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Plumbers-Address Bailey, Farrell & Co., Pittsburgh, Pa., for the best and cheapest iron case street hydrants. and 1/4 oz. dragon's blood to make it dark. Keep in

illustrating every subject for public exhibitions. Profi- removing stains from gold and silver plating? A. Im- bears against the bottom of the cylinder? A. The

"Little All Right," the smallest and most perfect Revolver in the world. Radically new both in principle and operation. Send for circular. All Right Firearm's Co., Lawrence, Mass., U.S.A.

For Solid Wrought Iron Beams, etc., see advertise-ment. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

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Wanted-Salesman thoroughly acquainted with Wood and Iron-working Machinery. Address John H. Kerrick, Indianapolis, Ind.



(1) J. H. P. asks how to get a good and durable dark blue on a gun barrel with acids, and without heat? A. Apply nitric acid and let it eat into the iron a little; then the latter will be covered with a thin film of oxide. Clean the barrel, oil, and burnish.

(2) W. H. L. S. asks: What is the mechan ical effect used on the stage in making one scene disappear gradually, and another appear as gradually in its place? A. One way is to arrange a mirror in rear of the stage, the glass being placed at an angle to the foctlights so that it will reflect a person standing near the side of the stage, but concealed from the view of the audience. The person stands in a dark compartment, so that his reflection in the glass is normally quite faint. A strong calcium light is then thrown directly on the person so that a vivid reflection appears in the glass. When the light is gradually diminished the re-flection appears to fade, and when gradually strengthened on a second person, near the first, the former comes into prominence. Similar effects are produced by the magic lantern.

(3) R. H. W. asks how to soften a lump of gold that is too hard. It has a little copper and silver in it. A. Anneal by the ordinary methods. The presence of tin will sometimes harden alloys of gold and silver.

(4) N. G. P. ask: Will you please give me a recipe for putting a black polish on white wood? A. Mix up a strong stain of copperas and logwood, to which add powdered nutgall. Stain your wood with this solution, dry, rub down well, oil, then use French polish made tolerably dark with indigo or finely powdered stone blue.

Also give me a recipe for making a cheap but durable mucilage? A. Macerate 5 parts of good glue in 20 parts of water for 24 hours, adding 20 parts of rock candy and 3 parts of gum arabic.

Will cream turn yellow, when used as a secret writing fluid on postils, when exposed to heat? A. Yes.

(5) J. H. P. says: I have just tried an experiment on making vinegar from the wild crab apple. It has from two nights' and one day's standing got quite sour, but too bitter to use. How can I get the bitter tion of making and drying it? A. Sulphate of manga in boiler? By figuring out the safety valve I find such taste from it without doing it an injury? A. Warm a nese, 2 parts, lampblack, 1 part; sugar, 4 parts; all in to be the case, or the steam gauge is incorrect. A. The sample of the vinegar and agitate it with a little egg albumen. If after settling 2 hours it is not improved, distillation must be resorted to.

(6) L. P. M. asks for (1) a lacquer to gild burnished iron and zinc? A. A good lacquer consists of alcohol, 8 ozs.; gamboge, 1 oz.; shellac, 3 ozs., annatto, 1 oz ; solution of 3 ozs. of seed lac in 1 pint alcohol. When dissolved add 1/4 oz. Venice turpentine a little with the temperature of the water. 2. What Magic Lanterns and Stereopticons of all prices. Views warm place for 4 or 5 days. 2. Also the best method of the water after the piston has made its full stroke and pared chalk.

> (7) A. A. R. asks the length of time incubation takes for hen's eggs, turkey's, duck's and geese', and the degree of heat during the time from first to 30 days, turkeys 27 to 28, ducks 28, hens 21. Temperature 140°. The eggs should be turned every 6 or 7 days. and the chicks, when hatched, keptuntil strong under an artificial mother made of sheepskin.

(8) R. A. McC. asks for a preparation that

ject it will be thankfully received. A. Rust joints are made by mixing the following ingredients in the given quantities, and driving the mixture with a caulking tool into the joint: Cast iron turnings or borings, 100 lbs.; powdered sal ammoniac, 1 lb.; flowers of sulphur 1/2 lb. The latter ingredient is sometimes omitted.

