

The principle underlying petroleum examination is the determination of the temperature at which the oil takes fire or flashes. Heating a sample in a cup over a spirit lamp and applying a burning match or taper to the surface until the oil flashes, and noting the temperature, is the crudest plan that can be adopted. Good oil should flash only above 110 deg. F.

(10) C. J. H. writes: There are many houses in Leadville whose ceilings, in lieu of lath and plaster, are covered with canvas and calcimined. In many cases, leakages of water from the roofs or upper floors upon the canvas have caused fantastic stains to appear, which will not "out" by covering with calcimine. A. The calcimine has not sufficient body by itself to cover the stains. By mixing with it zinc white, the difficulty will be overcome.

(11) S. N. H. asks: 1. How to make an article known as aureoline, for bleaching the hair. A. The substance called aureoline is simply hydrogen peroxide perfumed. See description of its manufacture in SCIENTIFIC AMERICAN SUPPLEMENT, No. 184, also consult the article in No. 339. 2. The receipt for a liquid that is used to "show up" microscopes. It resembles a thin flour paste, but when viewed through a small microscope it reveals innumerable animalcules. A. The substance is tripoli or infusorial earth, sometimes called diatomaceous silica.

(12) W. M. R. asks: 1. How to set a common slide valve in a stationary, locomotive, or marine engine. A. To explain slide valve adjustment for various kinds of engines would take up too much space for the department of Notes and Queries. We recommend to you a book on "The Slide Valve Practically Explained," by Rose, \$1, or "The Slide Valve," by N. P. Burgh, \$2, and "A Practical Treatise on Valve Gear," by McCord, \$3, all or any of which we can furnish. 2. What is the rule for calculating the safe working pressure of steam boilers when the material dimension of construction is known? A. For cylindrical boiler shells, divide the tensile strength of the iron by the diameter of the shell in inches. Deduct one-half of quotient for single rivets, or one-third, if double riveted. Multiply the remainder by twice the thickness of the iron in decimals of an inch, and divide this sum by 4, as a factor for safety in working pressure. Thus for a cylindrical tubular boiler of good iron and well stayed heads, 48 inches diameter, say for tensile strength of 48,000 pounds to the square inch, with five-sixteenths inch shell, double riveted, we have $48,000 \div 48$ inches = 1,000 less one-third = $667 \times 0.625 = 416.8 \div 4 = 104$ pounds maximum of safety. 3. What is the rule for calculating pressure of water to the square inch when the height is known? A. Multiply the height in feet by 0.433.

(13) C. N. V. C. asks: 1. How to tune up a set of glasses to use as musical instruments? A. Tones of musical glasses are dependent on the glasses and the amount of water used, this being determined by ear. 2. Where can the juice of the fruit of cajurio tree be obtained, and at what price? A. There is no such tree known to botanists. 3. Is there any cure for drunkenness, such as chloride of gold and other remedies? A. We have but little faith in cures for drunkenness. The taking of medicine will not produce abstinence in an individual. It is a question of will power. The so-called double chloride of gold is said to consist of:

- Ammonia chloride 1 grain.
- Alone 2 grains.
- Compound tincture of cinchona 3 ounces.
- Water to make up 4 ounces.

No gold is found in the preparation, and therefore its name is not even reliable.

(14) C. H.—The continued application of any preparation of lead to the skin is full of danger. It can, beyond question, cause paralysis and other forms of nervous disturbance.

(15) J. H. writes: With 5 pounds of pressure (steam), how many feet or inches or what surface does it require to heat one hundred square feet of glass roof and sides of a greenhouse in order to maintain a night heat of 55 to 65 degrees in the house, while the thermometer outside ranges at 15 to 20 degrees below zero. Also, the boiler surface necessary, etc.? A. One square foot of heating surface to 8 square feet of glass. Wrought iron pipe is the best for steam. Place along the sides of the house, both below and above the benches, 1 1/2 or 2 inch pipe, according to size of house. The boiler should have 1 square foot of heating surface to 6 square feet of radiating surface, and should have the water level in boiler not less than 4 feet below the floor of greenhouse. A horizontal tubular boiler is the best and most reliable. Steam heating for greenhouses requires that the fire should be stoked during the night as well as day. It is therefore not economical for small houses.

