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gun, and the proper charges of powder and buckshot? In our answer to T. C. E., page 331, current Answers: 1. No. 2. Your best plan would be to copy it is stated that either borax or shellac will probably dissolve the gum of the peach tree. The word ether should be substituted for either.

C. A. asks: How can I remove and prevent rust on a cooking stove? Answer: Remove as much of the rust as possible by scraping and brushing, and

The ordinary stove polish is this substance prepared for

J. A. M. asks: What is the best material

F. W. D. asks: If a current of electricity be passed through a telegraph wire, always in one direction

how can I find the direction it takes, knowing nothing

of its connections with the battery, yet having access

to the wire? Answer: If the wire runs approximately

north and south, you might be able to tell the direction

of the current by placing a magnetic needle beneath it, and observing the deflection. If the wire runs nearly east and west, it would probably be necessary to attach

a compensating magnet, so as to annul the influence of

the earth's polarity. In case the intensity of the current is not sufficient to defict the needle, you might be

obliged to employ a delicate galvanometer, and also to cut the wire and attach the ends to the instrument. You

will find directions in regard to the use of galvanome

J. H. M. savs: 1. I have two boilers, 4 feet

diameter, 16 feet long, with two 16 inch flues. The fire is under front end of boilers; it passes under boiler and

returns through the flues and up the chimney. Will some one tell me how large and how high a round iron

chimney should be to have a good draft? Fuel is wet

sawdust. I want to carry 90 lbs, steam and burnas much sawdust as possible. 2. Will some one describe a fur

nace and give its capacity for burning sawdust and making steam? 3. Is there a tightening pulley in use

with a rubber tyre? Would such a thing not be prefer

able to wood or iron, being a saving of belts? Answers

1,2. It is quite common to use sawdust for fuel, in many

localities. If you will write to any good builder of sta-tionary engines and boilers, he will probably send you an

engraving illustrating the arrangement of furnace. Per

haps some of our readers who have had experience with

this fuel will be kind enough to send descriptions. 3.

We scarcely think that such a pulley would be desirable.

ing force has the most powerful magnet ever known

2. Is there any magnet that will lift an object upward

to any distance? Answers: 1. About 3½ tuns. 2. No.

R. B. says: While at breakfast this morning a drop or two of coffee was by accident spilt on my

plate, and came in contact with some sirup I had been

eating. The peculiar shade assumed by the mixture

raised my suspicions that all was not right with the

sirup On further trial, I found that the coffee and sirup,

when mixed, turned very dark, while coffee and molasses did not change color. I afterwards tested the sirup

with tannin, and found, as I expected, that I had a pret-ty fair article of ink from the mixture. I presume the sirup was made from starch. I would be glad to have

your opinion as to the health fulness of such sirup, and whether coffee may be considered a fair test forglucose?

If so, it certainly is a very simple test, which can be made at any time, and should be better known. Answer:

The reaction of which you speak indicates the presence

of iron in the sirup. Tannic acid, it is well known, as well as its salts, are characterized by striking a deep

black color with the persalts of iron. There is sufficien

tannin in coffee to effect this reaction, and the iron in

the sirup is probably due to the iron vessels used in its

manufacture. We have ourselves noticed the reaction

J. A. C. asks: 1. Would rubber dissolved

in bisulphide of carbon be of any use on the inside of a gum belt from which the rubber has been worn off?

Would it adhere well, or would the solvent injure the cotton of the belt? 2. Would this solution do for water-proofing boots and shoes? 3. We are using a locomo-

tive boiler with 66 two inch flues; we have had grea

trouble with their leaking; we have had them reset, bu

they were no better. Then we stopped using the water

from our well, and took it from a dam on a small stream since which we have had no trouble. Now the tubes are

clean, or very nearly so. Do you think that any kind of

clear water would cause them to leak, at once? From appearances, it was the water that caused it, but we are

surprised that any water should cause it at once, and thought that they must become coated so as to over-

heat first. Answers: 1. We do not think that you can

repair the belt in the manner mentioned. 2. There is a

solution made for this purpose, which answers very well.

