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Reliable 2d hand Engines, Boilers, etc., Cheap. Illustrated circulars free. E. E. Roberts, 52 Broadway, N. Y.

The Universal Hand Planer is recommended in most favorable terms by all using them. Saves its cost in files and time of workman in a short time. Attached to any vise. Jacob E. Sutterlin, Manufacturer, 60 Duane Street, New York.

For Leather Manufacturers—Rights for Sale of a new patent process of Coloring Leather: most delicate colors; from 1c. per skin up. For particulars address John Koppitz, 1 Studley Pl., Boston, Mass.

Wanted—Applications for Specimen Copies of The Manufacturer and Builder. The cheapest Mechanical and Scientific Journal in the world. \$2 a year; \$1 6mos. Address Austin Black, Sec'y, 37 Park Row, N. Y.

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For the best Small Portable Engine in market, address Peter Walrath, Chittanooga, N. Y.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro., 414 Water St., N. Y.

Rue's "Little Giant" Injectors, Cheapest and Best Boiler Feeder in the market. W. L. Chase & Co., 93, 95, 97 Liberty Street, New York.

Flour, Feed, Paint, Ink, and all other kinds of Mills. Ross Bro's, Williamsburgh, N. Y.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

Parties needing estimates for Machinery of any kind, call on, or address, W. L. Chase & Co., 93, 95, 97 Liberty Street, New York.

Iron Steam Boxes for Stave Bolts & Veneer Cutting Machines. T. R. Bailey & Vail, Lockport, N. Y.

Boul's Unrivaled Paneling, Variety Molding and Dovetailing Machine. Manufactured by Battle Creek Machinery Company, Battle Creek, Mich.

Buy Gear's Improved Balanced Jig Saw, Boston, Mass.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., or lithograph, etc.

For Bolt Forging Machines, Bolt Holding Vises to upset by hand. J. R. Abbe, Manchester, N. H.

Small Tools and Gear Wheels for Models. List free. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

Brass Gear Wheels, for models, &c., made to order, by D. Gilbert & Son, 212 Chester St., Phila., Pa.

All Fruit-can Tools, Ferracute, Bridgeton, N. J.

Dean's Steam Pumps, for all purposes; Engines, Boilers, Iron and Wood Working Machinery of all descriptions. W. L. Chase & Co., 93, 95, 97 Liberty Street, New York.

Lathes, Planers, Drills, Milling and Index Machines. Geo. S. Lincoln & Co., Hartford, Conn.

For Solid Emery Wheels and Machinery, send to the Union Stone Co., Boston, Mass., for circular.

For best Presses, Dies and Fruit Can Tools, Bliss & Williams, cor. of Plymouth & Jay, Brooklyn, N. Y.

Hydraulic Presses and Jacks, new and second hand. E. Lyon, 470 Grand Street, New York.

Damper Regulators and Gage Cocks—For the best, address Murrill & Keizer, Baltimore, Md.

Steam Fire Engines, R. J. Gould, Newark, N. J.

Peck's Patent Drop Press. For circulars, address M. Peck & Co., New Haven, Conn.



We are obliged to J. H. W. for his explanation of the degrees of proof of alcoholic spirit, but the subject is exhausted.—U. U. should consult a maker of hay presses.—F. R. & S. can harden iron mold boards by the processes of case hardening described on p. 362, vol. 25.—T. O. M. will find a good recipe for paste on p. 280, vol. 28. Shaving with pumice stone is described on pp. 149, 180, 231, vol. 26.

T. H. G. asks: When is it winter in Patagonia (Cape Horn) and when is it midwinter there? A. Winter commences on the 21st of June, and it is midwinter in the month of August.