(16) H. W. asks for the best remedy to deafen a floor after the floor is laid, but not yet sealed? A. Nail furring strips on the sides of the beams 2 or 3 inches above their lower edge, and lath and plaster. Then cross-fur the beams with strips and lath and plaster for the ceiling.

(17) A. L. asks: What flux is used with hard solder? A. The usual flux for hard solder is borax. The common method of preparing it for use on small work is to grind it up with water into a cream on a slate or porcelain slab, and apply it to the joint and to the solder with a brush.

(18) J. G. S. asks: What can I mix with lead to make it harder to bend, and no harder to melt, for small castings in plaster moulds? A. A small percentage of antimony. Try type metal; it is an alloy of lead and antimony.

(19) W. S. asks if there is any simple way of making it more difficult to pick a watch from a vest pocket. I have had one watch picked out of my pocket, and don't care to lose another. A. Various kinds of safety pockets are in use, but probably the best way to prevent the removal of your watch from your pocket would be to wear a stout auxiliary chain around your neck, and carry it through the armhole of your vest.

(20) W. M. H. asks: What are the reasons why electric clocks (regulated by a chronometer in electric connection with them) are not in more general use in towns? A. We believe that the use of such clocks is constantly increasing. Probably they would come into more general use if it were not for the cheapness and reliability of common clocks.

(21) W. E. S. P. asks: What metal, if any, held near a permanent magnet, will strengthen the magnet? Can it be done in any way other than that commonly employed in the telephone? A. No metal in its normal condition, held near a magnet, will strengthen it, but by winding the magnet with copper wire, or any other electrical conductor, and sending a current through the conductor, you may increase the strength of your magnet.

(22) C. W. M. asks: What substance placed between a piece of steel and a magnet will stop the attraction of the steel to the magnet, that is, having the steel about an inch or so from the magnet? A. A large body of iron placed near or in contact with the pole of a magnet will absorb its magnetism; but no insulator of magnetism has been discovered.

(23) L. G. asks: Which wagon draws the lighter—the one with large wheels or the one with small wheels? A. The wagon with the larger wheel, as the leverage of a large wheel over obstructions is greater than that of a small wheel.

(24) W. L. C. asks: 1. Why would not a rapidly revolving disk of soft iron cut stone same as it does cold iron rails? A. We think the stone would rapidly wear away the soft iron disk. You could not expect to get the same effect upon the stone that is realized in the case of iron. 2. How can I harden iron or steel to make teeth for circular saw to cut stone? It is impossible to keep "borts" firmly in the saw. A. We do not think you can harden iron or steel so that it will answer for the teeth of circular saws for cutting stone, because the extremely hard steel is too brittle to maintain a cutting edge. Probably the best way to make steel extremely hard is to heat it to the required degree for hardening, and then plunge it into mercury. Care should be taken not to inhale the fumes of the mercury.

(25) W. H. H. asks: Will you tell me if the chrome battery is equivalent to two crowfoot batteries, and will they work on a ground connection for a telegraph line, and if so, how are they made up? A. One cell of bichromate battery when first set up is equal to two cells of gravity battery, but it rapidly runs down, so that the fair average would probably be about 1 1/2 volts, and about 1 1/2 times the electromotive force of a cell of gravity battery. For information on batteries consult SUPPLEMENT, Nos. 157, 158, and 159.