(12) W. G. M. says: 1. The Nautical Almanac gives the polar distance of Polaris for January 1, 1870, as 1° 23' 01". The formula for computing the azimuth of Polaris for the same date and for latitude $42^{\rm o}\, {\rm gives}\, {\rm azimuth}\, {\rm of}\,\, {\rm Polaris}\,\, 1^{\rm o}\,\, 51^{\prime}\,\, 45^{\prime\prime}.$ Will you please explain why the azimuth is greater than the polar distance? A. Azimuth is the distance between the meridian of any place and a vertical circle starting from the zenith of that place, measured on the horizon-the vertical circle of course cutting the center of the star whose azimuth it is designed to measure. It follows that, as the pole must be in the exact meridian, and an object either east or west of the pole is on a vertical divergent from the meridian of the place, of course it will be further from the meridian at the horizon than at the polar altitude. It must be understood that twice every twenty-four hours the azimuth of Polaris is 0°; this, of course, is when it is upon the meridian, either above or below the true pole. 2. Also why the azimuth increase, and decrease, with the latitude, as the azimuth for the same date for latitude 30° is 1° 36', but for latitude 50° is 2° 9' 15". A. As the zenith approaches the pole, the meridian and vertical circle, passing through an object of a given distance from the pole, will be more divergent, and of course make a wider space on the horizon, where the azimuth is computed.

(13) J. W. asks: What if the best system of artificial ice making? Is not chymogene dangerous to use? A. You will find that the special merits and ceived ample comment in these columns. That system of goodice is produced at the minimum cost in money and labor. Liquefied gases-as sulphurous acid and ammonia-although incombustible, are not less dangerous than ether or chymogene. Other things being equal, the process supplying the more volatile reagent is usually the most effective.

(14) B. D. N. asks: What will remove coal oil from boards? A. Strong lye,

How can I maker ubber cement? A. Fill a bottle $\frac{1}{10}$ full of native indiarubber cut in shreds. Pour in benzole until the bottle is 34 full. Shake every few days until the mixture becomes as thick as honey. This dries quickly.

What causes the Indian summer? A. No definite theory.

Is gas escaping in a room where a lamp is burning liable to set a house on fire? A. Yes, if a sufficient quantity enters to produce an explosive mixture with the air.

Is there such a chemical as hypophosphite of potassa? A. Yes. What is dextrin? A. A gum-like product of the ac-

tion of dilute acid upon starch at 200° to 212°. (15) J. W. W. asks how to make a black

inkin a cold orlump form, so that by adding water I can make ink as wanted? A. A good ink powder, which might with a little mucilaginous material be made into blocks by pressure, consists of Aleppo galls, 3 lbs.; copperas, 1 lb.; gum arabic, 1/2 lb.; white sugar, 1/4 lb.; powder and mix; 2 ozs. of this powder dissolved in 1 pint of boiling water gives a very good ink.

(16) J. R. asks: How can I make a fine quality of ink to stencil boxes, with stencil plates, and also not very expensive? Also the mode and preparation this altitude, or say 55 lbs, when there are actually 60 fine powder and triturated to a paste with a little water.

(17) E. H. says: 1. If I sink a cylinder weighing 10 lbs. at a depth of 20 feet in water, what pressure on the square inch would I obtain on its piston. the latter being 3 inches in diameter? A. The pressure of the water on the piston, at the commencement of its stroke, would be about $8\frac{7}{10}$ lbs. per square inch, varying weight would bring the cylinder up at the surface of it displaces, which volume cannot be calculated from the data given.

(18) E. L. W. asks for a recipe to make the composition to put on matches? A. A good paste last? Also the management the eggs require? A. Geese for matches contains: 1. Common phosphorus, 4 parts; niter, 16; red lead, 3; strong lead, 6. 2. Ordinary phosphorus, 9 parts; niter, 14; binxide of manganese, 14; gum or glue, 16. Melt the glue at 212° Fah., gradually add the phosphorus, which must be well stirred into the liquid; then add the niter and coloring matter. Keep the paste at a regular temperature of about 97 Fah. by means of hot water under the iron or marble slab on which it is spread.

