr. Clarence J. Canan, of Omaha, Neb. It consists of a corn cob coated or saturated with inflammable material, such as resin and tallow, pitch, etc., and a transverse supporting and ignition splint, being a cheap, clean, and effective fire kindler.

A combined hinge and blind fastener has been patented by Messrs. Warren S. Dwinel and Earl P. Mason, of Providence, R. I. The object of this invention is to improve lock hinges for window blinds, to effect which the construction is novel, and the device is cheap, strong, durable, and easy to operate.

A horse blanket has been patented by Mr. Clarence J. Canan, of Omaha, Neb. It is double breasted, and has two flaps at the front end, both of which are folded over the horse's breast, and held in place by means of straps and buckles, one of the flaps having a transverse slot through which the other flap can be passed.

A stench trap has been patented by Mr. Herman Pietsch, of Flatbush, N. Y. An exterior bowl or cup is connected to the inlet and outlet pipes, and so combined with a glass tube and cup as to make a trap of simple construction, which flushes and cleans itself automatically after use, and is made transparent, so the contents can be seen at all times.

A wagon jack has been patented by Mr. William H. Gray, of Neapolis, Ohio. It consists of a horizontal bed frame and vertical guides, in combination with a vertically sliding frame carrying two brackets for engaging the rack or wagon box, with a pawl and ratchet mechanism, for lifting racks and wagon boxes from the running gear of wagons.

A gin saw cleaner has been patented by Mr. Benjamin R. Eaton, of Middle Settlement, Ark. A shaft or mandrel is arranged to carry a series of disks to run some distance into the spaces between the saws; the disks have toothed margins as well as toothed edges, and the disks may alternately be brought into contact with one side and another of the saws.

A universal clock has been patented by Mr. Abraham M. Cory, of New Providence, N. J. It has a rotating dial annulus, surrounded by a fixed ring divided into degrees, so the time on each and every meridian will be shown at the same time; it has also additional disks to correspond with certain degrees, on which the names of places are printed on the same degree.

A secondary battery has been patented by Mr, Desmond G. Fitzgerald, of Brixton, County of Surrey, England. The invention consists in the manufacture of electrodes that are practically indestructible, by the use of suitable impervious and insulating material with which the electrode is in part coated, the internal resistance of the battery being not materially augmented if the protection be confined to the anode.

An ice machine has been patented by Mr. John Patten, of New York city. This invention relates to that class of ice machines in which cold is produced by vaporizing water by means of a vacuum maintained by removing the vapor as rapidly as it is formed, and it provides new and improved means for freezing a block of ice. The machine is so constructed that a layer of water is spread or distributed on a surface exposed to a partial vacuum, whereby water will be congealed, and although various ways of making it are provided for, the principle is always the same,

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

NEW BOOKS AND PUBLICATIONS.

THE ACT AUTHORIZING THE FORMATION OF CORPORATIONS. L. K. Strouse & Co., New York.

Walter J. Poor has compiled a convenient little hand book, giving the act under which corporations are formed for manufacturing, mining, mechanical, and chemical purposes, with notes and forms for establishing such corporations. The duty of receiver and his responsibility for the faithful discharge of his office is also included in this pamphlet.

Notes & Queries

HINTS TO CORRESPONDENTS.

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

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

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

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

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

Minerals sent for examination should be distinctly marked or labeled.

(1) W. F. asks how to transfer the ink from newspapers on to glass. A. The following is used to transfer engravings on to glass, and we think may be applied in the manner you desire. First, coat the glass with dammar varnish or else with Canada balsam, and let it dry until it is very sticky, which takes half a day or more. The picture to be transferred should be well soaked in soft water and carefully laid upon the prepared glass and pressed upon it, so that no air bubbles or drops of water are seen underneath. This should dry a whole day before it is touched; then with wetted fingers begin to rub off the paper at the back. If this be skillfully done almost the whole of the paper can be removed, leaving simply the ink upon the varnish. When the paper has been removed, another coat of varnish will serve to make the whole more transparent.

(2) C. J. R. asks a preparation to use for attaching a label to greasy tin. In filling cans with various kinds of oil the surface of tt times becomes greasy, and something is wanted that will adhere to the tin on simply wiping off the oil. A. Use a dilute solution (1 to 20) of white gelatin or isinglass, or else a starch paste with which a little Venice turpentine has been incorporated while warm.

(3) C. B. wants a formula for making a coating for peanut candy to protect it from dampness. A. Try gum arabic and water, or a solution of gelatine and water of quite thick consistency. A coating of this would probably prevent any moisture from being absorbed after the candies were dried.

(4) H. C. says: I have a barrel churn 24 inches long and 22 inches diameter at the ends, and 24 inches in the middle. It is usually filled two-thirds full of cream for churning, and is turned about 55 revolutions per minute by hand, end over end. Can you determine from the above data about the power required to run it, and whether it would be practicable to use an electric motor to run it with? I mean a motor propelled by batteries. If so, about how many cells would I want? A. We should say that about one-quarter horse power would be required, and although it would be possible to use an electric motor, a dynamo machine would be necessary, and to run this latter, unless you had steam power, the plant would be so expensive that after all it would not pay you to attempt it. Batteries would be impracticable.

(5) R. B. B. asks how to prepare the enamel used on brass signs with black letters. A. A mixture of lamp black, oil, and patent drier is applied or filled into the spaces cut out in the brass; after being allowed to dry it is polished, and by continual polishing, in time, it assumes an enamel like appearance. Black baking japan is likewise used in many instances with brass sigus.

(6) S. D. V. L. asks for a receipt to make salad dressing. A. Marion Harland gives the following: 2 hard boiled eggs, 2 teaspoonfuls salad oil, half a teaspoonful salt, 1 teaspoonful white sugar, half a teaspoonful made mustard, 1 teaspoonful pepper, 4 tablespoonfuls vinegar. Rub the yolks to a powder, add sugar, pepper, salt, mustard, and oil. Let it stand five minutes, and beat in the vinegar.

(7) C. H. K. asks: 1. What is the finish that is put on iron called "Tucker bronze," and how is it applied? A. Do not know of a Tucker bronze finish. Think it must be a local name. 2 What is the composition of genuine bronze, such as is used in manufacturing small ornamental hardware? A. Bronze for medals and ornaments:

Copper	89 parts.
Tin	8 parts.
Zinc	3 parts.

Another:

Copper	82 parts.
Tin	3 parts.
Zinc	18 parts.
Lead	2 parts.

