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to persons in
in the varlous departments of the establsh-



## (\$) (a) (G)

A. K. B. will find a recipe for solder fo gun barrels on p. 333 , vol. $27 .-$ R. S. S. Will find that
galvannzing wrought iron is described on p. 346 vol hin J. and others will find directions fo directions for modeling in clay, wax, etc., on p . 58 , vol. 24 .-S. N. Will find directions for making
gravel walks on p. 50 , vol. $32 .-$ R. J. will find direc tions for filling and poiishing black walnut wor on pp. 315, vol. 30, and 347, vol. 31
(1) W. O. H. says: A friend claims that, if a balloon could be made so as to sustain the press-
are from the outside, and the air were pumped ure from the outside, and the air were pumped
out so as to form a vacuum on the inside, that it out so as to form a vacuum on the inside, that it
would rise. I claim that it would not. Who is right? A. Your friend.
(2) A. J. S. says: Are you aware of any one Who has ever actually discovered perpetual mo-
tion? If it has not yet been discovered or revealed, do you really believe that perpetual moveale, do your realy beineve that perpetuar mo-
tion, pure and tion, pure and simple, would be of any pecau-
ary avanatae to its disoverer? A. No one has
ever discovered perpetual motion. You can judge of the probability of such a discovery if you bear in miud that the pripciple involved is the same as When one tries to lift oneself in a tub, by pulling
at the handles. Some of the perpetual motion inventors put cog wheels or levers between their
hands and the tub handles. But the result is the ame. It is al ways a perpetual no go. No rewar has been offered.
(3) G. L. L. says: What use, if any, can be made of old photographic collodion? A. If the solvents have not already evaporated, and the so-
lution contains no volatile acids, the ether and alcohol may be readily removed by subjectiog the solution to distillation in a glass retort over a wa-
ter bath, with a very ter bath, with a very gentle heat. The solution
however, should not be allowed to evaporate to dryness.
(4) H. M. asks: How can I bleach shellac a.
coll.
What

What are the average weights of a cubic inch of b., tin about 0.217 lb b.