(21) F. C. S. says: A master mechanic here claims that the proper manner to get the length of an eccentric rod, in case an engine came in with a broken one, is to get the length from center of driving shaft to center of knuckle on link where eccentric rod connects and from this length take the distance from center of eccentric to end of lugs on eccentric straps where the rod is bolted; theremaining length, he claims, equals the length of eccentric rod. Please give the correct way for ascertaining the length under the stated circumstances? A. As you state the rule, it is incorrect. A good way to find the length, is to place the crank on the wo centers alternately, and find the length that will divide the lead, or nearly so. This supposes that the eccentric is secured in the proper position. If not, it is first to be adjusted.

(22) Constant reader inquires the amount of upward pressure exerted on the sides of a coffer dam by the surrounding waters, the interior being pumped out to bottom; not taking into account the laying of the timbers composing the dam? A. It is equal to the weight of a volume of water equal to the volume of the submerged part of the coffer dam, or, more simply, the weight of the water displaced,

(23) A. B. C. asks: 1. Why is it claimed for compound engines, that the strains are more regular? It is asserted that the strains are not so irregular as in the simple engine. If the initial pressure in the high press cylinder is expanded into a large cylinder, before the high press piston has completed its stroke, is not the steam expanded, the pressure reduced, and as a consequence the strains as irregular as before? A. If you compare a simple engine with a compound, both working at a high rate of expansion, you will see that the range of expansion in the single cylinder is much demerits of the several systems mentioned have re- ; greater than in each of the two or three cylinders of the compound engines. The equalization of strains on the is of course the best by which the maximum quantity crank pin is effected by special arrangement of the cylinders, and this can be done either with compound cylinders or several simple ones. 2. Again, in regard to high pressure boilers, the strength of a cylinder is inversely as its diameter and inversely as its length. Please state where the limit is. I read in the Engineer that the tubulous boiler was the only style now known where the pressure could be safely carried at 150 to 160, that is, for sea-going ships. The Mississippi river boats carry 175 to 200 lbs. pressure per square inch; why could not they be used on marine vessels? A. This refers to cylinders exposed to external pressure. In practice the limit of length is a few feet, the internal flues being divided in effect into a series of short cylinders by attaching rings or bands. The tubular boiler is used in marine practice instead of the style with flues commonly found in western steamers, for the reason that it occupies less space and weighs less for the same capacity and economy.

(24) F. M. D. says: I am going to use a composition in my steam boiler to remove incrustation and keep the boiler clean. It is composed of 10 lbs, of soda ash, 11b. of muriatic acid, 1/2 lb. of acetic acid, and 2 lbs. of chestnut oak bark. Will this be injurious to the iron if used regularly, and if so, state which of these articles cause injury? A. Omit everything from the composition except the soda ash.

(25) W. P. says: I am working at an altitude of 10,500 feet, where it is impossible for a pump to draw more than 18 or 20 fact perpendicular, consequently losing 5 lbs. per square inch of pressure on the valves owing to the rarefied condition of the air. Now what I wish to know is this. Does not a steam gauge manufactured in Chicago or Boston, or any other city of the same altitude, mark 5 lbs. light when on a boiler up in ordinary gauge, when correctly adjusted, shows the pressure in the boiler above the atmosphere. To get the ab-olute pressure, the pressure of the atmosphere, as obtained from a barometric observation, must be added. We would be glad to have complete dimensions of your safety valve, with weights of the varions parts, and the conditions under which the discrepancy between the gauge and valve was noted.

