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George R. Barker's Heating and Ventilating Apparatue, illustrated in this paper Feb. 14, may be seen in operation at the Franklin Institute, Seventh Street above Chestnut, Philadelphia, Pa.

E. F. Thomas, Brooklin, Ontario, Canada wants to know where he can obtain a list of all the Carpenters in the United States.

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W. H. N. will find directions for hardening steel tools on p. 75, vol. 28. Steel points are sometimes used for scratching glass.—H. E. B. and L. C. F. will find directions for producing a polish on shirt fronts etc., on p. 114, vol. 24.—C. L. C. can make tracing paper by the process described on p. 241, vol. 28.-E. will flud practical directions for constructing and fixing light-ning rods on ip. 248, vol. 26. Read Noad's "Student's Manual of Electricity."—S. L. S. will find directions for preserving crayon drawings on p. 53, vol. 27. As to the other question, apply to a stationer.—C.D.will find explanations of sirup turning tea black on p. 171, vol. 80.— C.H. will find a recipe for a cement for glass letters on p vol. 27.-H. P. S. will find descriptions of magnets on p. 41,26,vol. 24.—D. W.S. will find directions, for coating from with copper without a battery on p. 155, vol. 26.—J. McE. can try to temper saw blades for cutting iron by follow can try to temper saw obaces for cutting iron by following the instructions on p. 16, vol. 24.—D. S. will find recipes for all kinds of solder on p. 251, vol. 28. Walnut wood can be stained by the process described on p. 314, vol. 25. Browning gun barrels is fully detailed on pp. 154, 266, vol. 28.—E.A. C. will find instructions for skel. etonizingleaves on p. 267, vol. 25, and for stuffing birds and other animals on p. 362, vol. 27.—F. R. B. should consult our advertising columns for booksellers' addresses.—A. S. H. will find a recipe for waterproof glue on p. 202, vol. 28.—M. A. H. is informed that the difference between 12 inches square and 12 square inches is 132 square inches .- A. B. D. will find explanations of the mock sun phenomena on pp. 132,171, vol. 28.—L. C. will find directions for cleaning inking rollers on p.348, vol. 26.—F. P. D. will find a recipe for black finish on optical instruments on this page.—N. B.D. and Q.H.B. will find directions for waterproofing canvas on p. 122, vol. 27.-E. A. R. will find a recipeforfine blacking on p. 73, vol. -G. W. C. should apply to a maker of smery wheels -P. K. will find a recipe for bronze dip on p. 58, vol. 26.
-J. R. C. and J. K. M. will find the needed particulars of the Australian fever tree on p. 103, vol. 30.—J. N.1s informed that we have no record of any finer spinning than the one he mentions.

C. P. T. says: I have a steam boiler of 100 horse power, with pipes from cistern 10 feet, deep dou-ble valve in pump, check valve near boiler, and direct valve between check and boiler. I find that, after atonping every night, if the direct valve is not closed, the boiler will fill itself full of water. Will you please tell me the cause? A. The steam in the boiler condenses and a vacuum being formed, the water is drawn up. Leave a gage cock open at night, if it is not convenient to close the direct valve.

G. W. L. asks: What is the difference been coal and wood in the amount of steam furnished? A. A tun of coal is supposed to be equal to 1% cords of good wood. As regards the steaming capacity, it will depend considerably on the construction of the furnace So far as we know, the boiler mentioned is a fair speci-Sen of the sectional variety.

W. asks: In what manner does the mode of propelling boats, described in your issue of January 24 as the invention of Mr. J. T. Bowman, of Texas, dif fer from that tried in the British navy, and which was so highly thought of by the late Admiral Farragut? It was applied, if I remember rightly, to a boat named the Waterwitch, and in principle, as I think, was the same method as Mr. Bowman's. A. Judging from the description, Mr. Bowman's plantonly differs, from that fit ted in the Waterwitch, by having three openings for the discharge of water instead of two, a difference which is probably unimportant.