How is the inside area of a cylinder found? A To find the surface of a cylinder: : circumference
of base $\times$ altitude) + twice the area of base of base $\times$ altitude) +twice the area of base
solid contents : A rea of base $\times$ altitude.
(5) A. S. asks: Is there any solvent besides cyanide of potassium, for sulphide of copper? A.
The sulphide of copper dissolves readily in strong The sulphide of copper dissolves readily in strong
aqua fortis (nitric acid) on application of heat.
(6) H. B. C. asks: What kind of a solution should I make to plate with tin, having tin as a
positive electrode? $A$. Electro-metallurgists consider the sulphate to be the best solution for this purpose; but the reduction of tin by galvanism cannot be considered an advantageous process. The best method for tinning metallic surfaces is that of immersing them in a bath of molten tin, the surface of which is kept free from oxide by
means of a layer of chloride of ammonium (sal means of a layer of chloride of ammonium (sai
ammoniac). An even and regular coating of the metal is thus obtained speedily and with little trouble.
(7) M. S. asks: 1. Are the oxygen and hydrogen, used in stereopticons, dangerous? A.
They are explosive only when mixed and ignited. Tney are explosive only when mixed and ignited.
2. Of what color are the screens that are used for the same purpose? A. White. 3. Are they paint-
ed or varuished? A. When intended to remain ed or varuished? A. When intended to remain
stationary, they are occasionally covered with an stationary, they are occasionally covered
even coating of whiting with a little size.
(8) C. T. S. asks: What process will make ordinary white quartz crystals, resembling ame-
thyst ? A. Take borax 5 parts, saltpeter 5 parts, pearlash or fixed alkaline salt, purifed with niter peariash or ixed hitainne salt, purined with niter,
33 parts, pure white sand, cleansed by washing, 57 parts. First reduce the sand in a glass or fint mortar to a fine powder, then add the other ingre dients and grind them well together. To 10 lbs. of
the above add $11 /$ ozs. of manganese oxide and 1 the above add 11/8 ozs. of mangunese oxide and 1
drachm of zaftre. Melt in a small clay crucible, drachm of zaffre. Melt in a small clay crucible,
and cover the surface of the crystal by immer and c
sion.
(9) H . asks: Of what size, and of what
cheap material, should a hot air balloon be made to raisea weightof 150 lbs. A A. A closely woven
variety of light cambric is best for this purpose It is not customary (where the proper material is In sed) in this style of balloon to use any vagnish
ustomer Whatever. If the case requires it, however, a light
solu ion of boiled linseed oil in turpentine may
,
(10) G. W. N. asks: Which is the positive pole and which the negative, in a battery? A. In all forms of battery, the binding screw attached
to the zinc plate is always negative, and the conothe inc plate is always negative, and the it be
netion of the opposing element, whether
copper, carbon, or platinum, isalwass positive. If a small mariner's compass be placed immediately under a copper wire running north and south, (that is, parallel with the needle of the compass
when in a state of rest and not subject to any disturbing infuence, over which a current is passing from north to south, the needle of the instrumen
will immediately be defiected, its north pole movink to the east, and its south pole to the west. If the current be reversed, the needle will move in the opposite direction.
There is a boat fastened to a dock by a rope. $P$. says that a man staudng in the boat will not obliged to exert so much force to pull the boat to
the dock, as one who stands in the dock and pull the boat toward him. N. says the man will have
to exert the same amount of foree in both case Who is right? A. N.
(11) D. A. C. asks: Is there an agent which
will beach or clarify, by burning or fumigation vegetable substances? I want an agent that will bleach tobacco in the process of curing or drying,
the plart. Sulphur will do it to a certan extent, but it imparts an odor which injures its market value. A. Tobacco may be readily bleached b in the operation it undergoes a tion, new salts being formed. This destroys the
properties for which the tobaco is most valued (12) J. H. L. asks: For some time past have been trying to bleach what is called cera de
Campeche, a wax made by a large bee near the PaCampeche, a wax made by a large bee near the Pa a dark yellow color and a strong smell; it becomes quite soft and sticky by working with the hands. How can I do this? A. Beeswax may be bleached by nitric acid ; but chlorine, though it destroys the
color, cannot be employed for this purpose wit color, cannot be employed for this purpose with
advantage, for it was observed by Gay Lussac that substitution of chlorine for a portion of the hy drogen occurs under these circumstances. Whe candes made from such wax are burned, irritating wax has been commonly bleached by exposing it in thin layers to the action of sunlight for some time. Try the action of a solution of chlorine gas lution of chloride of lime (bleaching powder). (13) A. P. asks: Is there any magnetic dig for water and where springs exist? A. There is no such instrument in existence.
(14) C. K.asks: Whut degree of heat is acted upon and absorbed by a liquid, such as an oxyhy
drocarbon oil,contained in an iron or copper vessel of about equal width to its depth, heated by live team of about 40 lbs. pressure? A. As you fail to state the particular oil in question, we cannot give
ou its specific heat. The temperature of the oi would, in no case, be higher than the steam or ho watcr 1 no case, be higher than the steam or ho Wher the oil vessel were completetain or ongly in part biled with the oil, the conditis both cases, the temperature mer case the expenditure of a larger amount of mer ca
fuel wo
sult.
(15) J. E. H. asks: Is there any known way by which skippers iu smoked meat can be de-
troyed without injury to the meat? A. Try the stroyed without injury to the meat? A. Try the
cetion of a small quantity of the iodate of calcisalicylicacid.
(16) T. W. C. says: I have a friend who uses a process in which a quantity of water must
be maintained at a temperature, near to butal ways above the freezing point. To procure this he use considerable quantities of ice. Could the same ef fect oe economically produced by the Carré freezing apparatus? A. Yes
(17) A. B. C. and others ask: Which wheel of a truck slips in going around a curve, the in-
side or the outside one? quently asked by our correspondents, and is very cully answered by a writer in the Railroad Gazette as follows : That wheel will slip on which the
pressure is the least. For a single truck with equally distributed load, other things being equal, on a fat track (that is, one ia which there is no super-elevation of the outer rail), the inside wheel will slip, for the following reasons: 1 . Because the direction of the resultant of the weight and of the outer than of the inner wheel 3 Because count of the paralelism of the axles and the play allowed the wheels, the fiaoges of the latter are against the outer rail and away from the inner one in the passage around the curve, and this is true whatever may be the speed. This brings the point of application of the resultant (corresponding to the loaded point on a beam) nearer the outer than
the inner bearing. On a curve, the outer rail of which has been elevated for a given speed, at this speed the resultant above mentioned is perpendicular to the plane of the rails, and hence at tha particular speed the first of these causes is inoperative, while the second, remaining in force, causes
the inner wheel to slip as before. At any higher the inner wheel to slip as before. At any higher speed, the irst cause again comes into play, and ai
lows the inner wheel still greater faciity for slip ping, and the more so the higher the speed. On the other hand, for a speed less than that for which the rail was elerated, the centrifugal force,
being diminished, brings the resultant more in the being diminished, brings the resultant more in the
direction of the inner rail than before, and at some direction of the inner rail than before, and at some
speed would make its direction such as to exactly speed would make its direction such as to exactiy
counteract the effect of the second cause, and would thus render the wheels equally liable to In the case speeds the outer wheel would silp are nearly in the condition of those of a single truck, while hose near the middle, being drawn to the inner rail by the action of the forward and rear portions of the train, will sooner come into a condition in which the outer [Wheels will slip. In
this, the coning of the wheels has been considered as a part of the elevation of the outer rail, either increasing or diminishing it as the fianges press against the outer or the inner rail.
(18) W. X. says: I have two $\frac{1}{4}$ inch pipes, one glass and the other lead, which I wish to unite a of a coumn of water ifteen feet in bight. In
what way can they be best united? A. Use as a solder the following alloy, which fuses below the
boiling point of water: Bismuth 2 parts, lead part, tin 1 part.
(19) E. J. F. says: How can I cut fine edgings on paper, such as the borders on valentines or
bouquet papers? A. These borders are stamped ut in meta.
(20) H. P. O. asks: Please give me recips which I can dye cotton and linen thread? A. ithF
rea, use cochineal, lac dye, madder, or log wood
with a tin mordant. For black, use logwood or
galls with an iron mordant galls with an iron mordant.
How can metal be cemented to glass? A. See p.
(21) C. A. F. asks: How can a silk fish line be made waterproof? A. Take 2 parts boiled oil, part gold size, mix, shake well, and it is ready fo ase. Apply with a piece of flannel, let dry thor
oughly, and apply another coat. Use 3 coats in
(22) C.S. W. asks: What is the best way of preparing starch for use on linen collars, etc. A. Wheat starch is generally considered the best.
It is made as follows: Sleep wheat four in wate fr a week, dra w the liquor off, and wash the res ue on a sieve; drain in perforated boxes, cut up
(23) J. D. says: Please give me a recipe for wax for tracing designs in hair lines on 2 inc with pen, which wil protect the zinc from acid used tch the design on the metalqua. If you use n tum, Burgundy pitch, and beeswax; meit them in an earthen pipzin, stir well, and pour into cold water. Use warm.
(24) A. L. H. asks: What is a good method of cleaning tin, copper, brass, etc., without scratching the same? A. On tin, use potash lye and rub
with a hard substance. On copper and brass, wse spiit of tar.
(25) C. E. G. stys: I claim, in arguing the
nerits of the Keely motor, that water is a spent ubstance and campor motor, that water is a spen equivalent is laid out on it. A. You are right. (26) V. H. says: 1. On p. 74, vol. 28, you per trays, consisting of a mixture of petroleum aphtha and paraffin. Can the varnish be applie each ingredient should be used? A. Put in paraf in till the petroleum naphtha will dissolve no re.
(27) W. U. asks: What are the rules for culating the permutations and combinations of numbers? A. The number of permutations of $n$
things $=1 \times 2 \times 3$, etc., $\times(n-1) \times n$. The number of arrangements of $m$ things, taken $n$ in a set, $=m \times$
$m-1) \times(m-2)$ ete..$\times(m-n+1)$. The number $m-1 \times(m-2)$ ete. $\times(m-n+1)$. The numbe
combinations of $m$ things, taken $n$ in a set $=$