(8) J. E. G. says: A mechanic of my acquaintance uses a liquid glue which he says will keep for six or eight months and improves with age, can be spread on a joint and not clamped for an hour after, yet it will set in a reasonable time and make an excellent job. As he will neither sell nor give away the recipe, can you give one as good? A. Liquid glue may be prepared as follows: Take a wide mouthed bottle and dissolve in it 8 ounces best glue in half a pint of water, by setting it in a vessel of water and heating until dissolved. Then add slowly 2½ ounces strong nitric acid 36° Baume, stirring all the while. Effervescence takes place under generation of nitrous gas. When all the acid has been added, the liquid is allowed to cool. Keep it well corked, and it will be ready for use at any moment. This preparation does not gelatinize nor undergo putrefaction or fermentation.

(9) W. I. T. asks for a process of hardening gelatine so as not to render it brittle, but to be of about the consistency of tissue paper. A. The hardening of gelatine is brought about by adding potassium or ammonium bichromate and exposing the film to sunlight. The addition of glue and tannic acid will also produce a similar effect. The exact proportions to use are kept secret by the various owners of photo engraving processes, whose value depends upon the proper manipulation of the ingredients.

(10) H. V. asks how much salicylic acid to put in a barrel of paste so it will not sour or mould, or could anything else be used that will not stain or discolor and that would come cheaper? A. One part in 1,000 to 2,000 is the proper quantity to be used in order to prevent decomposition. Carbolic acid is an equally good preservative for your purpose, and is less expensive.

(11) W. A. asks (1) if salicylic acid is of any practical value for keeping eggs in quantities. A. It is generally stated that eggs plunged for one hour in a solution of salicylic acid, and in no manner treated otherwise, will be found perfectly fresh after three months. 2. What is salicylic acid? A. Salicylic acid is prepared by heating sodium phenate in a stream of carbon dioxide, phenol distilling over, while disodium salicylate remains behind. By decomposing the latter free salicylic acid is obtained. Both carbolic acid and salicylic acid are derivatives of coal tar, and the salicylic acid may be derived from crude carbolic acid. For the treatment of eggs, see the articles in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 317, or 101 and 308.

(12) C. C. C. writes: I want to make a canvas canoe thoroughly waterproof by using some form of India rubber. How can I obtain the rubber and how dissolve it? A. The cement which you require is made by fusing together equal parts of pitch and gutta percha, and to this there should be added about two parts of linseed oil containing five parts of litharge. The heat must be continued until the ingredients are uniformly commingled. It is to be applied warm.

(13) M. E. H. writes: I have several old broken and cracked meerschaum pipes. Is there any way that I can dissolve them to a moulding consistency? A. It is impossible to dissolve meerschaum and then mould it. Egg cement prepared by taking some white of eggs with as much water, beating them well together, and sprinkling in sufficient lime (slaked) to make the whole up to the consistency of thin paste, is sometimes used to mend broken pipes. This cement sets or becomes hard very quickly, and can be used at once.

(14) J. W. D. asks: Is there any way for closing a crack in a meerschaum pipe? And is there any way for taking the color out of them? A. See answer to above. We are informed that it is impossible to completely remove the coloring from pipes. Partial methods are kept as trade secrets by prominent makers of pipes, which they refuse to communicate.

(15) J. E. B. asks for a formula for making a waterproof covering for mirrors. A. Try pouring over the plate a varnish composed of gum dammar 20 parts, asphalt or bitumen 5 parts, gutta percha 5 parts, and benzine 70 parts. This varnish will set hard on the glass, and once dry we do not think that it will be affected by water.

(16) A. D. asks: Does magnetizing a watch destroy the vitality or strength of the steel springs and wheels so that they are easily broken? A. No; only interferes with its regularity and sometimes stops its running, because its parts that are of steel, particularly those that are hardened, such as pivots, springs, etc., become magnets, and by their attraction stop the action of the lever.

(17) F. & M. Dept. writes: Please say in your correspondent column whether scarf welded or butt welded links are strongest, and which is used for ship chains. A. Scarf weld is best. Butt weld is liable to part unless carefully done. Machine made ship chains are butt welded; hand made are scarf welded.

(18) W. L. B. asks how to tin malleable iron castings. A. The great secret is to make the castings chemically clean. This is done by means of a pickle, either of sulphuric and nitric acid in equal quantities by measure, with water in quantity to equal the acids—1 sulphuric acid, 1 nitric acid, 2 water. Dip the clean castings into a bath of melted tin covered with a coating of powdered charcoal and tallow. Drawing them through the charcoal and tallow, after thorough heating, will show them effectually coated.

(19) J. C. S. asks: Can you give me a formula for brass lacquer? A. The best uncolored lacquer is shellac dissolved in alcohol. Better make a saturated solution and then thin as you desire. Use the best white lac and 90 per cent alcohol. Add color if you desire, but it is better without. Dry in shade.

(20) W. S. C. asks how to set a steam valve on a common single slide valve engine to work the steam expansively. A. You can only work steam expansively with a common slide valve by having a good lap to the valve, and even then you cannot cut off short of ⅝ to ¾ the stroke advantageously. When the valve is properly made, the setting of it would be the same as any ordinary slide valve.

(21) D. T., Jr., who as a practical druggist, has made "almost tons" of fly paper, amends our recent answer to W. H. on this subject by suggesting the use of resin, boiled with enough raw linseed oil to make it very stringy; some add a small quantity of honey, but this is open to the objection that it draws so many flies as to materially increase the number to be got rid of.

(22) H. G. V. asks: 1. Is there any possibility of fire from steam pipes in a dry house for seasoning lumber, the pipes laid on wood? A. Many fires have been attributed to the contact of steam pipes with wood, but the pipes are never hot enough to cause a fire directly; steam pipes in contact with some soft woods, however, char them, and this charcoal, under certain conditions of limited supply of air, causes spontaneous combustion. 2. Is it necessary to have ventilation to increase the drying process? A. A little ventilation is best in a drying room for lumber. 3. What is the usual time for drying inch lumber at a temperature of 200 degrees, continuous day and night? A. It depends on kind and condition of the lumber; from two to four days.

(23) S. S. S. K. asks the best method of taking writing and ink stains out of books, without injuring the paper or leaving a mark. A. Hydrochloric acid diluted in five or six times the quantity of water may be applied with success upon the spot, and after a minute or two washing it off with clean water. A solution of oxalic acid, citric acid, and tartaric acid is attended with the least risk, and may be applied upon the paper or plates without fear of damage. Chlorine water removes perfectly stains of ink. In fact, almost any bleaching agent properly applied will accomplish this purpose.

(24) C. & Sons ask what method is best to heat a building, area 5,000 square feet, 3 stories—steam, hot air, or hot water, no steam in building. A. If you have no use for steam other than for heating, hot water has the preference for both cheapness and cost of care. It is more bulky than a steam apparatus and not largely in use for heating buildings, its principal use being for greenhouses. Hot air furnaces are the great staple of the United States for heating purposes on account of cheapness in first cost and least care. Everybody can manage a hot air furnace.