G. S.G. asks: Does the steamboat law compel me to have a registering steam gage, lock valve, life preservers, axes, hose, and all the other appliances, and licenses for engineer and captain, on a small steam launch 21 feet long, used on a river? I claim that a boat too small to register, used only for the owner's pleasure, is not expected to comply with the law. Am I correct? A. We think that you are right.

A. C. asks: 1. How large and how long a stroke, and what size bore would be the best proportions for a small slide valve engine for a boiler 18 inches in length x 14 inches in diameter, with 5 two inch flues, made of iron of sufficient strength to stand a working pressure of 50 lbs. to the square inch? The sides of the furnace are sheet from tanks, so that the feed water will be boiling hot when injected. What horse power would ithave at 15 revolutions per minute? A. You can make a evlinder about 4 inches diameter and of 6 inches stroke and under the conditions mentioned, it will develope about 3-16 of a horse power. 2. I have heard it stated that the mouth of the Mississippi river was actually 300 feet higher than its source, the centrifugal motion of the earth's rotation forcing the water towards the equator. Is this so? A. The mouth of the Mississippi is further from the geographical center of the earth than the source is, so that in this aspect the river runs up hill. The mouth, however, is below the surface of ouilibrium due to the rotation of the earth, so that the water flows from the source to the mouth, to fill up to the proper level.

N. C. O. asks: If a boat with enormous paddle wheels were anchored in a strong stream, would not aforesaid stream put the paddles and some machinery in motion? Is this an old idea, or worth a patent?

A. The device is very old. See p. 229, vol. 29.

W. J. asks: 1. Why is it that a forked witch, held with crotch up, will in the hands of some persons turn down in crossing certain places, while with others it will not turn? A. It will not do it. 2. Is there any means or instrument by which one can tell without digging where there is a vein of water in the earth? A. No.

F. A. R. says: On p. 28, vol. 30, I saw a recipe for making a deep black ink. Se I procured the ar ticles as named, but could not get the Aleppo galls. I got instead nut galls, the same quantity, but the ink is not so black as expected. Would a larger quantity of the same be necessary, or will they not answer the purpose at all? A. The percentage of tannic acid, which is the substance contained in nut galls that is essential to making ink, varies in nut galls, and those you obtained are probably inferior to Aleppo galls. But a larger quantity ought in this case to yield more tannic

J.H.G.asks: What are the chemical symbols for the following: Lard, white wax, camphor, borax alkanet root, rose oil, heliotrope oil, orange flower ofl? A. Lard consists of olein  $C_{114}$   $H_{104}$   $O_{12}$ , margarin  $C_{108}$   $H_{104}$   $O_{12}$ , and stearin,  $C_{114}$   $H_{110}$   $O_{12}$ . White wax: C<sub>108</sub> H<sub>108</sub> O<sub>4</sub>. Borneo camphor: C<sub>20</sub> H<sub>18</sub> O<sub>2</sub>. Laurel camphor:  $C_{20}$   $H_{16}$   $O_2$ . Borax: NaO,  $2BO_3+10HO$ . Alkanet root, rose oil, heliotrope oil, and orange flower oil are each composed of a number of substances, and have no chemcal formulæ of their own.

J. H. C. asks: Will you tell me how to preoare bones to make charcoal, suitable for sugar refiners filters, etc. > A. The bones are treated with sulphide of carbon, which dissolves the fat to the amount of 5 or 6 per cent of the weight of the bones. This fat may be recovered from the sulphide of carbon, and the latter used over again.

E.G. A. asks: 1. How can I make a silver solution for plating with a galvanic battery? A. Dissolve 2 parts of cyanide of silver and 3 parts of cyanide of potassium in 250 parts of water. 2. What length of time should a watch case be left in the solution to re ceive a coating sufficient to wear for two years? A.
The time depends upon the strength of the galvanic current. 3. How should the wire be connected with the battery and the article to be plated? A. The watch is to be connected with the zinc plate by a wire dipping into the solution, and opposite to it a small strip of silver connected with the carbon plate.

