ANSWERS TO CORRESPONDENTS

In our answer to T. C. E., page 331, current volume, 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.

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 in 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 dipping 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 prussian blue by the addition of dilute solution of yellow prussiate of potash (ferrocyanide of potassium). Add the yellow prussiate solution by degrees, stirring well until a blue color ceases to be formed, and then allow to settle. Pour off the acid from the precipitate.

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 then rub with plumbago, ordinarily called black lead. The ordinary stove polish is this substance prepared for the purpose.

J. A. M. asks: What is the best material for a bake oven? Answer: A brick oven will probably be the most serviceable, but you can make one of mud or clay.

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 deflect 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 galvanometers in any good text book on electricity.

J. H. M. says: 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 burn as much sawdust as possible. 2. Will some one describe a furnace 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 preferable 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 stationary engines and boilers, he will probably send you an engraving illustrating the arrangement of furnace. Perhaps 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.

D. T. T. asks: 1. What attractive or lifting 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 pretty 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 healthfulness of such sirup, and whether coffee may be considered a fair test for glucose? 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 sufficient 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 of tea with iron.

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 waterproofing boots and shoes? 3. We are using a locomotive boiler with 66 two inch flues; we have had great trouble with their leaking; we have had them reset, but 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 overheat 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, causing leaks.

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 soaking 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 poisonous, so that care must be exercised in using it.

J. T. A. asks: 1. Can buckshot be fired from a swivel boat gun, so as to kill large birds at 1,000 yards? 2. What would be the length and caliber of such a gun, and the proper charges of powder and buckshot? Answers: 1. No. 2. Your best plan would be to copy as nearly as possible the 12 pound mountain howitzer, used in the army. The weight of this gun is 220 pounds. 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 ¼ 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 yards range, elevating your piece to 5° and cutting your fuse at 3 seconds. For further information, consult any standard work on gunnery, or the Army Ordnance Manual, whence you can obtain full 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 along the floor in an ordinary heating 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.

H. D. asks for a formula for bay rum. Answer: Tincture bay leaves 5 ozs., otto of bay 1 dram, 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 reference to a machine, is a unit for expressing the amount of work that it is capable of performing in a 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 education 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 Department at 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 barometer 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 icing of cakes from rapidly 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; add 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 cider. 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 coloring matter 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, become 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 assistance of other workmen of A. Now to whom belongs 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 though made while at work for another party. Where the invention of an employee is put into use with his knowledge and consent, the employers have the right to continue the use of the specific machine thus made, after a patent has been granted to the inventor.

J. P. says: I have observed the following phenomenon which I cannot satisfactorily account for. I 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 proximity with the lamp, and found the focus to be many times greater 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 I wish to know is this: 1. Why does not the lens in the second case produce the same sized focus or image as 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 without 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 convergent are the rays after refraction, and the farther the true focus is from the lens. 3. Rub gently with soap 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 pinion 3 feet in diameter; on same shaft with pinion is an intermediate gear 5 feet in diameter, which gears into another pinion 2½ 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 ⅛ of one revolution of the water wheel, which runs 7½ 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 up more 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 direct from 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.

W. E. says: 1. It has been the practice, in building up a wagon spring, to punch a slot in one leaf and a nib on the other, so that the nib will enter the slot and keep the leaves straight. Where these slots and nibs are made, about one third of the strength has been destroyed; and the strain 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 two 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 38 flues each. They are connected with a breeching. The smoke stack enters at top of breeching, runs back about 4 feet, then turns at a right angle and runs 10 feet, thence upwards 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? I 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 afterwards under the grate bars, but failed to receive any benefit. 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. I burn anthracite coal. Answer: Possibly the chimney is not properly 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. Many years ago, I had an engine of 2 feet stroke. The motion had to be reversed; and in doing so, the length of lead 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 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 boards alone 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 may have 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 circulating 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 draw water 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 Auchincloss on "Link and Valve Motions," and Molesworth's "Pocket Book," useful. 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 specifications and drawings issued at the Patent Office are divided into classes, and those of any class are sent for ten cents," but you do not say who sends them, yourselves or the Patent Office. Answers: 1. In this calculation, the resistance of the air must be considered. 2. We think not. 3. In our answer to A. M., we said that the price of the specifications of any class was ten cents each. You must send to the Patent Office at Washington for them.