G. M. asks: 1. If a vessel containing 5 cubic feet of compressed air be placed inside of another vessel of 20 cubic feet capacity, and the compressed air be very gradually let into this vessel, with a proper means of escape to prevent an increase of pressure, could a person breathe inside the large vessel? If so, how long would the compressed air supply the necessary amount of air for respiration, the air being compressed to 200 lbs. per square inch? 2. How is gas of ammonia made? A. 1. A person making 15 respirations in a minute would require, under ordinary circumstances, 45 x 15 = 645 cubic inches of air. The inner vessel would contain 200 x 15 x 5 x 1728 = 115,200 cubic inches of air at ordinary pressure. Hence the air would support respiration for 115,200 ÷ 645 = 178 2/3 minutes. 2. Put equal weights of quicklime and sal ammoniac, powdered and intimately mixed, in a retort; gently heat it, and an abundance of pure ammonia gas will be given off. An ounce of sal ammoniac will yield about 380 cubic inches of the gas.

C. E. G. asks: How are we to reconcile the conclusions of scientific men in regard to the strength of iron at extremes of temperature? Common observation shows iron to be stronger at a temperature of from 75° to 90° Fah. than at from 25° to 35° below zero. I went to work on a very cold day; the thermometer showed 38° below zero; in attempting to drive a mill dog with a mallet, I broke the dog in two places. The iron showed clean breaks. The rod was one inch square at one break, and 3/4 inch round at the other, parting in both places at the same blow. I tried another dog and struck it into the log with my hand covered by a buckskin mitten. This dog also broke where it was 3/4 inch in diameter. Thinking it dangerous to try to run the saw, we thought we would try to get some stones and ice from the tall race that obstructed the water. I took a common crowbar; and getting a short bite under a stone frozen in, I sprung the bar with my left, and the bar broke about 6 inches from the fulcrum, showing a perfectly clean break of 1 1/2 inches square iron. Thinking the laws of cohesion had suspended for a time, we suspended operations until a warmer day. This and the facts shown by R. H. Thurston are a paradox. A. The following conclusions, as stated by Professor Thurston in his paper on the "Molecular Changes Produced in Iron by Variations of Temperature," will probably make this matter plain. "10. That the general effect of increase or decrease of temperature is, in solid bodies, to increase their power of resistance to rupture, or to change of form, and their capability of sustaining 'dead' loads. 11. That the general effect of change of temperature is to produce change of ductility, and consequently, change of resilience and power of resisting shocks and of carrying live loads. This change is opposite in direction, and usually greater in degree than the variation simultaneously occurring in tenacity. The practical result of the whole investigation is that iron and copper, and probably other metals, do not lose their power of sustaining 'dead' loads at low temperatures, but they do lose, to a very serious extent, their power of sustaining shocks or resisting sharp blows."

J. M. McG. asks: Will you give me a good plan for steaming and bending plow handles, etc.? What pressure of steam should be used, and how long should they remain in it? Is there anything that, if put in the water, will facilitate the softening of the wood? 2. Why were all the American quarter and halves of dollars stamped in the year 1853 stamped with an imitation of the sun's rays on the eagle side, and none before or since? A. 1. The steam chest for bending timber is commonly made of wood, and connected with the boiler. It is the exposure to the heat of the steam that softens the wood, and probably nothing put into the water will hasten the process. It does not make much difference what pressure of steam is maintained. After the pieces are softened, they are bent to shape, and then, being secured in that position, are placed again in the steam chest, to take a set. 2. Probably because this suited the designer at that period.

C. C. S. asks: 1. What is the length of the Mississippi river from Cairo to New Orleans? 2. What is the speed of the current per hour between these two places? 3. We wish to start from Cairo and go to New Orleans in a small boat. Do you think this is feasible? If not, why? 4. Would the wind aid us in sailing? 5. What size and kind of a boat would you advise us to build? 6. Do you know of any good book describing the Mississippi? A. 1. 1,040 miles. 2. At high water, the velocity is about 2 1/2 miles per hour; at low water, between 1 1/2 and 2 miles per hour; mean velocity for mean water, 2 1/2 miles per hour. 3. Yes. 5. Probably it will be best to build a cat-rigged center board boat, from 18 to 20 feet long. 6. There are numerous guide books of the Mississippi, which doubtless contain much that would be interesting and useful to you on your voyage.