3. Fresh water sometimes cuts out scale or mud at once

S. A. T. says: I had about \$10 worth of postage stamps, torn apart, in a tin box on my desk; and somebody upset ink on them, which has dissolved the

gum on them and soiled nearly all of them. The gum has dried and they are all stuck together and soiled with

ink. What can I do with them? I can soak them apart,

but how about the ink? Answer: After carefully soak-ing the stamps apart, you can remove the ink stain by

brushing them over with a fine camel's hair brush dipped

in a dilute solution of oxalic acid. Oxalic acid is poison-

J. T. A. asks: 1. Can buckshot be fired from aswivel boatgun, so as to kill large birds at 1,000

vards? 2. What would be the length and caliber of such a

ous, so that care must be exercised in using it.

of tea with iron.

causing leaks.

D. T. T. asks: 1. What attractive or lift-

ters in any good text book on electricity.

plumbago, ordinarily called black lead.

then rub with

the purpose

H. D. asks for a formula for bay rum. Answer: Tincture bay leaves 5 ozs., otto of bay 1 drsm, bi carbonate of ammonia 1 oz., borax 1 oz., rose water 1 quart. Mix and filter. Bay rum is said to be made in the West Indies by distilling rum with the leaves of the bay tree.

P. asks: What is the exact difference in time between New York and Washington? Answer: Twelve minutes, fifteen and forty-seven hundredths seconds, (12 min. 15.47 sec.).

S. E. asks: What is a horse power of an engine? Answer: A horse power, when used in refer-ence to a machine, is a unit for expressing the amount of work that it is capable of performingin 9 given time, being the power required to raise 33,000 pounds one foot high in a minute.

F. O. W. says: What is the requisite edu-ation for entering the United States navy as engineer? Also, what experience, influence, money, etc., are needed? In what text books would one be examined? Answer: We believe that it is necessary for all those who wish to join the engineer corps of the United States Navy to enter the Naval Academy as cadet engineer. If you will write to the chief of the Bureau of Steam Engineering, Navy Departmentat Washington, we think you can obtain a circular giving full particulars.

F. P. B. says: Why does a barometer show the same pressure of atmosphere inside a room as it does outside? Answer: Because the atmosphere of the inside of an apartment communicates, through the cracks of the doors, windows and other parts, with the outside atmosphere. If the room in which the barome-ter is placed is airtight and rigid, the barometer will not be affected by changes in the exterior atmosphere.

A. B. K. asks: 1. What is used to give imported pickles their agreeable flavor? 2. Is there anything that will prevent the iceing of cakes from rapid-ly turning yellow? 3. What is used to prepare the sugar for molding for ornamenting? Answers: Wash your vegetables and fruit in cold spring water, and steep for some days in strong brine; drain, dry, and put in jars; and the spice, if required, and fill up with hot, strong, pickling vinegar; cork up tight, and tie over with bladder. When the jars are cold, seal over the corks with sealing wax. The ordinary difficulty is with the vinegar. It is useless to try to make good pickles with sour ctier. Use a malt vinegar, if you can get it. 2 and 3. Beat the white of eggs to a full froth, with a little rose water; add, gradually, as much finely powdered sugar as will make it thick enough, beating it all the time. Use vegetable coloringmatter for the ornaments. This ought not to become rapidly discolored, if the sugar is pure.

C. S. K. asks: Why does a hair out of the tail of a horse, thrown into warm water, becom e animated in a few days, with apparently some of the characteristics of the snake? Answer: It does not.