(25) S. F. asks: 1. Does wool, after being off the sheep's back, grow in length? A. It is possible that the wool on pelts grows while the pelt is moist, but we know of no authentic instance. 2. Does the hair of a human being grow after death? A. Exhumed bodies have given evidence of the growth of human hair after death.

(26) C. W. B. asks: 1. What kind of red paint does Alvan Clark use to polish lenses? A. Red oxide of iron, or rouge. 2. What kind of moulds do they mould table glassware in? A. The moulds for glassware are made of iron.

(27) S. K. writes: Two rollers, one larger than the other, are running together, and to prevent a side motion it is proposed to make the surface of contact of the larger one convex, and of the smaller one concave, so as to exactly fit. Will there be more friction, grinding, or rubbing, or anything of the sort in the case of the curved rollers, and if so, why? A. The friction will be greater in the curved face wheels, because the periphery in both wheels does not run at the same speed in all parts of the curve. Hence some part of the curved bearing slips, and thereby produces friction.

(28) J. W. M. asks: What will make paper transparent without using grease of any kind? And what is used to make photographs transparent, so that they may be painted on the back? A. Paraffine will make paper transparent. For rendering photograph prints transparent see SCIENTIFIC AMERICAN SUPPLEMENT, No. 297.

(29) J. M. W., referring to a former note in this column, says: There is no such bird either in this country or Europe as the "English sparrow." The house sparrow (*Passer domesticus*) is the bird meant. A. Very true; house sparrow is the correct designation, and thus only is the bird known in Europe, although so commonly styled here the "English sparrow."

(30) C. A. H. asks: What curve should I give a disk for grinding lenses of a certain focus? I think if I turn a disk of 2 inches curve it will grind a 2 inch focus lens, 5 inches disk, 5 inches focus, and so on up as high as one wishes to go. Am I right? A. You are nearly right in regard to the curve. Glass varies considerably in density, which varies the focal length a little for a given curve. You will find interesting articles on lens grinding and kindred subjects in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 139, 318.

(31) G. W. asks if there is any reliable rule for calculating the amount of hay in tons contained in a barrack or barn of given measurements. A. 270 cubic feet new hay, 216 to 243 cubic feet in stacks or mows, according to age or degree of settlement and dryness, weigh one ton of 2,240 pounds; 297 to 324 cubic feet of dry clover weigh a ton.

(32) H. C. C.—If the tinware is stained so that a little whiting on a rag will not clean it, you may use a weak solution of oxalic acid in water by wiping the surface with a rag slightly moistened with the acid water, and then wipe dry with a little whiting on a cloth.

(33) F. D. R. W. asks if there is any process for coloring iron or steel wire fancy colors—red, blue, yellow, green, etc. A. We do not know of any natural means of coloring the surface of steel wire of any other color than the blue and yellow due to oxidation by heating. A red color is produced by dipping the cleaned wire into a solution of sulphate of copper, the red being derived from metallic copper precipitated upon the wire. This may be given other colors by a chemical treatment of the copper surface, which may be preserved by lacquers. This treatment comes under the head of the various colors in bronzing copper, which may be made, by chemical treatment, an iridescent green or brown.

(34) W. H. W. asks: What is the reason that the suction of the pump in a hydraulic lifting jack is so small, those I am using having about one-sixteenth of an inch suction to an inch pump? A. The suction inlet and valves are made small to insure tightness. 2. Could you inform me if there are any machines in the market for twisting coal miners' auger drills? A. Special machines such as for twisting augers are not on sale. They are made to order for parties engaged in the business; more often home made.

(35) E. A. W. says: In a catalogue of optical instruments, I see the statement that an achromatic object lens will bear a power of fifty diameters for each square inch of its diameter. Will you please say whether this means that a lens one inch in diameter will bear a power of fifty, one two inches a power of two hundred, etc.? Also why a lens of one inch diameter of sufficiently long focal distance will not bear as high power as one of larger dimensions? A. The rule is good theoretically. The diameter is not the square. A 1 inch objective bears a power of 39, a 2 inch objective bears a power of 150, and so on. The capacity for power depends upon quality of definition and amount of light transmitted.

(36) G. W. P. asks (1) where he could get a speaking phonograph. A. Speaking phonographs are not on sale. A few have been made to order by experimenters. 2. What books treat on compressed air? A. See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 140, 188, 282, 92, 279, 309. 3. What books would be profitable for a young man, intending to be a civil engineer, to read? A. Griswold's Railway Engineer's Pocket Companion $1.75, Trautwine's Field Practice $2.50, Trautwine's Embankments $2.00, Trautwine's Civil Engineer's Pocket Book $5. 4. How much it costs on an average to construct a mile of common railway track? A. About $10,000 per mile would be the lowest cost, and from that up to $100,000; no average can be given without definite knowledge of the line. 5. How large in diameter would a balloon filled with common coal gas have to be to lift 100 pounds? How large if filled with pure hydrogen? A. With coal gas about 26 feet, with pure hydrogen about 12 feet. 6. The process of making panclastite (described in SCIENTIFIC AMERICAN, vol. 1, No. 15, on page 227). A. The panclastite experiments referred to were made in France; we cannot give you further information on the subject than we have already published.

(37) G. P. A. writes: I have certain articles which I have been bronzing with copper. I would like to find something that would give me the same color and be cheaper. The way I am doing now I have to cover the iron with a coat of paint and then bronze over that; this makes it expensive. A. There is no cheap paint that will take the place of surface bronzing. You may mix the bronze powder with a light varnish and paint the work, and thus save a little time and trouble; but the material will cost more than by the present method. Chrome yellow mixed with a little vermilion, just enough to give it a light orange color, with a little varnish in the paint, to give it a gloss, may be also worth trying.

(38) "Mechanic" asks how to prepare the iron casting of any object to serve as a pattern for others. How to go to work to design in orthographic projection any object having warped surfaces or surfaces of double curvature, and surfaces following no law like the helicoid, for instance. From the drawing of such an object a pattern maker is to make a pattern having certain dimensions. A. Iron patterns should be thoroughly cleaned of the sand scale by pickling with sulphuric acid 1 part, water 4 parts, for several hours, then scrub the surface with a metallic brush, or smooth the roughness of the pattern casting with files or pieces of broken grindstone. When cleaned and made ready for a pattern, it may be warmed by any means to a temperature that will melt beeswax. Rub the beeswax all over the pattern, wipe off any excess that may lodge in cavities, leaving upon the iron pattern only a very thin coat of wax. When cold it will be ready for the sand. The method of projecting curved surfaces orthographically for pattern making is laid down in a series of illustrated articles in the SCIENTIFIC AMERICAN SUPPLEMENTS, embracing about 450 engravings, stitched in paper cover, $2.50.