M. E. J. asks: 1. What is the rule for finding the number of pounds weight to hang on a safety valve lever, and the proper distance from the valve to fulcrum when the area of valve and number of pounds pressure per square inch is known? 2. Will the number of pounds indicated by steam gage show the number of pounds per square inch in the boiler? Answers: 1. Box's rule is: If we have a 3 inch valve for 45 lbs., steam, and the effective weight (of valve and 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 respectively, or 1 to 6: Then, the area of a 3 inch valve being 7·06, we have $[(7·06 \times 45) - 12] \times 3·25 \div 19·5$, $[(7·06 \times 45) - 12] \div 6 = 51$ lbs. 2. The steam gage, if in good order and properly set, shows the pressure per square inch in the boiler above the atmospheric pressure.

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

T. F. de S. asks: How can I anneal lamp chimneys? 2. What are carbon diamonds? Answers: 1. Place them in cold water, and heat it slowly to boiling point. Then allow it to cool gradually. 2. Carbon is supposed to be an element. It exists in crystalline and amorphous states. Soot or lampblack is a good example of amorphous carbon. Diamond is one form of crystallized carbon.

F. L. G. asks: What should be the dimen- ons of a pleasure boat, to use an engine and boiler of orse power? What size and pitch should the wheel ve? Answer: About 25 feet long by 5 feet beam; di- eter of propeller 20 inches, pitch 2 feet.

V. G. says: A friend says that he has a mmon suction pump that on some days draws water feet and upwards, perpendicularly. I say that no such mp ever did or will do it. Answer: You are right.

W. E. says: I have a wash pipe 1 inch in meter leading from a wash basin, having a common g, and protected by the usual cross bars. The pipe ead, and has become stopped by some object, I think ouse. How can I clear it out without taking it down? uld oil of vitriol do it, without destroying the pipes? swer: Use a solution of caustic potash.

W. B. G. asks: Are not conical bullets for ifle and other rifles made by punching, and how fast they be made by the machines now in use? Answer: machine in use at our arsenals was invented by a kman named Snyder, in the arsenal at Watervliet, . We think it makes about 40 bullets a minute, but not quite certain. Some of our readers will doubt- correct us, if we are in error.

. L. O. says: I have a 2 horse power en- working under 15 lbs. steam. The water in our hy- t pipe indicates 20 lbs. pressure; the engine is used for 2 hours per day. Could I use the hydrant water ead of steam in my engine? I think the amount of r used is cheaper than coal. Answer: Probably you l not make the change, with the present arrange- of valves.

L. C. asks: What will produce a very t permanent red color on leather, to be polished a hot iron? Answer: Scarlet morocco is and roans yed with cochineal.

B. G. asks: 1. How can I give a fine blue h brown color to small articles made from sheet 2. How, also, can articles made from sheet brass onzed? Answers: 1. After the articles are tem- , polish them, and heat to color, over a spirit lamp, harcoal fire, or a lead bath. 2. See p. 331, current ne.

F. B. asks: What is the lifting power of , the shape of which is an inverted isosceles trian- 10 feet perpendicular, surmounted by half a circle et diameter? Answer: We published on p. 331, t volume, a table of the force of the wind, at dif- velocities. Knowing the weight of the kite, and ection which the wind has, you can calculate the power.

F. asks: How can I make Babbitt metal? r: Melt 4 lbs. copper, add by degrees 12 lbs. best s. regulus of antimony, and then 12 lbs. more tin. , or 5 lbs. of the last quantity of tin have been reduce the heat to a dull red and add the re- r.

. A. asks: 1. How much power will it cut a plate of iron 1½ inches thick? 2. What the effect of expansion and contraction on the at St. Louis, Mo.? Answers: 1. The resistance ght iron to shearing is about 45,000 pounds per inch, on an average. 2. The effect will probably ise and lower the crown of the arch a little, if le structure is rigid.

I. asks: What is the difference in cot- tween ordinary and middling, for instance), and t detected? Answer: The classification of dif- rades of cotton is made according to length and of fiber, and is expert work.

. D. T. asks: Why is it that the sun and when first appearing over the horizon, seem ian when in the zenith? Is it owing to the pe ondition of the atmosphere near the earth? : Yes.

says: Chemistry teaches that, when a of hydrogen and oxygen contains common air y nitrogen) it will explode when ignited. There- e water for charging boilers were drawn from om of a deep tank, the superincumbent column would weigh more than the air (or more than 15 to the square inch) and all air would be ex- I think that all surface ground water con- losives in solution. In the tank containing ere should be arranged some flat vessels con- lumina or the like incombustible substance; explosives would be neutralized, the water ified for that purpose. Answer: We believe mmittee of the Franklin Institute made experi- this subject in 1837, and determined that ex- mpounds, other than steam, were not formed boilers.