J. A. asks: What is the law in regard to joint interests of employer and employee in case of patentable improvements on machinery? For instance, employer, A, is using new and peculiar machinery of his own device and construction; employee, B, is at work for A, for per diem wages, and he proposes changes and improvements which, with A's advice and consent, are put in at A's expense of time, material, and risk, some of which improvements in their details A requests to have tried; the improvements operate successfully; A proposes to have a patent, and orders a model constructed, which B goes on and builds, employing the as-sistance of other workmen of A. Now to whom be-longs the right of the patent? Can either party claim it for himself? Or does it belong to both? If B may claim it, what becomes of A's right and interest, the improvement being devised expressly for him at his expense and under his order and knowledge? Answer: The rule is that when an employer directs an employee to make a thing, giving him general instructions what to make, the invention belongs to the employer, the other party having merely exercised his mechanical skill in carrying out orders. But where an employee gets up a new improvement without such instruction, the invention belongs to him thoughmade while at work for another party. Where the invention of an employee is put into use with his knowledge and consent, the em-ployers have the right to continue the use of the specific machine thus made, atter a patent has been granted to the inventor.

J. P. says: I have observed the following phenomenon which I cannot satisfactorily account for. placed a lamp in a room some twelve feet distance from the wall, and held a plano-convex lens in the rays of light near the wall, and observed the focus to be a small speck; I then removed the lens into close prox imity with the lamp, and found the focus to be many timesgreater than in the former case. I also noticed that these were the only two points where a lens could be placed to form a focus or image upon the wall. What 1 wish to know is this: 1. Why does not the lens in the second case produce the same sized focus or imageas in the first? 2. Is it because the lens in the second case intercepts a greater number of rays and is incapable of converging to a small focus? 3. How may I clean a speculum which has become covered with fly dirt with out injuring the face? Answers: 1 and 2. There is only one position of the lens (with respect to the light of the wall) where a true focus can be obtained. This is where the diverging rays of light from the candle are refracted to a focus by the plano-convex lens. The nearer this lens is moved to the source of light, the more divergent the incident rays become; and consequently the less

W. E. says: 1. It has been the practice, in building up a wagon spring, to punch a slot in one lea and a nib on the other, so that the nib will enter the slot and keep the leaves straight. Where these slots and nibsare made, about one third of the strength has been destroyed; and thestrain is thrown on the weakest point and they soon break. If I make a spring without these slots and nibs, but, in the place of them, with an ear on wo inside corners of each leaf to rest against the inside edge of the next longer leaf, and thus, in connection with the bolts in the center, keep them straight, would it not be an improvement and patentable? Answer Probably the value of this method would depend upon the cost of manufacture. As to your water wheel query correspond with a manufacturer.

J. K. W. says: I have difficulty with my boilers on account of want of draft. I have 2 boilers set side by side, 12 feet long, 42 inches in diameter, with Safues each. They are connected with a breeching. The smoke stack enters at top of breeching, runs back about 4 feet, then turns at a rightangle and runs 10 feet, thence npwards 75 feet. Stack is 18 inches in diameter all the way from boilers. Is there any way to increase the draft except by enlarging the smoke stack? If not, how large should the smoke stack be to give sufficient draft? 1 very seldom have enough draft, except in very cold weather, and not always then; sometimes one boiler will have a fair draft and the other none at all. I tried a blower last winter, first in the smoke stack and after-wards under the grate bars, but failed to receive any bene fit. I have since tried a jet of steam in smoke stack taken from another boiler, running with 40 pounds of steam, but still fail to improve the draft. Iburn anthra cite coal. Answer: Possibly the chimney is not proper-ly proportioned. You do not send enough data to enable us to determine.

O. A. F. says: In your issue of October 26, 1872, in answer to E., query 10, page 216, A. H. G., of Mo. says: "Make a mixture of sal soda 40 pounds; gum catechu 5 pounds, and sal ammoniac 5 pounds, and use one pound of the mixture to each barrel of water used, and it will take the scale off the boiler?" 1. Will this mixture injure a boiler in any way; and will it take the scale off which is formed by different kinds of water? He also states that, after the scale is once removed, sal soda will prevent any more forming on the boiler: is that true? 2. I also wish to know how copper is deposited on iron wire, such as is used for pail bails. Answers: 1. We know nothing of the merits of this mixture, and would hardly recommend the use of sal ammoniac in a boiler. 2. We believe it is done by dipping them into a solution of sulphate of copper.