C. M. B. asks: 1. What is decalcomania, and how do you "decalc" any thing? 2. Is there any remedy for that every day annoyance, a bad cold in the throat? A. 1. There are various methods of decalcomania or transferring of pictures. The finest is to transfer the pictures on wood. Paper pictures for this purpose are now sold by the stationers. A varnish is applied to the picture only, and it is then pressed on the wood. When dry the paper is dampened and rubbed off with the fingers, leaving the picture on the wood. 2. The way to prevent taking cold is to keep the feet always warm and dry, the chest well protected and to eat plenty of nourishing food. The remedies that have been prescribed for sore throat would fill too much space to be inserted here. Gargling with strong sal-

water is a good remedy, if used the moment a sensation of soreness is perceived. Singers should wrap the throat up after exercise when going out into the cold air, but at other times the throat should not be too much covered, so as to harden it to the weather. Growing beards is said to be a good preventive against colds in the throat for those who have them to grow.

S. W. asks: How can I run a small bellows without using my hand? A. You might arrange a motion to be worked by your foot.

R. B. S. asks: 1. How can I make a battery that I can silver plate with? Would an ordinary local battery, such as is used in telegraph offices, do? 2. Can you inform me how to clean and polish shells of various kinds? 3. I have tried to make a Hero's fountain, but have not succeeded very well. Suppose I have two tanks, each one holding five gallons, what size should the inside of the tubes connecting them together be? Are all the tubes to be the same size? What height should the top tank be above the top of the other? A. 1. We think such a battery would answer very well. 2. See p. 132, vol. 27, and use friction for giving a fine polish. 3. Inside diameter of tubes, about one quarter of an inch. All the tubes can be the same size except that you should contract the opening for the jet. Height of upper vessel below bottom one is regulated by the height of jet required. From 4 to 5 feet would do very well.

W. P. asks: What is an average analysis of coal? A. Carbon 78.65, hydrogen 4.65, oxygen 14.21, sulphur 6.55, ash (consisting of silica or quartz, oxide of iron, clay, potash, soda) 2.49.

W. S. B. says: 1. I have been told by several mechanics that a block cannot be squared on all sides, that is, that all the sides of a cube, at right angles to each other, cannot be obtained by a common try square. 2. Can a screw be set up tighter with a long screw driver than a short one? What is the theory of this? A. 1. We think a block can be squared on all sides by the use of a carpenter's square, first dressing one face out of wind, and marking a square on it, to serve as a guide in laying off the other faces. 2. The increased inefficiency of a long screw driver is due to the greater leverage afforded by inclining the tool, as already explained on page 393, vol. 18.

R. J. T. asks: Can a locomotive start with more cars, one crank being on the center or dead point, with the other crank below the axle, or above the same? A. There would be no difference in the two cases, except the power required to lift the crank and connecting rod from the lower half center.

E. H. B. asks: What is a remedy for biting the finger nails? A. Keep the fingers out of the mouth. If that fails, wear mittens.

R. H. D. asks: Will the same amount of power exerted on a long screw driver produce a greater effect than on a short one? A. As a matter of fact, it is well known that more effect can be produced with a long screw driver than a short one. See p. 333, vol. 18.

A. D. says: I have a hollow iron cylinder, in which I have made a deep dent. I have tried to fill the dent up by pouring in melted lead, but I could not make the lead to adhere to the iron. How can I make the lead stick? A. You can make the lead adhere by boring holes in the cylinder.

C. D. asks: Why is it that, during rainy weather, when the air is filled with vapor of water, the barometer falls? A. The barometer falls just before stormy weather, because the vapor in the air is condensed, thus lightening the column of air that supports the mercury.