J. E. H. says: I have been trying to make a flexible non-elastic airtight bag to hold 15 or 20 lbs. pressure to the square inch. I made a bag of strong, closely woven cotton, putting the seams together with rubber cement, and then coated it 2 or 3 times with pure rubber dissolved in naphtha, but it was not entirely satisfactory. 1. Is rubber perfectly impervious to air?

A. No. 2. How thick do you think the rubber ought to be to hold 20 lbs. pressure, provided the stuff is strong enough to keep it from bursting? It is very desirable to have itas light as possible. A. One twelfth of an inch of pure rubber. 3. Is there any composition that would serve the purpose better? A. No. 4. Would the heat or perspiration of the body have any effect on rubber in the course of time? A. Probably it would.

W L C asks Will kerosene oil dissolv or soften the ordinary rubber packing after any length of time? A. It probably will.

A. asks: 1. In the present theory, is light considered a non-elastic fluid? A. Light is supposed to be a wave-like motion of a subtle elastic substance which fills all space, termed ether. 2. What is the best way to remove superfluous hair? A. By pulling. S. Can it be permanently removed? A. Yes. by the application of substances that will burn or remove the hairy surface of the skin.

T. L. S. asks: How can I make a wash or paste which I could dip dried beef into, to keep it from the air and files? It must be something that will not injure the meat for eating, and that will not dissolve by moisture or slight heat, and that will not crack off. A. Try immersing the beef for a very short time in a bath of melted parafin,

F. G. K. asks: What is the cause of the variation of the sun's rays as they strike any meridian? Why is the sun not in a plane with the meridian at 12 o'clock noon at all times in the year? A. The difference is caused by the eccentricity of the earth's orbit, the obliquity of the ecliptic, and the perturbations due to the moon and planets. For the Nautical Almanac, write to UnitedStates Observatory, Washington, D. C.

I. R. M. says: I have found quite a difference in the weights of hard burned and soft burned bricks, the hard burned bricks being the heavier. is this? A. They have probably taken up more foreign matter from the fire to which they were exposed.

S. S. F. asks: Can a hole be made through pane of glass by means of the sand blast, without breaking the glass? A. Yes.

A. S. asks: 1. How can I make models for small castings? A. Use fine sand or plaster of Paris. 2. How can I prepare a metal that will polish and can be melted over a charcoal fire? A. Brass composition will

C. Bros. ask: What is the matter with our iler? We have a 45 flue boiler, 14 feet long, running a boiler? 30 horse power engine. Having been in use some eight years, we recently took out all the flues, and cleaned and replaced them, washing out the boiler with soft soap and water, and, as we supposed, thoroughly clean-ing it with clear water. When we fired up again, we had little trouble in raising steam tor 4 days, when we were unable to raise over 24 lbs., the engine not running; and on opening throttle, it immediately all vanished. All this time we had a heavy coal fire under boiler. Will foaming in boiler cause this difficulty? Is It impossible to raise much steam from some kinds of water? A. It may be that the soap was not removed, andformed a scale. If this bethe case, by blowing outa considerable quantity of water twice a day, you may remedy the trouble. You will understand that this is only a surmise on our part, and we think it would be better for you to refer the matter to a reliable engineer who can make an examination.

G. U. asks: How are boxwood rules and steel standards marked? By what mechanical means is the accuracy obtained? A. They are graduated by means of a dividing engine, the divisions being made with a suitable tool.

W. J. says: On p. 123, vol. 30: "Is there any instrument that will detect the presence of a metal in the earth?" You answer: No. I think you are mistaken, or at least a gentleman in this county professes to find lead, silver, and gold with an instrument. A. We are sware that there are individuals who profess the possession of such instruments. The presence of iron ore beneaththe ground may in some cases be detected by the seof the magnetic needle. But as for gold, silver, lead, and other metals, no instrument capable of indicating their presence is known to science

J. P. asks: What is the best pump for a well of 40 feet depth? Will a chain pump answer for that depth? A. Yes.

C. R. asks: What is hydrochlorate of ani-line? A. It is made by combining aniline with muriatic acid. Your specimen did not come to hand.