C. R. M. asks: 1. What is the best length of lead to give the valve of a steam engine? The cylinder is 14 inches by 20, making about 110 or 120 strokes per minute. The present lead is hardly one sixteenth of an inch. Manyyears ago, I had an engine of 2 feet stroke. The motion had to be reversed; and in doing so, the length of least was changed from almost nothing to about one fourth of an inch. The engine ran much faster with the same steam. Would it improve my engine to give it the same steam. Would it improve my engine to give it more than one sixteenth of an inch lead? 2. I wish to case my boiler. Ought I to use anything besides the planking; and if so, what is best? Will the board salone do? The boiler is on the locomotive plan. Answers: 1. We think you should give the valve, if set cold, about three eighths of an inch lead. Possibly you mayhave to try it at several points, before hitting upon the best position. 2. See our advertising columns for boiler covering.

J. S. M. asks: 1. What is the best way to filter the water after it has passed through a surface condenser? The steam goes in on the outside of the tubes, and water is pumped through the tubes by a cir culating pump. The air pump is a fresh water pump which pumps the water overboard ; there are two plunger pumps, which take the water from the bottom of an air chamber on the air pump. There is a delivery on the air chamber close to the top. 2. Why is the delivery at the top of the air chamber? 3. How do pumps draw the water when it is so hot? 4. Does this condenser have tube heads besides the outside heads? 5. If there is a cut-off on an engine, is there any need of the main valve to do more than just cover the ports? Answers: 1. We do not think that it is necessary to filter the water. 2. Probably for convenience. 3. The pump will drawwater unless the tension of the vapor is sufficient to overcome the vacuum that would otherwise be produced. Some pumps are fitted with relief valves, to allow the escape of the vapor when it exceeds a given pressure. 4. Yes. 5. It is not absolutely necessary, but it is sometimes convenient. You might find Auchineloss on "Link and Valve Motions," and Molesworth's "Pocket Book," use ful. Much of the information you want can only be acquired by practice.

C. W. D. asks: 1. What is the difference in velocity of a body, for instance iron or lead, falling through air or through a vacuum; and is the rule for computing the velocity the same? 2. Can air be used a fuel? 3. You say in your answer to A. M.: "The speci fications and drawings issued at the PatentOffice are di vided into classes, and those of any class are sent fo ten cents," but you do not say who sends them, your selves or the Patent Office. Answers: 1. In this calcu lation, the resistance of the air must be considered. $\boldsymbol{\boldsymbol{\xi}}$ We think not. 3. In our answer to A. M., we said that the price of the specifications of any class was ten cent You must send to the Patent Office at Washing ton for them.

M. E. J. asks: 1. What is the rule for find valve lever, and the proper distance from the valve of falcrum when the area of valve and number of pound pounds pressure per square inch is known? 2. Will th number of pounds indicated by steam gage show the number of pounds per square inch in the boiler? Al swers: 1. Box's rule is: If we have a 3 inch valve fu 45 lbs., steam, and the effective weight (of valve ar lever) on the center of the valve is 12 lbs., the distance from fulcrum to center of valve, and from fulcrum position of the weight, being 3'25 and 19'5 inches r spectively, or 1 to 6: Then, the area of a 3 inch valbeing 7.06, we have $[(7.06 \times 45) - 12] \times 3.25 \div 19.5$. $[(706 \times 45) - 12] \div 6 = 51$ lbs. 2. The steam gage, if good order and properly set, shows the pressure p square inch in the boiler above the atmospheric pre sure.