(26) H. C. inquires whether the whole length of the tube, or only that part surrounded by water, is reckoned as heating surface in an ordinary uptable business for a man with a small capital. Also lan-terns for college and home amusement. 74 page cata-loguefree. McAllister Mf. Optician, 49 Nassau St., N.Y. pared chalk. as water-heating surface. Surface with hot gas on one side and steam on the other is called superheating surface

> (27) A. E. R. asks: 1. Is a hot water boiler test less hurtful to the boiler than a cold water test? If so, why? A. A hot water test is generally less injurious to a boiler than a test with cold water, for the reason that the boiler if tested cold is subjected to strains that do not occur in its practical use. 2. Is there an inspector of boilers in New York State now, and how often does the law require a boiler to be inspected? A. We

Bolt Forging Machines and Power Hammers a spe-

Felt of every description for Manufacturers' purposes especially adapted for Polishing, can be furnished in any thickness, size, or shape. Tingue, House & Co., Manu- of a pendulum rod to vibrate seconds is 39_{10}^{3} inch, how facturers. Salesroom, 69 Duane St., N. Y. Factory at can the number of vibrations be found from any given Glenville, Conn.

Gray & Wood Planer; Ball's Planer and Matcher; Smith's Mortiser; Universal Woodworker; Tenoning and Moulding Machines; in good order, and cheap for cash. Address D.W. W. Smith, 135 N. 3d St., Philadelphia, Pa

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will erase lead pencil writing from printed pasteboard cards (colored) that will not injure the printing or color cialty. Send for circulars. S. C. Forsaith & Co., Man-chester, N. H. dia rubber.

> (9) C. M. C. asks: If the requisite length length of rod, or vice versa, the length of rod from the

number of vibrations? A. The time of oscillation increases in the same ratio as the square root of the length of the pendulum. Thus if the length of a pendulum be increased 4, 9,16, times, the time of its oscillation will be increased only 2, 3, 4, times.

(10) J. C. W. asks: 1. What was the cost per mile. 2. What was the greatest engineering work of modern times, and what was its cost? A. The Mississippi jetties and the tunnel under the Straits of Dover, both unfinished.

(11) D. U. G. says: I have had several ar-Reliable information given on all subjects relating to joints in cast iron, and have been told that it cannot be you quote has about the same significance as if it were tell If you can give me any information upon the sub- of developing 2,500 indicated horse power.

(19) J. L. S. says: Can you give me a process for purifying rancid butter, also best coloring ingredients? A. Use 1 pint of water to each lb. of butter, previously adding 20 grains of chloride of lime to each pint of water; wash well the butter in this mixture, afterward rewash in cold water and salt: or melt the butter in a water bath with animal charcoal, coarsely powdered and previously well sifted to free it from dust; skim, remove and strain through flannel, then salt. For coloring, a solution of annatto is commonly used.

(20) J. H. P. asks; 1. What is the meaning For Town and Village use, Combined Hand Fire En- of the Suez Canal? A. \$80,893,665, or about \$808,936 of the term "pitch," when applied to propellers or screws? A. The pitch is the distance the screw would advance in one revolution, if it worked in an unyielding medium, after the manner of a screw in a nut. 2. In describing steamship engines, why is it said that the nominal horse power is, say, 500, but will work up to, say, 2,500 horse power? A. The term nominal horse guments with parties in our town about making rust power is merely a commercial unit, and the expression done. I claim that it can be done; but how I cannot said that the vessel has a No. 8 engine, which is capable

think not.

(28) C. T. asks: Can an engine run as fast on the level with 100 lbs. steam, as it can with 150 lbs., no load attached to take the steam? A. If the question refers to a locomotive running light, as seems probable. the speed will be greater with the higher pressure if the pipes and ports are sufficiently large.

(29) F. C. S. asks how in drawing an engine with inclined cylinder is the end of the end of the cylinder intop view projected from side view. Four points I can get easy enough, but how can I get more? A. You can find additional points in a similar manner to the first four, by noting where perpendiculars from certain elements or lines parallel to the axis in the side view cut the corresponding elements in the top view. How many feet a minute can a plunger pump be run to work well? A. The speed of pump is governed by the size of plunger or suction pipe, noting that for ordinary lengths of suction pipe, the velocity of the water should not exceed 600 feet per minute, which figure can be used for a first class pump.

(30) P. B. asks: What does the Post Office department desire for an invention for cancelling postage stamps? A. A canceller is desired which shall be