

S. A. R. asks: In making steam connections using the globe valve, which end of the valve should be placed next the steam pressure? A. It is generally placed so that the pressure is on top of the valve. Some engines, however, prefer to arrange it the other way, so as to be able to pack the stem under pressure.

J. H. H. asks: 1. What causes zinc to bubble and leave blow holes when poured into a plaster of Paris mold? A. It may be caused by impurities, or by insufficient vent in the mold. 2. What kind of anti-mony is used to harden zinc? I bought some, but it turned black and would not melt. A. You probably have a compound or an impure article. 3. I took a bottle and filled it with water, and then put in a cork with just enough lead on it to make it sink very slowly. I then connected a force pump to the bottle, supposing that when the pressure became great enough the cork would rise to the surface. I put 35 lbs. pressure on the bottle, but the cork stayed down. I then took off enough lead so that it would just float; then when the pressure was put on, the cork went down and would come up when I lessened the pressure. A. When the pressure was increased, the air in the cork was compressed, and sufficient water entered to make it sink. When the pressure was taken off, the air expanded and forced out the water.

H. S. H. asks: If a quantity of air be compressed to half its bulk, what pressure will it exert against the sides of a vessel? By what rule of proportion is the pressure governed? A. If the temperature is constantly during the compression, the pressure varies inversely as the 1/408th power of the volume.

T. W. M. asks: Can you tell me of a cheap and simple method of reproducing manuscript music? A. Write it of lithographic transfer paper, have it transferred to stone, and printed by a lithographer.

R. U. asks: How is phosphor bronze made, and what percentage of phosphorus does it contain? A. Phosphor bronze is made by adding a small portion of phosphorus to common bronze or gun metal. The latter is composed of 90 parts of copper, and 10 parts or less of tin. To this, from 6 to 10 per cent of phosphorus is added, to make phosphor bronze.

C. R. asks: How can I make French polish, and how should it be applied? A. Dissolve 1 1/2 ozs, shellac and 1/2 oz. sandarac in 1/2 pint naphtha. Wet a piece of flannel with polish, stretch a clean linen rag over the flannel, apply one drop of linseed oil to the linen, and rub in a circular direction.

P. H. B. asks: What kind of roof will a composition, said to be composed of French asphaltum, hydraulic cement, salt, coal, tar, and sand (of such consistence as to be easily spread with a plasterer's trowel upon paper felting) make? What is the difference between French and American asphaltum? What is and what are the uses of an oil called dead oil, said to be mixed with carbolic acid for disinfecting purposes? A. There is no asphalt called French asphaltum as distinguished in any peculiar quality from any other asphalt. The combination of ingredients specified by you is useless for the purpose indicated, as the salt would destroy its efficiency by continually attracting moisture from the atmosphere. Dead oil is the last that comes over in distillation, and is a fatty oil that is not likely to dry well in such a composition. A great deal of the material complained of is said to be put on by the purchaser, and unless properly laid is not likely to give satisfaction; cases have occurred, we are informed, where the material has been sent out with the plainest directions, and where, nevertheless, the preparation of felting, etc., has been laid with the upper side down, thus exposing to the weather a surface never intended and not prepared for it.

A. D. B. asks: Will copper wire, which is covered with cotton and then with beeswax, do for a primary coil? A. Two thicknesses of it may be used. 2. I have a coil which is too small, the covering of the wire of the primary of which is worn off in some places, and the secondary coil has been cut in several places. Can I mend the fine wire, and, with more added to it, use it for the one I wish to make? A. There is no reason why the wire should not answer when properly joined. 3. Is it necessary to put layers of oiled silk or other insulator between the layers, it being covered with cotton? A. The oiled silk will perfect the insulation.

A. A. W. asks: What kind of wood are gutters made of? A. Well seasoned pine is frequently used.

C. G. asks for a recipe for making furniture polish. A. Take pale raw linseed oil 10 ozs., lac varnish and wood spirit each 5 ozs. Mix well, and it is ready for use. This is a recipe for French polished wood.