G. J. V. D. says: You say that for casting small articles of iron, plaster of Paris would be better than clay. Will it also do for brass, for articles 6 or 8 ozs. in weight? Would vent holes be needed for the escape of gas? A. We think that plaster of Paris would answer in the cases mentioned, if proper vent holes were provided.

P. G. K. asks: Is it precisely 12 o'clock, noon, at any given point when the sun is due south of that point? Does it vary? If so, what is the variation? When is the sun due south of San Francisco at noon? A. It is precisely noon under these circumstances at four times in the year, about December 25, April 16, June 16, and September 1. At all other times the noon time, as shown by the sun, must be corrected by the equation of time, which is given in the Nautical Almanac for every day of each year. In answer to your other query, consult a lawyer.

J. R. asks: Where should the draw bar of a locomotive be attached? If above the center, she will tip up in front, vertically. A. As low down as possible.

R. M. S. asks: 1. What is gasoline composed of? 2. Is it more dangerous to burn than common coal oil? If so, why? 3. What are naphtha and benzine composed of? A. 1. The term gasoline is a barbarism applied to highly rectified naphtha, one of the liquid hydrocarbons distilled from petroleum. 2. It is extremely dangerous to attempt to burn it in the ordinary manner, on account of its volatility, the combustibility of its vapor, and its explosiveness when mingled with the air. 3. Naphtha and benzine are two names for the same thing. They are compounds of hydrogen and carbon. We do not know the other fluids you mention.

J. F. A. asks: What proportions of carbonate of soda and sulphuric acid, each in solution of equal quantities of water, will generate the best quality of carbonic acid gas for extinguishing fires? A. The quality of the carbonic acid gas will not be affected by varying the proportions or the strength of the solutions employed.

L. H. D. asks: 1. How can I make a gold wash? 2. How can I mold hard rubber, so that it shall retain its elasticity? A. 1. You can make a gold wash as follows: Dissolve 1 part of gold in 3 parts of nitromuriatic acid (a mixture of nitric and muriatic acids) evaporate until vapors of chlorine cease to be evolved, and then set the solution aside to crystallize. Dissolve the crystals, which are the perchloride of gold, in water. To the solution add ether and shake the two together for some time. Finally pour off the upper portion, which is an ethereal solution of gold. When this is applied with a camel's hair brush to polished iron or steel, the ether soon evaporates and leaves the surface covered with a film of pure gold. In this way any fancy device or writing may be executed with facility. 2. When rubbers melted it does not readily again become solid. Your best plan is to immerse the rubber in a mixture of bisulphuret of carbon 95 parts, and rectified alcohol 5 parts, until it swells into a pasty mass, which may then be molded into any desired form.

J. A. E. asks: Can you give me any information respecting the merits of the Vera Cruz cement, used by the Mexicans for building purposes? 2. How can I construct a cheap home-made telescope? A. 1. It is very highly spoken of by engineers who have made experiments to determine its qualities. 2. See p. 7, vol. 30.

F. T. H. says: In trying to make gun cotton, I took a handful of cotton and poured upon it one ounce of nitric and one half ounce of sulphuric acids, mixed well, and allowed to cool before pouring. After allowing my cotton to remain in this solution 10 or 15 minutes, I removed it and washed it until the cotton did not have any chemical effect on blue litmus paper. I then dried and ignited it, but it burnt only as common cotton would do. A. Your acids were not in the proper proportions and probably not strong enough. Treat as follows: Mix together equal measures of concentrated nitric acid (S. G. 1.5) and concentrated sulphuric acid (S. G. 1.845). When cool, pour into a glass vessel and immerse in it clean dry carded cotton, in as loose a state as possible, for 4 or 5 minutes, promoting the action of the liquid by stirring with a glass rod. Then pour the acids off and squeeze the cotton as dry as possible, by means of the glass rod, or between plates. Then throw the cotton into clean soft water, as large a quantity as practicable, squeezed dry again, and then wash in a stream of water until the article is perfectly free from acid. Lastly dry by a steam bath at about 180° Fah. Only small quantities of cotton should be prepared at a time, and the greatest caution observed in handling after manufacture. Good gun cotton explodes at 300° Fah., without either smoke or residue.