## $m \times(m-1) \times(m-2)$ etc. $\times(m-n+1)$

(28) L. H. R. says:I wish to know whether e followingconjectures are probable : Scientists, niving the hights of mountains, clouds, bal
loons, etc., say they are so many miles above the eve of the sea. Is the level of the sea the same of ther the surface of the earth? Is the surface Ifstance from the center of the globe at the same would be so if there were the earth? I think earth around its axis; but since there is, the cen rifugal force thereby produced would canse the ooser particles (water) of the earth to be heaped
up at the equator, making the level of the ocean at this part bigher than at parts north and sout of it. And further, in my opinion, the wate would not only accumulate here, but wouldac mulate in proportion to its quantity or mass there. by making the Paciici Ocean of higher ler it than He Allantic. Is this actually the case? A. IS
you measure the hight of the sea level by its distance from the earth's center, it is not the same everywhere, but is higherunder the equator and lower at the poles. This is called the fiattening of
the earth, and is, in round numbers the earth, and is, in round numbers, $\frac{1}{10} \pi$, which
neans that the polar axis is $\frac{1}{2} \times 88,000$, or about 26 , means that the polar axis is $5 \frac{1}{3} 6 \times 8,000$, or about26,
miles shorter than the equatorial diameter therefore the ocean's surface at the equator is 13 miles igherthan at the poles, and the Mississippi rive of the in certain sense, acturlly up hill. The or the mountagns is always estimated from the
nearest sea level. There are, besides this, other iregularities in the ocean level, of which we have , J. W. W: 1 .
(29) J. C. W. asks: 1. If any one will look as is used by the United States Signal Corps, consisting essentially of hollow hemispheres, and will notice the direction in which the cups revolve, he may after a time apparently see the motion recontrany to that cups going in a direction exachy good position to take with reference to the anemometer is about 50 yards from it, and nearly up to the level or horizontal plane in which it moves. No doubtothers havenoticed the deception, as it is very apparent when once observed. A little
perseverance in the effort may perbans be necessary at first in order to perceive the change as it seems to be. A. This optical delusion has been often observed, and is simply caused be the difif-
culty of deciding which balls are the nearer If culty of deciding which bals are the nearer. If
we take the further off for the nearer, the motion of course appears reversed. The same thing may the edge of the arms. 2. Another illusion may be Procu Procure a round paper box about two cr three
inches in diameter, and, if its bottom does not bulge upward in the center, make it do so by
pressing it in with the thumbs. Any sized round box of almost any material that is not atfected by mercury will doubtless answer the purpose, but
the kind mentioned is easily procured in the form of alarge pill box or a collar box. After pressing the bottominwards, as directed, pour into the box about one ounce weight of clean bright quicksiluntil the quicksilver revolves rapidly around the circumf erence of the box in the depression caused with the perpendicular walls of the box. It is best to lay the box flat on a horizontal table while rotating it; and when the quicksilver seems to be