C. R., and Mrs. G. W. P. ask: 1. How can I make a light gray color to color a brown wall so that it will stand the weather? A. Put a very little blue black in ordinary whitewash. 2. How can I make a dark brown color for the same purpose? 2. Use amber or ocher in whitewash, to the shade required.

A. H. W. G. asks for a recipe for turner's cement, for holding small articles in the lathe. A. Take Burgundy pitch 2 lbs., resin 2 lbs., yellow wax 2 ozs., dried whiting 2 lbs.; melt and mix.

D. E. R. asks: How can I put a fine polish on walnut in a very short time, say 3 hours? A. Melt 3 or 4 pieces of sandarac, each the size of a walnut, add 1 pint boiled oil, and boil together for 1 hour. While cooling, add 1 dram Venice turpentine, and if too thick, a little oil of turpentine also. Apply all over; and after a few hours, rub it off.

G. F. F. asks: What is the best thing to use in cleaning silver plated goods? A. Prepared chalk in cold water; apply with a plate brush, chamois leather, or soft woolen rag.

Mr. E. Kireersky, of Penza, Russia, and many other correspondents ask for further particulars as to burning brick with petroleum, described on p. 53 of our current volume. Will our "Old Subscriber" send us the details?

J. S. G. asks: 1. Has the exhaust steam of a high pressure engine ever been used as a source of power? A. Yes. In the compound engine, its expansive power is utilized. In other inventions, it is used to run a second cylinder with vapor of a liquid of a low boiling point. 2. How is a compound engine constructed? A. See pp. 116, 394, vol. 25.

C. R. McC. asks: I. Can water be raised and thrown with a hydraulic ram to 200 feet elevation and 1,500 feet distance through 1/2 pipe with a strong spring and 21 feet of fall from springhead to ram? Would such a situation afford a reasonable supply of water for a dwelling and barn, by using the most improved ram? A. You can make a good ram answer the purpose, if you have plenty of water in the spring. A manufacturer will give you instructions as to the proper size of pipes.

C. F. B. says: I have a room 14 x 15, heated by a stove, which I wish to ventilate by leading a register into an air passage between the boarding and plastering. Where should the register be put, at the top or bottom of the room? A. You should have two registers, one at the top and one at the bottom.

R. A. M. asks: Would it be practicable to plate steel pens with zinc, tin, or other metals, either by dipping them in the molten metal or by electricity? Would it prevent them corroding without injuring the temper? I have succeeded in tinning a few without injuring their writing qualities, with a common soldering iron, with the aid of muriate of zinc. A. Steel pens plated with different incorrodible metals are largely manufactured.

P. H. W. asks: 1. What is tin foil, such as is used for wrapping tobacco, composed of? A. An analysis of a piece of tobacco tin foil in our possession showed that it contained mostly tin with some lead. Seven other samples obtained from different sources had the same composition. 2. What are storm glasses, indicating changes in the atmosphere in advance of storm, wind, etc., filled with? A. See p. 123, vol. 29.

J. W. B. says: I. I wish to make a Ruhmkorff induction coil. I have 10,000 feet of No. 32 silk covered wire for the secondary coil. Of what size and length of wire should the primary coil be? A. Forty feet No. 12 copper wire, silk-covered and varnished with shellac in alcohol. 2. What should be the diameter of the iron core? What should be the length of the coil? A. A bundle, 1 inch in diameter and 1 foot long, of No. 16 soft iron wire. 3. What amount of surface should the condenser have? Are tin foil and paper the best to make it of? A. 50 square feet of tin foil and 50 square feet of paper soaked in melted paraffin is the best known. 4. What is the best material for the ends of the coil? A. Glass or hard rubber. 5. About what length of spark will I be able to get from a coil of that size? A. If carefully drawn, pure copper wire is used well insulated with paraffin or shellac, you will get a spark 1 inch through air, with two cells of Grove's battery. 6. What is used for polishing black rubber with? A. French polish. 7. Do you think I could make a Ruhmkorff on this plan, without loss of power or other defects? A. Yes; it is better to have less metal around the secondary coil. 8. What book on electricity and magnetism do you think the best? A. Noad's is a good work.