(39) O. C. D. asks for an oxidizing dip to give an olive green to brass. A. Try Prussian blue with Scheele's green in muriatic acid and water, using proportions to trial for color; clean in clear cold water; no potash.

(40) M. C. H. asks: How can polished spring steel be blued without heating and drawing the temper? Can it be done by dipping? A. All the bluing of steel or iron presupposes a heating to a "blue temper." No "dip" will give the color. A superficial and temporary color can be given by using Prussian blue of Winsor & Newton's tube colors mixed with copal varnish and dried in a gentle heat.

(41) E. L. B. asks how to make his plow mould boards and land slides of iron hard enough to scour in black soil, without casting them in chilling moulds. A. Use hard iron—chromic ore and scrap iron—melted in an air oven by bituminous coal. This iron cannot be drilled, or chipped, or filed, and the bolt holes must be cored. No case hardening will be effective.

(42) I. S. B.—Your air pump, properly arranged, will not draw the water back; the air will rise if it can do so by replacing water, but there can be no perceptible compression of the water.

(43) M. B. asks for the best and simplest way to anneal crucible steel castings and the time taken to do so. Also some further particulars regarding the cheapest way of producing above castings. A. Annealing of steel castings in a small way may be done in the same manner as the annealing of forgings of steel, by heating in a forge fire to a full red and slowly cooling in a mass of hot ashes or lime; both mixed make a very good annealing bed. If there is a large quantity to anneal, an oven is the most economical. Something like a reverberatory furnace, which can be heated to a full red heat with its contents and then closed and allowed to cool gradually. Ordinary annealing may be done in from three to six hours, depending upon the condition and size of the castings. For casting small work, crucibles of plumbago are generally used, charged with the broken pieces of steel or scrap steel, sometimes tempered with a little cast iron and wrought iron scrap. The furnace being like those used by brass founders, with a strong draught on a large scale, the cupola is used much after the style of those for cast iron. It requires much more experience than we can teach to enable you to produce perfect steel castings. Many establishments have not succeeded until they have expended much money and valuable time in experimenting.

(44) C. T. M. writes: Is it beneficial to health to put on flannel clothing next the skin, especially during the daytime? Is there any harm in wearing such clothing in summer? A. The use of flannel next the skin has certainly nothing objectionable in it, either by day or by night, in winter or in summer. The personal comfort and convenience of the wearer alone can guide him as to it. Every one should wear underclothing sufficient to secure a proper amount of heat, and to guard against the effects of sudden changes of temperature; no more and no less. And consequently the amount needed for one may be either too much or too little for another. The material is not of itself important. It may be ganze, it may be silk, it may be flannel, it may be chamois leather, or buckskin, at choice.

(45) G. H. H. says: Can you give me a receipt for removing moles from the face? A. The moles can be removed from the face only by excision. The operation is slight and leaves only a linear cicatrix. Of course a caustic application might destroy the skin as completely, but it is not to be considered; the pain is great and the cicatrix disfiguring; all milder treatment is without avail.

(46) H. E. J.—For good recipes to make real fruit jellies, see SUPPLEMENT, No. 196. Gelatine is used to a very large extent by dealers. Much of the jelly put on the market, adorned with elegant labels, is composed of gelatine, colored, and flavored with essences, without the use of any fruit.

(47) F. G.—Disks are cut round by chucking them upon the revolving disk of the grinding machine with pitch. Make a hoop of brass or copper wider than the thickness of the glass to be cut; make it about one-thirty-second of an inch thick, with a stiffening piece at the upper edge. Fasten the hoop to an arm of metal or wood, so that you can retain it in a central position upon the glass. When adjusted, feed emery (No. 70) and water upon the glass, at the same time revolve the glass under the hoop and pressing down gently upon the hoop with the hand. The emery will spread under the edge of the hoop, and soon cut a groove entirely through the glass.

(48) B. C. F.—Your proposed connection of lightning rod with water pipe is a good arrangement. The rod should be in one piece, but if in pieces the joints should be well soldered. Also make soldered connection of rod to pipe.

(49) C. O. F. asks: What is it in Canadian kerosene oil that causes the discoloration of the chimneys, and also what gives it the unpleasant odor? A. The discoloration of the chimneys is produced by the volatilization of the sulphur, etc., which attacks the glass. Similarly the odor results from the sulphur; possible phosphorous and their combinations with carbon and hydrogen.

(50) W. M. L. wishes to know how oleate of copper for the removal of freckles is to be applied, how often, and in what consistency. A. The remedy should be used in the state in which it is received from the apothecary, and should be lightly applied to the spots with the finger upon retiring at night. It would be difficult to say how long it would take any remedy, internal or external, to effect a cure.

(51) L. H. C. writes: My lawn, not of great extent, is completely covered with dandelions, which are choking out the grass. Lawn was richly manured last fall, and they seem to thrive upon it. Can you or any of your readers suggest a method of killing them out? A. We know of no better way to eradicate dandelions in a lawn than to cut them out with a long, narrow knife. Run the knife down beside the root, loosening as much as possible of the root, and pull it out. The next best is to resod the lawn.

(52) G. W. asks how to make a good liquid barometer.

A. Camphor	2½ drachms.
Alcohol	11 "
Water	9 "
Saltpeter	38 grains.
Ammonium chloride	38 "

Dissolve the camphor in the alcohol, the salts in the water, and mix the solutions together.

(53) C. J. R. asks: 1. By what osmotic action or why liquids of different densities tend to mix, or project their particles through each other in opposition to the laws of gravity? A. Osmotic action is definable by its effects; its cause is not known, unless it be due to molecular motion. 2. Why given odors tend to shoot through still atmosphere at considerable velocity? A. The cause of the dissemination of matter producing the sensation of odor is unknown, except as being one of the phenomena of volatilization. 3. By what law magnetic atoms dart off from the poles of a magnet in ceaseless streams, or what motive force sends electric fluid through a wire at almost inconceivable velocity, leaving out that it comes through "nature"? A. Magnetic atoms, as such, are unknown, and electricity is only known by its effects.

(54) A. B. C. asks how the liquid slating used in painting the surface of blackboards is prepared? A. One gallon 95 per cent alcohol, 1 pound shellac, 8 ounces best ivory black, 5 ounces finest flour emery, 4 ounces ultramarine blue. Make a perfect solution of the shellac in the alcohol before adding the other articles. To apply the slating, have the surface smooth and perfectly free from grease; well shake the bottle containing the preparation, and pour out a small quantity only into a dish, and apply it with a new, flat varnish brush as rapidly as possible. Keep the bottle well corked, and shake it up each time before pouring out the liquid.