(26) W. C. R. writes: In making the dynamo electric machine of the SUPPLEMENT, No. 161, I am told by an electrician, connected with the electric light plant in this city, that the numbers 18 and 14 are not the best sizes to use, that a finer wire on the armature would increase the intensity, etc. A. The sizes of wire given for the dynamo described in SUPPLEMENT, No. 161, were for general purposes. Of course, if you desire a current of high tension, you can procure it only by the employment of finer wire. On the other hand, if you desire a current of low tension, for electro plating and similar purposes, you will need to wind your armature with No. 14 or 16 instead of 18, and the size of the wire on your field magnet should be correspondingly increased.

(27) J. R. W. asks: How is it that the ticking of the telegraph instrument can be heard over the telephone wire if the wires of each instrument run parallel with each other for a short distance? A. The ticking produced in the telephone is caused by the electrical impulse passing over the telegraph line. It is simply a matter of electrical induction.

(28) C. E. K. asks: Can persons learn telegraphy themselves, and receive by sound with an instrument without the aid of any one? A. We think you could attain fair proficiency in telegraphy by studying the subject with the aid of a suitable instrument, but you might fall into habits which could not be easily corrected. Better consult some good operator from time to time during your study and practice.

(29) F. H. F. asks: In what way are the teeth cut in wood saws, hack saws, and gig saws? A. In the smaller sizes they are generally cut in a milling machine; a number of saws being clamped together, so that one row of teeth will be cut through the whole series by one operation. The teeth in larger saws are cut one at a time by means of dies.

(30) C. A. Y. asks: 1. How large a gravity cell will it take to swing a one second pendulum which weighs about ten pounds, and how large should the electro-magnet and the wire thereon be? A. If your pendulum is properly constructed, two to three gravity cells ought to keep it in motion. You will probably require a magnet with cores 3/4 inch in diameter and 1 1/2 inches long, wound with about six or eight layers of No. 24 wire. 2. By what process is the great heat obtained from the gasoline stoves or machines now used for analyzing and melting specimens of ore? A. The flame is urged by means of a blowpipe. Petroleum burners, on the principle of the atomizer, produce very intense heat. 3. How close may the flues be placed in a boiler to generate steam with the greatest rapidity for the amount of water? A. This depends so much on the diameter of the flue, the size of the boiler, and its position, that we are unable to give you a definite reply. However, half the diameter of the flue is probably a good distance for horizontal boilers.

(31) C. D. V. asks (1) how to make a storage battery which will give from 4 to 5 volts, its width and length not to exceed 4 inches, nor the thickness 1 1/2 inches. A. We do not think a storage battery can be made to fulfill your conditions. A storage battery, to yield a current having an electromotive force of from 4 to 5 volts, will occupy considerably more space than 4x4x1 1/2 inches. 2. Also tell me how long 16 Fuller bichromate cells, which are used to run a 16 candle power incandescent lamp, will last without renewal? A. We think you will find it impossible to run a 16

candle lamp with 16 Fuller bichromate cells. The Fuller bichromate battery is not so well adapted to continued use as the Bunsen bichromate battery. The Bunsen battery requires renewal once in from 4 to 6 days.

(32) W. G. asks how to make a battery to be carried in a belt, the two poles of which I want to apply to the body by means of conducting cords and disks; one that will last a week or so without recharging. Do not want a very strong current, or it will burn the skin. Something that will take the place of an electric belt. A. To make such a battery as you require, take a plate of zinc and a plate of copper of the same size, and cut 24 sheets of blotting paper about the size of the plates, saturate 12 of the sheets of blotting paper with a saturated solution of sulphate of copper, and saturate the remaining 12 sheets of blotting paper with a weak solution of sulphate of zinc. Place the two packages of blotting paper together, then apply the copper plate to the paper saturated with the sulphate of copper, and the zinc plate to the paper saturated with sulphate of zinc; now solder a wire to each plate and connect the wires with your electrodes. The plates, together with the wet paper, may be wrapped up in thin sheet rubber, or you may make a rubber case for inclosing the battery.

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