W. H. B. asks: Is there any quick way of finding the number of diameters which a small compound microscope will magnify? A. For scientific purposes, it is generally determined experimentally by means of a micrometer. If you can find the foot of the object glass and the eyepiece, the magnifying power of each can be determined approximately by dividing 10 by the focal distance. The magnifying power of the microscope is equal to the product of the two magnifying powers so found.

M. M. S. asks: 1. What load will a thin-bell skinned wagon bear, with 4 inch spindles, the wheels being three feet and one half in height? A. We are not familiar with wagons of that kind. 2. What is the largest sized cube that can be cut from a globe whose diameter is 12 inches? A. One having a face about 6.93 inches square. The rule is to multiply the radius of the sphere by 1.516, to find an edge of the cube. It is given in nearly every work on mensuration.

M. & S. ask: What is best to use on chills to prevent blowing? A. You do not send sufficient details to enable us to give you any information. Matters of this kind are best learned by experience. They may be considered secrets, akin to the secret of Ogle, who was asked how he mixed his colors, and replied "with brains." We have seen it stated, however, that it is a good plan to cover the mold with a mixture of red lead and oil.

L. T. W. asks: 1. Will you give me the formula for ascertaining the number of square inches of heating surface in cylinder and flue boilers? A. Heating surface of cylinder boiler in square feet = 8.1416 x radius in feet x length. Heating surface of flue boiler in square feet = 8.1416 x radius of shell in feet x length in feet + 8.1416 x twice the number of flues x radius of flues in feet x length of flues in feet. 2. How do you estimate the horse power of a boiler, either cylinder or flue? A. We can give you no definite rule. 3. How can I compute the area in square inches of a square fire box? A. The area is equal to the product of the length and breadth, supposing the surface to be flattened out. 4. How many horse power would vacuum add to an engine, or, in other words, if a high pressure be converted into a low pressure engine, how would you estimate the added horse power? A. It would increase the mean pressure in a certain ratio, and the horse power in the same ratio, other conditions being the same.

J. B. asks: Can a concavo-convex lens, 1 1/2 inches in diameter, be made to throw a focus 1/2 inch in diameter at a distance of 48 inches? A. The focal image of a star is a bright point. The diameter of the image compared with that of the object is proportional to their respective distances from the lens, if aplanatic.

A. S. says: 1. We put steam from a small engine into a tank for supplying the boilers, likewise the steam from pump at boilers; we use olive oil for lubricating. Will it hurt our boilers or cause them to scale? We use terra japonica as a boiler purge, and find it very effective in removing scale. A. The oil will not injure the boilers, unless you use a very large quantity. 2. When you speak of heating surface (in calculating horse power), do you mean all the parts exposed to the action of the fire or heat, such as the tubes, back end of boiler, and all below the brick work? A. All this surface is ordinarily counted. Some persons, however, do not estimate all. 3. Is there any means of finding where there is water for a well without digging for it? A. If the soil is not rocky, you can make borings with very little trouble. 4. Does a broad belt on a pulley cause more friction if only the same weight be applied, as a narrow one? A. No. 5. What is the best material for preserving belts and keeping them in working condition? A. Castor oil is often recommended.

E. S. W. asks: What is the amount of resistance per foot of cross section to a body moving in the air at a given rate, say 100 feet per second? When the velocity is equal to that at which air will flow into a vacuum, is the resistance equal to our atmosphere? Does much depend upon the shape of the body? What reliable experiments have been made, and where can the results be found? A. Experiments on this subject are far from complete. A resume of the most important is given in the Encyclopaedia Britannica, and the rule is deduced that the resistance of the air to the motion of a plane surface, in grains per square foot, is equal to 16 times the square of the velocity in feet per second. A sphere does not encounter more than one fourth the resistance that would be opposed to the motion of a plane surface with the same cross section.