(55) W. says: 1. Some time since you gave a receipt for making ink as follows: 1 part of commercial nigrosin in 80 parts of water, etc.; does this mean 1 to 80 in bulk, or 1 to 80 in weight? A. Use parts by weight. 2. What percentage of cream should milk show in the lactometer? A. The lactometer shows the specific gravity of milk, from which the quantity of water that it contains is roughly estimated. The cream is determined by means of the creamometer.

(56) H. K. R. says: I have been trying to make a compound for producing the so-called Indian white fire, that is, a very intense light; the mixture I used consists of saltpeter 6 parts, sulphur flower 2 parts, black sulphite of antimony 1 part, but in spite of all my efforts it does not ignite readily, and burns only very slow, and often going out again. A. Use dry niter 24 parts, sulphur 7 parts, powdered charcoal 1; or instead of the charcoal 2 parts red sulphide of arsenic. Mix them intimately in an iron vessel, and ram the mixture into thick paper cylinders of about 3 inches in length by 1 inch diameter. These are kept in a dry place, and when one is required to be used it is set on end, and a piece of red hot charcoal placed upon it. See page 5055 of SCIENTIFIC AMERICAN SUPPLEMENT, No. 317, for colored lights.

(57) L. H. M. asks: 1. Is resin oil a lubricator, and can it be mixed to advantage with different oils to make an axle grease for railroad axles? A. Resin oil is used as a lubricator, and is one of the ingredients in Frazer's axle grease. 2. Is it injurious to railroad axles, and, if so, in what does its injury consist; and what would be a proper proportion of resin oil to a gallon of oil? A. We think it might be objectionable for railroad use on account of its tendency to gum. 3. Can lime be used in an axle grease of this kind to make it hard? And how is this hardness produced with this substance? A. Both lime and magnesia are used for this purpose. 4. Can caustic soda be used to give a necessary degree of hardness to a grease of this kind and, if so, would it not cause combustion in a journal? A. Caustic soda would not be so desirable a hardening agent as lime. 5. Can you give me a receipt of a good axle grease? A. For use in;

Winter.	Summer.
35 parts	60 parts tallow.
10 "	8 " oil of resin.
65 "	40 " olive or rape oil.

See also the receipts on page 5039 of SCIENTIFIC AMERICAN SUPPLEMENT, No. 316.

(58) C. A. B. says: To make artificial marble, suppose I wanted to mix 10 pounds of plaster of Paris: What would be the necessary quantities of water and alum? How long must the plaster of Paris soak? How long must it bake? When baked, ought it to be hard, or does the alum prevent it from becoming so? A. The process is generally conducted as follows: The plaster of Paris is mixed with a saturated solution of alum, and the mixture calcined until perfectly dry; then it is ground to powder, which if worked up with water the mass hardens, forming a satisfactory imitation of marble.

(59) E. E. asks for the best method of photographing on wood for engravers? A. Dissolve tannic acid in hot water, and make a white glue solution as thin as possible; first dip the block in the hot thin glue solution, allow to cool off, then dip in the hot tannic acid solution, and use when dried off. Some prefer the white of egg to the glue solution. You will have to experiment to learn just how to get the best results with these solutions in making the block ready for photographing.

(60) D. E. W. and H. P. ask for a chemical preparation that will permanently remove surplus hair from the face or neck without injuring the complexion? A. Both calcium and barium sulphide are used for this purpose. The following is likewise commonly employed: Mix 3 parts crystallized sodium sulphide, 10 parts finely powdered quicklime, and 11 parts starch. It should not be applied longer than 2 to 4 minutes. It is said to be "very effective and safe."

(61) A. M. L. V.—Wind your wire as in the drawings in SUPPLEMENT, leaving a space in the middle. If the coil is soaked in pure paraffine, it will improve it. You will find description of mercury contact breaker in almost any work on physics. Sound waves will travel against a wind, but will, of course, be somewhat retarded.

(62) J. L. K. asks: Is it practicable to run cog gearing 2½ and 3 inches in diameter 2,000 revolutions per minute? A. It is considered impracticable to run such small gearing at this speed.

(63) A. H. asks: Would a meniscus lens of larger diameter and longer focus (correspondingly) than that described in SUPPLEMENT, 252. work satisfactorily (say 4 or 5 inches diameter) for an astronomical telescope? A. Yes, if made of proportionately longer focus.

(64) G. P. asks if there is any duty on English goods shipped to Canada? A. In the absence of a reciprocity treaty, the Canadian tariff makes no distinction as to where the goods come from.

(65) J. B. asks if there is a way of incorporating zinc and glass by fusion, and if so, how? A. Metallic zinc cannot be incorporated with glass. It is too volatile. Its oxides may be mixed with melted glass.

(66) J. O.—Your question is very incomplete. Speed depends upon load, condition of track, and capacity of boiler to supply steam for high piston speed.

(67) C. H. P. asks: 1. What composition can be applied to pencil drawings to prevent them from rubbing off, without discoloring or injuring the paper, and how applied? A. The drawing is generally passed through a solution of equal parts of milk and water in such a way as to wet the paper through, but not enough to allow any of the liquid to run on the surface of the drawing. 2. Please give a receipt for making a wash for removing the black and tartar from the teeth without injuring the enamel? A. Use the softened and fibrous end of a wooden toothpick with fine pumice stone, until the tartar is thoroughly removed, washing the mouth with lime water; occasional use of the lime water, with proper care of the teeth, will prevent the tartar coming on again. None of the washes recommended for this purpose are of much value. 3. What horse power will a Backus water motor give with 90 pounds water pressure, 1 inch pipe, and ¼ inch jet? A. Three-quarters of one horse power. 4. Which of the following jets will give the most power to the above motor: ⅜, ¼, or ½ inch? A. A ⅜ inch jet is the largest you can use advantageously with a 1 inch pipe, and will give a little over 1 horse power. 5. Please give receipt for making paste that will keep? A. The best paste for general purposes is simply wheat flour beaten into cold water to perfect smoothness, and the whole just brought to a boil, while being constantly stirred to prevent burning. The addition of a few drops of creosote, carbolic acid, or oil of cloves will preserve it for years if kept covered. 6. Also a receipt for making mucilage such as is used on postage stamps and envelopes? A. Gum dextrin 2 parts, acetic acid 1 part, water 5 parts. Dissolve in water bath, add alcohol 1 part.

(68) W. W.—The "Universal Putz Pomade" consists of American bole mixed with sufficient oleic acid to form a paste, and perfumed with nitro benzol. The following is likewise said to be similar if not identical with the "Putz Pomade":

Levigated rottenstone	1 part.
Iron subcarbonate	3 "
Lard or olive oil	q. s.

To make the finished product the consistency of lard, perfume with oil of bitter almonds.