S. A. B. says: I am told that nitrogen may be formed by fabricating coke. Will you explain this? Does it mean that coking the coal accomplishes it, and can it be done in open air? 2. How much nitrate of potassa will be sufficient to put in a ton of fertilizer? A. 1. There is no free nitrogen formed in the destructive distillation of coal. A ready means on the small scale of obtaining nitrogen is to burn up the oxygen in a bell glass filled with air, over water, by means of phosphorus. 2. Dr. Jeannel's fertilizer (see p. 401, vol. 28) contains 25 per cent nitrate of potash.

J. M. says: I have a plain cylinder boiler 16 feet long. The fire goes under it and up the smoke stack. Would a check wall built at the far end of boiler save fuel? A. We do not think the proposed arrangement will prove efficient.

A. K. asks: 1. What fish swims the fastest, and where could I see a good drawing of the same? 2. What is the name of the fluid which removes all dirt from the works of a watch by immersion? A. 1. Either the sword fish or tunny. You will find them illustrated in almost any good encyclopedia. 2. See p. 98 of our vol. 26.

R. T. asks: How can I make a filling for walnut wood, that will take varnish well? A. Mix with good whiting such colors as will produce the desired hue. Give the wood a good coat of oil, and sprinkle the mixture over the work until it is pretty well covered, then rub in well with a soft rag. Wipe off the superfluous filling, let dry, and varnish.

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

S. S. S.—This is a fine specimen of micaceous oxide of iron. It is often found in connection with common specular iron, but rarely in sufficient quantities to be explored by itself.

N. R. T. Jr.—Copper pyrites, a compound of copper, iron, and sulphur. 2. Quartz conglomerate. 3. Iron pyrites. 4. Red oxide of zinc and magnetic iron.

W. H. H.—This mineral is a compact brown oxide of iron.

E. E. B.—1. Clay with oxide of iron. 2. Clay containing brown oxide of iron. 3. Brown quartz.

D. McD.—Your mineral is shale, and its presence is considered a strong indication of coal in the vicinity. The bituminous variety, however, is more closely connected with coal. The presence of bitumen may be easily determined by the smell, after heating for a moment in the flame of a lamp.

W. S.—Your mineral is bog iron ore, a variety of brown oxide of iron. Bog iron ore generally yields about 30 of 35 per cent of cast iron; but on account of its containing a small proportion of phosphoric acid, the bar iron made from it is often more or less "cold short." It is advantageously smelted with the brown oxide and other ores of iron.

Josiah M. Hess, 292 East Washington street, Indianapolis, Ind., wishes to know who makes the best horse radish grater. Will some correspondent inform him?

COMMUNICATIONS RECEIVED.

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

On Photographs of the Invisible. By J. H. On an Aerial Ship. By W. O. On What to Do in Hard Times. By G. E. and by J. P. A.

On the Ventilation of the Senate Chamber. By R. T. C.

On Small Steamers. By G. S. C. On a New Means of Producing Fire. By C. C. A.

On Purifying the Air. By S. B. On Administrative Reform in the Patent Office. By G. R.

On Some New Inventions. By C. W. P. On an Instance of Atmospheric Refraction. By T. H.

On the Alignment of the Hoosac Tunnel. By C. F.

On a Total Eclipse of the Moon. By J. M. B.

Also enquires from the following:

F. S. L.—D. C. T.—K. A. H.—H. M. P.—G. W. K.

Correspondents in different parts of the country ask: Who makes steam fire engines? Who makes a pie lifter, of copper wire? Who sells knitting machines? Where can machinery for light cooper's work be obtained? Makers of the above articles will probably promote their interests by advertising, in reply, in the SCIENTIFIC AMERICAN.

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