R. asks: What is oil of citronella? Citronella is an oil procured by distilling the *andropogon schœnanthus*, which grows wild abundantly in Ceylon, whence this oil is chiefly

says: In Culpepper's "Complete here is mention made of a plant called Christ's of course is the vulgar or local name. What tanical name of that plant? Answer: You refer to the flower of the bush known as orn, or *paliurus aculeatus*.

asks: Is the ocean level? How much he city of New York than Liverpool? An- evel line is one that coincides with the gener- the surface of the earth, which is that of an eroid. The surface of the ocean would be an low tide, were it not for the wind. As it l varies in different locations. The difference e level of New York and Liverpool, if any, is .

P. asks: 1. What is carbon disul- Can I make a liquid of transparent color to e hands when bruised, so as to form a false swers: 1. Carbon disulphide is a compound and sulphur, made by passing the vapor of er fragments of red hot charcoal in a porce- d condensing the gaseous product. It is also lide of carbon, and sulphuret of carbon, and of carbon. 2. Collodion is used for the pur- ention. This is made by dissolving gun cot- oxylin, in a mixture of ether and alcohol. It er for you to purchase the collodion already a druggist, as its preparation involves skill specially in making the pyroxylin, which, s an explosive substance.

., asks: 1. Have the Bessemer steel he satisfaction to railroad managers anticipated considered, over a first class iron rail? 2. e silicon rail compare with the Bessemer in wers: 1. Yes. 2. So far as we know, very de of the silicon steel have been laid down, as not been enough time to enable a compar- ade.

D. B. P. says: I wish to run a woven iron wire cylinder in water, and to protect it from corrosion. Tinning does not answer the purpose, and galvanizing fills up the meshes. Can you suggest a remedy? The cylinder will be subjected to some wear. Answer: You might overcome the difficulty by constructing the cylin- der of wire cloth with a larger mesh than you require, so that, when it is galvanized, it will be of the proper size. Or you might have the cloth made of galvanized wire in the first place.

B. and P. say: We have to use swamp water for our boiler; it forms a soft muddy scale, easily scraped off, but it has to be done often. What is the best thing to hold it in solution that it may be blown off? 2. Water collects in our steam heating pipe and, freez- ing, bursts, or cracks it. What is a good cement for the cracks? Answers: 1. Probably your best plan will be to filter the water, before it enters the boiler. There are feed water heaters in the market that are said to remove all impurities which are held in solution. 2. We expect the best plan will be to renew the pipe. But you might try a cement made of red and white lead and fine iron borings. Put this over the crack, cover with a piece of tin, and wrap strongly.

F. N. says, in reply to A. R.'s query in re- gard to the locomotive, that air can be pumped in the boiler to almost any pressure where there is power suf- ficient to draw the engine; of course the engine is re- versed. I have frequently seen engineers oil their throttle valves by reversing their engines for a few sec- onds while rolling down hill just after tallowing the cylinders, when there was, perhaps, a pressure of 140 pounds of steam on the boiler. A. R. seems to think that the air would escape by the way it entered. The throttle valve prevents this by acting as a check.

T. B. J. says, in reply to L. W.: Brass can be stained a permanent dark brown by placing it in a mixture of iron scales 1 lb., arsenic 1 oz., muriatic acid 1 lb., and holding a piece of sheet zinc near it in the solution.

G. M. says, in reply to A. D., who asked for a remedy for snails other than salt: Put ashes with the seeds into the ground, or outside of them, wherever the snails may be found.

F. V. F. says, in reply to G. W. C.'s ques- tion as to two locomotives: If the wheels were of the same size on the two locomotives, it is evident that they would both reach the foot of the incline at exactly the same instant; but the wheels being of different diame- ters, it is equally evident that nothing can influence the relative motions of the locomotives on the incline except the friction of the two sets of wheels, which friction is found by experiment to be inversely proportional to their radii. Hence, since the radii of the two sets of wheels are to each other as ⅝ is to 1, the friction being inversely proportional to the radii, we have S : L :: 1 : ⅝, in which L and S indicate the large and small wheels re- spectively. Also, in the case of the smaller wheels, in consequence of their making a greater number of revo- lutions during the descent than the larger wheels, the rods, shafts, links, etc., attached to them would move faster, and hence increase the friction. I conclude from these facts that, since the locomotive with the four foot wheels has a little more than ⅛ as much friction as the other locomotive, the last mentioned locomotive will arrive at the foot of the incline in a little less than ⅝ of the time that it takes the other to arrive there.