(69) F. S. P. asks: Suppose a very narrow pit 14,282 feet below the level of the sea or ocean, how much less than 30 pounds to the square inch would the atmosphere exert at the bottom of the pit? A. We have no records for so great a depth as this. The pressure is supposed to slightly increase in descending shafts about half a pound to 1,000 feet, which would make the pressure at such depth about 21 pounds to the square inch.

(70) E. K. says: I wish to use a fine metallic powder of iron and copper; could you advise me a cheap way to get it, in some quantity, possibly by grinding on emery wheels or else? The way of precipitation by hydrogen gas is too troublesome and expensive. A. A fine iron powder may be gathered in machine shops and foundries where much grinding is done with emery wheels. Copper powder may be obtained in the same way. We know of no trade in which copper is so ground.

(71) A. L. S. asks: Does it take more power to raise water out of a 100 ft. depth well with a 4 in. pipe than it does with an inch pipe, both pipes to have 2 in. cylinders at bottom of well? A. It takes less power by the difference in friction between the 4 in. pipe and the 1 in. pipe. With the small cylinder there will be no perceptible difference with a slow movement, the static pressure being the same in both pipes.

(72) E. B. H. says: I use considerable aluminum plate. My scraps I have not been able to remelt and roll out. I seem to destroy some properties of the metal in remelting. Anneal it as often as I will, it continues to crack or break in rolling Can you help me out? A. The melting of aluminum, if properly conducted, should yield good results. It fuses at about 700° C. In order to remelt aluminum scraps, a fusing mixture of common salt and potassium chloride must be employed, as the presence of other fluxes, such as borax, glass, etc., renders the metal very impure.

(73) W. H. H. asks: Can sperm oil be used again for lubricating purposes, after being used on an engine? A. Sperm oil that has been used on bearings is not suitable for reuse upon bearings or shafting, but is good for drilling or cutting threads, as bolts, nuts, etc., until entirely used up.

(74) A. P. L.—An ohm is a unit of electrical resistance which is equal to 330 feet of No. 9 iron wire (0·155 in. diameter). The term "mile ohm" means the weight in pounds of metal required to produce in a mile length of wire the resistance of one ohm.

(75) M. O. S. writes: During a heavy thunder storm which passed down the St. Lawrence, June 18, I noticed a somewhat strange phenomenon. While standing outside watching the progress of the storm, I saw a flash of lightning almost directly north at about 20 degrees from the horizon, followed by another and another, at, I may say, exactly the same elevation, flash succeeding flash, each one about 4 degrees due west from the preceding one. The whole succession of flashes extended from north to almost west, and from first to last occupied from 1½ to 2 minutes. It resembled exactly the flight of a firefly, the flashes occurring at about the same intervals which elapse between the flashes emitted by a firefly. What occasioned this form? A. Lightning takes the course of the least resistance. It is probable that the lightning followed a column of rarefied air, which remained undisturbed during the period of your observation.

(76) F. G. R. asks: Will you please tell me if I will be able to get anything that will be repelled by a magnet with the same power as soft iron will be attracted to it? A. Like poles of two magnets will repel each other with the greatest repellent force obtainable from magnets, but this force will not be equal to the attraction of either of the magnets for a piece of soft iron.

(77) J. H. T. asks for the most correct method of ascertaining the contents of a barrel or cask, the diameter of the head, the diameter at bung, and the length being given. You will see in Haswell's "Engineers' and Mechanics' Pocket Book," of the issue of 1878, page 102, an example thus: Diameter of head 17 inches, bung 19 inches, length 28 inches; volume, 7,689 cubic inches. Now, by what rule is this answer arrived at? I have figured it various ways, but cannot bring the answer as above. A. Find the mean diameter of the barrel, and the number of square inches in this curve, multiplied by the height of barrel in inches, will give the cubical contents. Owing to the difference in the forms of barrels and the different curves of the staves, it is impossible to make one rule for finding the mean diameter apply in all cases. We think the figures quoted are a misprint, as they do not correspond with our calculation; they are changed in a later edition, which gives rules for four varieties of casks.

(78) B. T. H. says: I have a portable gas machine, gas made from heavy oil passing over red hot retort, in use since 1856. The pipes from retort to gasometer have become partly filled with a thick tar. Can you suggest anything to pour in which will dissolve this tar? A. There is no practical or safe way of dissolving the tar out of the retort connections. Take them down and scrape them out. There should be a hydraulic main and a washer between the retorts and the gas holder, which will gather the surplus tar on a water surface and save the pipes from clogging.

(79) J. C. M. says: I have a parlor fountain, in which the water mixed with air runs through about 30 feet of glass tubing which gets very dirty, so we can't tell the difference between the bubbles of air or water (we use hydrant water). Can you inform me what to put in the water to clean the tubes and not hurt the zinc with which the tank is lined that feeds the fountain? A. Know of no better way than to take out the glass tubes and pour nitric acid through them. Fix the tubes so that the acid will run free. Make a little funnel of beeswax or paraffine around the top to enable you to pour the acid from a small bottle, catching it in a bottle at the bottom.

(80) C. P. asks for a receipt for a blue and white, for stamping on goods; one that will not rub off. A. The indelible blue coloring which is sometimes used consists of ultramarine mixed with burned linseed oil, ground together and printed on the white surface. It is practically the equivalent of blue printer's ink; the white coloring material which is similarly used consists essentially of white lead. The soluble colors which are applied are the simple ultramarine mixed with gum water, and likewise the dry white lead mixed with the same substance. The addition of a little potassium dichromate in the water added to the gum and then exposed to the light might possibly prevent its dissolving. Those who use these articles are very unwilling to give the formulas employed by them, claiming that they are trade secrets, for which they have paid money.

(81) J. D. P. asks: Who was the first person that invented a steamboat, and what part did George Fitch play in the steamboat world? A. There have been several claimants for the honor of being first in this field, and it is not quite clear how the credit should be divided; John, not George, Fitch built the first steamboat that was run in this country, making trips on the Delaware, above Philadelphia, in the summer of 1790.

(82) D. and R. ask for a receipt for coloring small tin articles different or various colors, by dipping them in some solution so as to give them a smooth, hard, and durable finish? A. There are no means of coloring tin except by lacquering and japanning. The latter is fully described in SCIENTIFIC AMERICAN SUPPLEMENT, 316, and for the former we would suggest that the articles be coated with some suitable metallic oxide or other coloring matter mixed with japan varnish and baked.

(83) J. D. F. says: 1. I have some old paint brushes which have become hard with paint; how can the paint be removed so as to make the brushes perfectly clean without injury to the bristles? A. To soften brushes that have become hard, soak them 24 hours in raw linseed oil and rinse them out in hot turpentine, repeating the process till clean; or wash them in hot soda and water and soft soap. 2. Can you tell me of something to put on awnings to prevent mildew? A. To remove mildew stains, mix well together two tablespoonfuls of soft soap, one of salt, two of powdered starch, and the juice of a lemon. Lay this mixture on both sides of the stain with a painter's brush, and then lay the articles on the grass, day and night, until the stain disappears.