P. C. W. asks: Is it practicable to raise water 14 or 15 feet with a steam ejector through a 3 inch pipe? How many cubic feet of steam at a given pressure to 100 cubic feet water raised will be required? Will it be as economical as to use a steam pump for the work? Answer: The ejector will work very well under the circumstances mentioned; but probably it will not be as economical as a good steam pump.

T. asks: 1. Has there ever been discovered, and if so what is it, a geometric rule for trisecting any angle save a right angle? 2. Is there any known way by which a hyperbola or parabola may be trisected ! Answers: 1. An equation of the third degree is involved n the solution of this problem. 2. We do not understand what you mean by this question.

A. M. asks: How can I get iron out of dip-ping acid (nitric and sulphuric) which has accidentally been dissolved in it? It gives the brass articles a dull color when dipped in it. Answer: If the mixed acids are not too strong, you can precipitate the iron as prus. sian blue by the addition of dilute solution of yellow prussiate of potash (ferrocyanide of potassium). Add the vellow prussiate solution by degrees, stirring well until a bluecolor ceases to be formed, and then allow to settle. Pour off the acid from the precipitate.

used in the army. The weight of this gun is 220 pounds. the true focus is from the lens. 3. Rub gently with soap You might place your buckshot in canisters, and thus obtain a range of perhaps 500 yards: but the deviation of the balls at the end of their path would be over a space of fully fifty feet in diameter. The proper charge of powder is 3/2 lb. to the above mentioned weight of projectile. If you have facilities for making shells and understand the arrangement of time fuses, you can do good execution at 1.005 vards range, elevating your piece to 5º and cutting your fuse at 3 seconds. For further information, consult any standard work ongunnery, or the Army Ordnance Manual, whence you can obtainfull particulars as to caliber, material, length, etc.

W. P. asks: In heating a greenhouse by hot water, would it not do to carry the smoke alon the floor in an ordinaryheating flue, and thus utilize its heat instead of carrying it directly up the chimney as is usually done? Answer: A very common method of heating greenhouses is to carry the smoke flue along the floor, as you suggest.

R. asks: Which locomotive engine has the most power to start a heavy freight train, one with large drive wheels or one with small? Answer: The engine with small wheels has more tractile force, other things being equal, because the difference between length of crank and radius of wheel is less than in the case of an engine with larger drivers.

convergent are the rays after refraction, and the farther and water, using a soft woolen cloth, and then rub with chamois leather.

A. H. says: We have a breast wheel 25 feet diameter by 12 feet face. The wheel gears into a pinion3 feet in diameter: on same shaft with pinion is an intermediate gear 5 feet in diameter, which gears into another pinion 21/2 feet in diameter; on the shaft with last named pinion is the main drum, 8 feet in diameter, from which we belt to different parts of the mill. Recently we have added machinery so that the buckets of the wheel fill full and a small quantity of water spurts out at each side of the apron; at the same time we fall short of our regular speed about 4 revolutions on loom shaft, or about % of one revolution of the water wheel, which runs 7% feet per second on the rim. Can I lag the main drum sufficiently to gain the right speed as the wheel now runs, or would it be better to lag upmore and run the wheel slower? Would it be any gain in power, or effect any saving of water, to throw out the 5 feet intermediate and the 2½ feet pinion gear, put a larger drum on the jack shaft, and so get power and speed directfrom wheel? Answer: There will probably be a little gain if you throw out the intermediate gear; but lagging up the wheel will have no effect if the water wheel is not sufficiently powerful, as we judge, from your statement, is the case.

G. A. H. asks: Can sheet zinc be tinned If so. what is the process? Answer: We presume could be tinned by being placed in a bath of molten ti

T. F. de S. asks: How can I anneal lam chinneys? 2. What are carbon diamonds? Answei 1. Place themin cold water, and heat it slowly to bo ingpoint. Thenallowit to cool gradually. 2. Carb is supposed to be an element. It exists in crystalliz amorphous states. Soot or lampblack is a good ϵ and ample of amorphous carbon. Diamond is one form crystallized carbon.