W. G. asks: I. What is the elastic hand tamp made of? A. Rubber. 2. Is there a book published on all kinds of dyeing, weaving, and dressing cloth? A. You will find such books described in the eatalogue of a scientific publisher. 3. Is there a journal on woolen machinery and manufacturing of wool, etc.? A. No. 4. I have a circular saw for sawing logs 44 inches in dismeter and running 450 revolutions per minute, from a40 inch double turbine water wheel, under 12 feet head and fall. I contend that, if I double the revolutions per minute of the saw, I shall double its force. Doyou thinkthat I shall gain any power? If so, how much? A. If the wheel is powerful enough, these sawshould do double the work under these circumstances. 5. A schoolmaster took thin writing paper and dipped it into a yellow liquid; he placed a card with a picture on its surface against the saturated writing paper, and then put them between a couple of panes of windowglass, and placed the whole in the sunbeams. In a few minutes, the picture was beautifully copied on the yellow paper. What was the liquid? A. A solution of bichromate or potash, probably.

H. L. G. asks: 1. How can I construct a cheap electrical machine? A. By using a large glass bottle for the cylinder of the machine, and coating the prime conductor with tin foil. 2. How are the batteries used by physicians made? A. Some are made of plates of zinc and carbon immersed in dilute sulphuric

J. B. asks: What will be the result of the constant meteoric accumulations on the surface of the earth? The weight and bulk of our planets are being constantly increased, and if things go on as at present the doubling of the earth's weight and bulk is only a question of time. A. The moon would fall to the earth and the earth reach the sun in a shorter time. Mr. Proctor estimates the earth's present supply of meteorites at one inch in depth in 400,000 years.

A. asks: 1. Can you give me a plan for constructing a cheap telescope, consisting of two dou bleconvex lenses with a power of 86 times, without using an achromatic lens? Could I use a double con vex lens. 5 inches in diameter with a focus of 72 inches and aneyeglass 1 inch in diameter with a focus of 2 inch es? A. Cheap telescope tubes may be made in four ways: 1. By rolling pasteboard, covered with paste or glue.ona wooden mandrel; remove to dry, and varnish insideand out. 2. By gluing together wooden strips an inch wide overhoops. 8. Rolltightly, with glue upon a mandrel, strips of second quality veneering. Each layer must be kept in place, as glued, by a cover of canvas strapped very tight. 4. Use sheet or tinned iron, the best method. The fittings for the object glass cell and eyeplece tube are turned brass castings. A six inch crown lens was used by Zöllner for observing solar protuberauces. For other objects, such a lens cannot e used to advantage.

O. says: What are the astronomical names and probable distances from our globe of three fixed stars, familiarly called the triple twins? They arrive over the meridian line at about 8 o'clock P. M., and about 45° above horizon, preserving equal distance apart and in a right line. A. The three stars you mention are Delta, Epsilon, and Zeta, in the belt of Orion. They are about the second magnitude; Delta and Epsiton are double stars, while Zeta is triple.

C. A. C. asks: 1. Can alcohol be frozen? A. Alcohol has never been frozen, though, when cooled to atemperature of 166° below zero, it becomes viscid. 2. Is there any premium offered by any government or exposition for a varnish that will prevent wire from rust ingand will not crack off while being bent? A. We neverheard of such a reward.

 $G.\ R.\ E.\ asks:\ Is there anything that\ I can throw into a privy vault that will remove the offensiveness? I would like to use the soil as manure. If the$ upper part is filled with dry earth, would it settle and answer the purpose? A. The dry earth would fill up the well, but would be offensive. Copperas  $\pi$  lixed with half its weight of lime would perhaps answer your purpose of removing the odor and permitting the product to be afterwards used as a manure.