(84) F. A. writes: I made a telephone as shown in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 142. The phones are made of ebony, and are perfect. Magnets are about as close as can be to the diaphragm. I cannot get them to work; like to know the cause. A. We cannot say where your trouble lies without knowing more of the details of the construction of the instrument. You do not say which kind of telephone you made. You may have a broken conductor. Your magnet may be closed by an iron armature. Your diaphragm may touch the end of the magnet. If you have used horse shoe magnets, see that like poles are in contact with the pole extension. See also that the pieces used to clamp the magnets together are not iron.

(85) J. H. asks how shoe polish is made, the quality used by street boot blacks? A. Day & Martin's celebrated English blacking consists of bone black in a state of powder mixed with sperm oil until the two are thoroughly incorporated. Sugar or molasses is then mixed with a small portion of vinegar and added to the mass. Sulphuric acid is next added, and when all effervescence has ceased, more vinegar is poured in until the mixture is of proper consistency. The formula for a French shoe dressing is given on page 355 of SCIENTIFIC AMERICAN for Dec. 8, 1883. On page 150 of SCIENTIFIC AMERICAN for March 10, 1883, several other formulas are given.

(86) H. P. asks: 1. How can mother-of pearl be bent and straightened after it is cut from the shell? A. Mother-of-pearl is generally used in small pieces and thin layers which are held in their position by japan varnish. (See page 5058, SCIENTIFIC AMERICAN SUPPLEMENT, No. 317.) In the compressed mother-of-pearl the shells are submitted to a strong heat, which separates them into thin scales; these are then pressed in the cylinders of a flattened roller, and afterward pounded in a mortar. It is then sifted to get rid of the dust, and the powder is treated with gelatine, and shaped in form. 2. How can bone and ivory be bleached without the direct action of the sun, for instance, by the use of some fluid? A. Hydrogen peroxide is used to bleach ivory and bone. See SCIENTIFIC AMERICAN SUPPLEMENT, 339.

(87) "Buttons" asks: Can you kindly inform me in your answers to correspondents. 1 What articles or tools are used by professionals in stamping on felt, canvas, or other goods for embroidering, marking, or braiding, etc.? 2. Where these articles or tools could be purchased? A. 1 and 2. The tools are few and simple; they cannot be purchased, and are made to order by the special individual using them from his own designs. 3 If there is any other way more practical and convenient for a lady to do her own stamping? If so, how? A. The process is not practicable or convenient for a lady to undertake; it would be far cheaper in every instance for her to purchase the stamped pattern rather than to undertake the preparation herself. Where a dealer can, by having special stamps cut for him, sell a large number of similar patterns, the price will be considerably less than if a single one were prepared.

(88) A. B. says: I am putting a steam furnace into my house to heat it, and wish to wrap the steam pipes with common building paper. Can I saturate or cover the paper with a cheap solution that will prevent the paper from taking fire with the steam at 10 pounds? A. There is no danger from wrapping the steam pipe with paper in a low pressure heating apparatus. Old carpet cut in strips, or listing, makes a very good felting for the inside or next the pipe. The paper should be put on loosely and tied with twine. You may fireproof the paper by dipping it in a strong solution of borax and sal ammoniac or alum.

(89) H. D. Q.—Probably the best battery for your use is the Bunsen bichromate or electropoin battery. It is moderately constant, and has a high electromotive force. For a motor to be used only occasionally, the plunging bichromate battery is best. For full description of batteries see SUPPLEMENT 157, 158, and 159. You will find small electric motors described in the back numbers of the SUPPLEMENT.

(90) R. F. says: I have some monthly roses in my yard, and I find that the ants eat the leaves, and are always on them. I have tried kerosene and milk diluted with water, but it appears to kill the leaves, and still it does not kill or drive away the ants. Can you give me a remedy? A. We do not know of anything better than to put a ring of soft tar around the stems of the rose plants near the ground. Shake off all the ants, and see that all other communication between the leaves and ground is cut off. Wet the surface of the tar ring occasionally with kerosene oil to keep the tar soft. Ants do not love tar rings. You may also poison them by feeding them with mutton tallow into which a little arsenic has been mixed.

(91) S. R. G. says: A dry piece of lumber, a foot square, will soak up a half pint of water, and swell a half inch in width. A duplicate piece may be saturated with oil until it will bend like leather, and yet it will shrink. Why is this? A. The theory is that the water, having an affinity for the particles or atoms of the fiber, penetrates and unites with it, causing the fibers to swell; whereas the oil only enters the pores and lubricates the spaces between the fibers, causing them to easily move upon each other, making the wood elastic, the oil having no affinity for union with the particles of the fiber.

(92) B. F. W. writes: I have an engine with cylinder 10x12, rated at 20 horse power (center crank), boiler 42 inches by 11 feet with 36 three inch tubes, steam pipe 2 inches, exhaust pipe 2 inches (all new); have not power enough to run a 50 inch saw so as to cut more than 4,000 feet per day. Engine seems to run free and easy with 20 to 30 pounds steam while running light machinery in a sash factory, but nearly chokes down while running through a log with a 50 inch saw with steam at 80 to 100 pounds. What should be done to increase the power? What size should the exhaust pipe be? A. The exhaust pipe should be 2½ inches and as short as possible. If there is ample supply of steam, you might increase the speed of the engine by changing some of the pulleys, and gain a little power. Really, the engine is too small for the saw.

(93) J. D. C. asks: Does the report of a cannon fired over the water where a person has been drowned, bring the body to the surface? If it does, can you explain upon what principle this takes place? A. The firing of cannon near the spot where the body of a person that has been drowned is supposed to be lying upon the bottom, has in some cases caused bodies to rise: sometimes it fails. It is supposed that bodies that are liable to rise upon the firing of cannon are almost in an equipoise upon the bottom, and the intense vibration of the air, and consequently the water, tends to slightly distend such parts of the viscera as may contain gases under slight pressure. In this way a very slight distention of confined gas would overcome the difference in gravity between the body and the water, and cause the body to rise.