P. O. T. asks: How can I estimate the amount of tannic acid in bark, leaves, and roots of different kinds? A. By precipitating the tannin with protochloride of tin mixed with chloride of ammonia, and measuring the precipitate.

L. W. E. asks: How many gallons of water are required, per horse power, to run a small engine for a day? A. From 50 to 75 gallons per day of 10 hours.

C. G. C. says: I am running an eight horse engine with coal. The furnace has a poor draft; would the pipe referred to in a recent issue of your paper, to throw steam direct from boiler to stack, be of any use? We run the engine all the time, and exhaust into the stack. Would it be of any use to reduce the size of the exhaust nozzle? It is large, I think 1 1/2 inches in diameter. How small shall we make it? A. Generally, the exhaust can be arranged to make enough draft.

G. E. S. asks: Will a tin boiler, 2 feet long and 18 inches in diameter, be large enough and strong enough to run an engine cylinder 5 inches stroke and 3 inches diameter, at 80 revolutions per minute? A. Yes.

J. T. and others: Foaming in boilers is especially caused by impurities in the water, insufficient steam room, and too heavy firing.

W. S. W. says: 1. In your issue of March 14, the statement is made that the combustion of 1 lb. of coal in one minute is productive of a force equal to the work of 300 horse power during the same time. A. The work represented by 300 horse power is the same as that required to raise 9,900,000 lbs. 1 foot high in a minute. Now every unit of heat produced by the combustion of coal, if it could be converted into work, would be capable of raising 772 lbs. 1 foot high, so that the number of units of heat required for the production of 300 horse power would be about 13,000 a minute; and the total heat of combustion of ordinary coal exceeds this. 2. Have not theory and practice shown us that 2 1/2 lbs. consumption of coal to the horse power per hour is a very favorable result? A. The large ocean steamers at present consume about 2 1/2 lbs. of coal per hour per horse power. Better results are obtained in some cases.

W. W. B. asks: 1. Will a gun with a long barrel shoot straighter than one with a short one? A. Other things being equal, probably one will shoot with as much precision as the other. 2. What was the name of the first newspaper printed in the world, and where was it published? A. The first periodical newspaper whose existence is not disputed; was published at London, May 22, 1622, by Nicholas Bourne and Thomas Archer. It was called The Weekly News. 3. Where was the first balloon voyage made, and who made it? A. At Paris, November 21, 1783, by Pilatre de Rozier, and the Marquis d'Arlandes. 4. How much does the atmosphere surrounding the earth weigh? A. About 11,000,000,000,000,000 lbs.

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 Theory of the Sense of Smell. By D. E. G.
On laying out Teeth of Gears. By H. I. C.
On a Museum of Natural History. By J. G. L.
On the Cause of the Tides. By W. M. D.
On Steam on the Southern Rivers. By G. W. S.
On Drying Lumber. By H. R. T.
On a Boiler Explosion. By A.
On Using Old Tin Cans. By J. P.
On Hydrogen. By V. P.
On Modern Telegraphy. By G. L.
On the Keely Motor. By D. D. P.

Also enquiries and answers from the following:

- C. W. Y.—D. E. G.—J. T. B.—C. W. B.—H. G. H.—W. W. H.—R. H.
Correspondents whose inquiries fall 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.
Correspondents in different parts of the country ask: Who makes ax helves and similar wooden articles? Who sells electric gas-lighting apparatus? Who makes cotton seed hullers and linters? Who makes a wood engraver's ruling machine? Makers of the above articles will probably promote their interests by advertising, in reply, in the SCIENTIFIC AMERICAN.
Several correspondents request us to publish replies to their enquiries about the patentability of their inventions, etc. Such enquiries will only be answered by letter, and the parties should give their addresses.
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

April 14, 1874,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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