A. G. Jr. says, in reply to J. N. Q.'s query as to coloring photographs: An exact representation of any transparent leaf or plant of any color or shade can easily be made by obtaining direct from the leaf a carbon negative, then using tissue, of the color desired, for positives. You can obtain, from the following so- lutions and their admixtures, almost any shade of blue, green, yellow, and brown. Solution No. 1, to be used as a bath: Dissolve 2 ozs. lead in nitric acid, and evaporate to dryness. Then dissolve 2 ozs. of the resulting nitrate of lead in rain or distilled water, in a glass or porcelain vessel. In another, dis- solve 2 ozs. of the ferricyanide of potassium (red prus- siate of potash), mix the solutions, and filter into a suitable bath. Then float, upon this, either plain or albumen paper, and dry in the dark. Then use a paper, or carbon, or ordinary photographic negatives as J. N. Q. describes. After finding the proper time to expose (and a few experimental failures will soon do it), immerse in the following solution to make a dark green leaf: bichro- mate of potash ½ oz., perchloride of iron ½ oz., water about one pint. For red: sulphate of copper 1 oz., water 1 pint. For brown: weak solution perchloride of iron and a little sulphate of copper. For dark brown, more iron and less copper.

E. J. O. says, in reply to J. N. N.'s query as to a common house fly, surrounded by a kind of opaque vapor, after death: It is a mold or fungus, and is caused by the bite or sting of the mosquito. I have watched the combat, and the mold or fungus is deposited during and immediately following the death struggles of the fly.

W. E. H. says, in answer to W.'s question as to mensuration of circles: I use rules that are not given in school arithmetic books: To find the cir- cumference of any circle: Multiply the diameter by 9 $\frac{5}{10}$ and divide by 3. To find the area of the same circle: Take $\frac{7}{8}$ of the square of the diameter. Having the circumfer- ence, to find the diameter: Divide the circumference by 19 and multiply the quotient by 6.

J. C. S. says: "When our belts slip, we pour castor oil on them just in front of the pulley, and the effect is always satisfactory; we also use tanner's or neats' foot oil on the outside of the belts. We run the grain side of our belts next the pulley, preferring always to use, for our own purposes, large pulleys and long belts, keeping them soft and pliable, and having them loose as possible."

C. H. R. says, in reply to C. C.'s question on page 250, current volume: The answer is: 12,533 lbs. less friction, which in this case would be over ½, and also less an amount in proportion to the distance the pin for the sheaves is placed from the ends of the lines.

C. M. N. says that A. M. can solder brass to brass by taking a piece of the brass to be soldered and adding a little silver while melted in a crucible. One eighth part of silver will do, and it will melt just as the piece to be soldered begins to flow. Two parts brass and one of silver is a good solder for brass, iron or steel.

J. E. E. says, in reply to C. C.'s question on page 250, current volume: Disregarding friction (which will be about ½), the pressure on W will be 72,833 lbs., four times the power (less friction) given by the use of the four pulleys.

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

R. W. H.—Your specimen is tripoli, of value as a polishing material.

H. S.—The black material is carbonate of iron.

J. J. T.—Galena or sulphide of lead, a valuable ore of lead, consisting of lead 85 and sulphur 13 parts, the remainder being oxide of iron or other impurity, with sometimes a little silver. Lead is obtained from it by roasting in a reverberatory furnace, and smelting the residue with coal and lime.

M. E. B.—Nos. 1 and 3 are trap rock, of no value. No. 2 is trap with spangles of plumbago, and perhaps some galena, disseminated through it.

J. T. C.—No. 1 is a vein of trap, of igneous or eruptive origin. No. 2, hornblende. No. 3. This is possibly metal- liferous at some depth.

COMMUNICATIONS RECEIVED.

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

On River Navigation. By G. W. I.

On Sexadigitism. By W. T. R.

On Ecclesiastical Bickerings. By J. R. P.

On Insect Nests. By A. B.

On Snake Poisons. By T. J.

On Flying Spiders. By E. F.

On Water Gas. By A. A. H.

On the Proposed Great Telescope. By W. M.

Also enquiries from the following:

W. A. B.—S.—E. N.—S. B. H.—J. P.—B. W. W.—J. C. —T. C. C.—G. S.—C. E. B.—J. W. P.—S. N.—A. L. B.— P. L.—J. M.—F. C. D.—J. A. V.—F. D. B.—J. P. L.— C. W.—M. F.—H. Z. T.—D. T. T.—J. M. S. Jr.

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.

[OFFICIAL.]

Index of Inventions

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APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

27,043.—LOCK FOR UMBRELLA STAND.—A. M. Foote. Jan. 21

27,185.—SOLDERING IRON.—A. Burbank. Jan. 28.