(94) M. D. asks: 1. How can I temper my two inch auger? It is soft. A. Temper an auger, if it is of steel by heating in a charcoal fire, a full or cherry red, and dip in water. If it is hard by trial with a file, you may have to draw the temper to a dark straw or light blue. If it does not harden, it is probably iron that has been casehardened. Any blacksmith can recaseharden it. 2. Will beef cook tenderer under 100 pounds pressure to the square inch than it will in open kettle? Or will 200 steam pressure be better? A. Beef cooks tender under slight pressure with steam; one or two hundred pounds pressure will disintegrate it, and destroy its flavor. 3. Ought not a water pump to work, working cylinder 27 square inches surface on piston of low pressure cylinder, 3 pounds pressure to square inch, piston one inch square, working against 70 pounds pressure to the square inch? A. You have 81 pounds gross pressure upon your steam cylinder, against 70 pounds upon the water cylinder, only 10 pounds difference, which is not enough to overcome the friction; you should have 50 per cent more steam pressure, or about 4½ pounds.

(95) S. G. N. says: When turning shafting, one center has to be dug over, and quite frequently the shaft has to be straightened after it has been reversed in the lathe. Now, what is the cause of this? A. We think the trouble is with the hole in the spindle There are very few lathes that have the hole absolutely true; you turn up your center, as you think, perfectly true, take it out, harden it, and put it back in some other position, and although you may not observe upon the taper point that it is not running true, it may nevertheless be out one-sixty-fourth of an inch. Springing in hardening is also a cause of eccentric center The pressure of the dog might also cause eccentricity with a blunt center; in this case the shaft would not be round.

(96) C. W. W. asks: What amount of hydrogen can be obtained from one cubic foot of water, by passing its steam over red hot iron turnings in iron retorts? A. One cubic foot of water, theoretically, will produce about 1,400 cubic feet of hydrogen and 700 cubic feet of oxygen. 2. What amount of iron turnings will it take to absorb the oxygen of the cubic feet of water by passing the steam over them in the manner stated. This will require about 192 pounds of iron for its absorption. 3. What amount of heating surface will it take to convert the one cubic foot of water into steam in one hour? A. To convert a cubic foot of water into steam in one hour will require from 10 to 15 square feet boiler heating surface, according to conditions of pressure, etc.

(97) C. W. W. asks: 1. What is the lifting power of 1,000 cubic feet of hydrogen gas, made by passing steam through red hot iron turnings, and purified in lime? A. The lifting power of pure hydrogen gas is 71 pounds per thousand cubic feet. In practice, owing to diffusion through the pores of the balloon, this would be considerably reduced, say 25 per cent to 50 per cent. 2. Would a cast iron cylinder 8 inches in diameter, half an inch thick and 8 feet long, do for a generator? A. The cylinder suggested is rather thin. 3. What size steam boiler would be necessary for generating the steam? A. The size of the boiler must be estimated on the basis that 1 cubic foot of water will give 21 feet of hydrogen. 4. How often would the retort need recharging? A. Assuming that the retort would hold one-quarter of its internal volume of metallic iron in the form of borings, etc., one filling would yield about 3,000 cubic feet of hydrogen, if the iron was completely decomposed. 5. What amount of gas could be made in one hour? A. This depends on so many things that it is impossible to more than guess at it. Hydrogen is very troublesome to handle, on account of its diffusion.

(98) C. C. J. writes: I have a large number of India rubber articles, upon which I wish to put a firm, durable, white surface, as near an imitation of porcelain as possible, without being liable to crack or break off. The articles mentioned are for out door use, and must be weatherproof How shall I proceed? A. If the articles are of soft rubber, we do not think it possible to effect; if of hard rubber, it would be impossible to add a porcelain-like coating, for that would necessitate baking the articles, under which circumstances they would melt. We think therefore the most satisfactory thing to do would be first to apply some coloring substance in the way of a thin paint, and then finish by coating the objects with some of the best body wearing varnish.

(99) W. S.—Panclastite consists of about equal parts of carbon disulphide and hyponitric acid, and it is exploded by means of mercury fulminate or gunpowder.

(100) A. W. G. asks (1) how long it will take to let air out of a cylinder measuring 1 cubic foot, compressed to 300 pounds to the square inch? The hole to be an eighth of an inch in diameter. A. A rule for determining this will be found on page 891 of Clark's Rules and Tables for Engineers. 2. How is it that we don't see anything more about driving boats by pneumatic pressure? I've a boat partly made to be driven that way, but am afraid it will cost as much to compress the air as it would to furnish steam. A. Because there has been no economical success; the power developed from compressed air is often not more than about 40 per cent of that required for the compression.

(101) J. W. asks: How is the best piano polish made? A. We would recommend you to try the following: Very pale shellac 5 pounds, mastic 7 ounces, alcohol (90 per cent) 5 or 6 pints; dissolve in the cold with frequent stirring.

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

W. W.—The specimen is ordinary mica, and if the find runs like the sample it is of no value. Large sheets are frequently found, which can be used for stoves and the like; in such a condition it sometimes becomes worth as high as $10.00 per pound. The specimen also contains garnets.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

July 1, 1884,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Advertising rack, J. N. Akarman	301,318
Agricultural implement, combined, T. H. Meinhard	301,384
Air compressor and exhauster, P. Ehlers	301,348
Alarm lock, A. F. McCollam	301,252
Amalgamator, H. McDougall	301,253
Anæsthetic agents, apparatus for combining, A. M. Long	301,377
Annealing and galvanizing wire, apparatus for, E. Tucker, Jr.	301,184
Armor, metallic vest, G. Grebe	301,358
Axle lubricator, car, F. Brown	301,334
Axle, vehicle, Williams & Taylor	301,419
Bag fastener, W. C. Smith *et al*	301,294
Bale tie, L. Williams	301,312
Baling press, W. D. Slauson	301,398
Bar. See Chain bar.	
Barrels, bellows attachment for, H. B. Park	301,146
Battery. See Secondary battery.	
Bed bottom, adjustable spring, M. N Lovell	301,130
Beer cooling apparatus, L. Schlather	301,394
Bicycle, W. F. Healy	301,234
Bicycle, E. G. Latta	301,245
Billiard cue tip fastener, C. Scher	301,284
Bit brace, W. R. Clarkson	301,339
Bitters, G. Mitchell	301,385
Blackboard, reversible, J. H. Rudolph	301,392
Blind slat adjuster, R. M. Martin	301,453
Block. See Game or toy block. Pulley block.	
Board. See Blackboard.	
Boiler. See Steam boiler.	
Boiler furnace, A. Backus, Jr.	301,324
Book support, Dupin & Morris	301,345
Books and papers, machine for trimming, G. L. Cady	301,335
Books, wood binding for, J. D. Mets	301,255
Boot or shoe inner sole, A. G. Gardner	301,226
Bottle stopper, G. & W. H. Chamberlin	301,093
Bottle stopper, M. B. Manwaring	301,139
Bottles, material for packing, O. Long	301,250
Box. See File box. Mail box. Pounce box.	
Box fastener, H. Lorentz	301,135
Box machine, J. A. Paige	301,145
Brace. See Bit brack.	
Brake. See Car brake. Cornice brake.	