Chief Engineer's Office, U. S. Navy Yard,
WASHINGTON, November 18, 1874.

Commodore Thos. H. Patterson, U.S.N., Commandant:

SIR:—In obedience to your order of October 5th, 1874, o carefully test the EMPIRE PORTABLE FORGE, manufactured at Troy, N. Y., I have the honor to submit the following report:

* * * * * * This is a very excellent and convenient forge. It works easy and with but little noise, and the power being applied with a lever, it can be worked without interfering with the manipulation of the fire.

I can recommend it as a very useful tool for work on ship board or shop use.

Very respectfully, your obedient servant,
[Signed] EDWIN FITHIAN,
Chief Engineer, U.S.N.

Business and Personal.

The Charge for Insertion under this head is $1 a Line.

Notes & Queries

W. H. A. will find directions for bleaching beeswax on p. 299, vol. 31.—W. M. will find a recipe for silver-plating solution on p. 299, vol. 31.—W. H. M. will find directions for coloring putty on p. 107, vol. 31.—R. C. J. can plate iron with silver by the process given on p. 314, vol. 24.—W. H. W. will find an explanation of sailing faster than the wind on p. 176, vol. 28.—R. H. H. will find directions for bronzing on iron on p. 283, vol. 31.—H. E. will find directions for case-hardening iron on p. 69, vol. 31.—F. E. H. will find a recipe for marine glue on p. 43, vol. 32.—E. E. W. will find the recipe for furniture polish and also for finish for black walnut on p. 315, vol. 30.—J. K. S. and J. S. S. should each consult a physician.—C. G. M. will find a description of the wonder camera on p. 26, vol. 31.—C. C. S. will find directions for preparing muriate of ammonia for inhalation on p. 315, vol. 31.—W. H. and many others are assured that there is not and cannot be an instrument for indicating hidden treasure.—J. D. will find directions for softening and toughening wood on p. 319, vol. 31.

(1) W. J. A. asks: Will nitro-glycerin explode through a capillary tube? A. If we understand your question, yes.

(2) C. D. B. asks: What kind of oil is the best to preserve shoe leather, and to keep it soft? A. You will find neatsfoot oil the best.

Will a compound of cologne, hartshorn, tincture of cantharides, oil of lavender, oil of rosemary, and oil of nutmeg injure the skin? A. Probably not if used only a few times, and not in excessive quantity. Cologne is mostly all alcohol, which has a very injurious effect upon the skin, if used frequently, by dissolving out the natural oils, leaving the skin harsh and dry. If in the formula you present the oils are in excess of the alcohol or cologne, then the cologne is of no use on the skin and can be dispensed with; if, on the other hand, the cologne is in excess, the oils are of no use, as the uncombined alcohol is free to unite with the oils and fats of the skin. Unless the skin is diseased, the best lotion is cold water.

(3) F. S. asks: How can I use india rubber in either turpentine or naphtha without impairing its elasticity? A. Caoutchouc dissolves in bisulphide of carbon, coal naphtha, and rectified oil of turpentine. In these liquidsit first swells up very considerably, and eventually forms a ropy liquid, which, on evaporation, leaves the caoutchouc with its original elasticity.

(4) F. W. asks: How is nitro-glycerin made, and how is it exploded? A. See p. 91, vol. 32.

Is there such an invention as the screw of Archimedes for elevating water? A. The screw of Archimedes, called after the philosopher that invented it, is one of the simplest machines for raising water, and operates at only short distances. It consists of a tube wound spirally round a solid cylinder, the lower end of which dips beneath the water at an angle of about 35°, the upper end being supported by a suitable arrangement, and fastened on a crank, which serves to rotate it.

(5) R. S. G. asks: What are the ingredients of Seidlitz powders? A. Rochelle salts 1 drachm, carbonate of soda 25 grains, tartaric acid 20 grains. Dissolve the two first in a tumbler of water, then add the latter, and drink immediately.

(6) N. P. K. asks: 1. How can I prepare hard enamel? A. Mix 100 parts of pure lead with 20 to 25 of the best tin, and bring them to a low red heat in an open vessel. The mixture then burns nearly as rapidly as charcoal, and oxidizes very fast; skim off the crusts of oxide successively formed, till the whole is thoroughly calcined. Then mix all the skimmings and again heat as before, till no flame arises from them, and the whole is of a uniform gray color. Take 100 parts of this oxide, 100 parts of white sand, and 25 or 30 of common salt, and melt the whole by a moderate heat. This gives a grayish mass, often porous and apparently imperfect, but which runs to a good enamel when afterwards heated. 2. How can I bring a low quality of gold to the color of 18 carat gold? A. Alloy it with the proper proportion of silver and copper. 3. I have a quantity of silver melted with lead; it is so brittle that I cannot roll it. How can I get it in condition to work? A. The desired object may be attained by melting the alloy in a cupel formed of bone ashes. The lead is gradually oxidized, melted, and absorbed by the porous material composing the cupel.

(7) H. P. A. says: I am now using the sap part of the white wood tree, cut to the thickness of 36 to the inch. In order to cleanse it of the sap and woody taste, I boil and frequently change the water, yet do not get it tasteless. How can I cleanse it of the taste without injuring the strength of the wood? A. Try weak lye, and water afterwards.

(8) T. B. C. asks: Is there any way of restoring marble that has been spotted with lemon juice? A. Marble being a carbonate of lime, the action of such an acid upon it would be to enter into combination with the lime, expelling the carbonic acid, forming a different body from the original marble; and from the fact of its being a mealy powder, it was easily wiped away without notice, leaving behind it the blur or depression in the surface of the polished plate you speak of. We do not think it can be remedied.

(9) H. S. says: What is the simplest way to make an apparatus for blowing glass, such as is used by men that travel the conntry? A. What you require is a current of air forced upon a flame produced from a wide illuminating surface, as a large wick, or, better, a gas flame widened and then subjected to the current of air.

(10) A. C. B. asks: 1. Is there any way to harden coin silver? A. We do not know of any. 2. Is there any hard metal or alloy that can be used for fine work, and will not scale when heated? A. Try the alloy known as packfong, or German silver, a compound of nickel, zinc, and copper, in which the proportions vary considerably. A good alloy consists of 5 equivalents of copper, 3 of zinc, and 2 of nickel. Packfong is of a yellowish white color, and, when newly polished, closely resembles silver in appearance.

(11) F. C. asks: Will anything dissolve lithia carbonate except carbonic acid water? A. Yes, ammoniacal salt.

(12) H. H. asks: How can I make bisulphate of tin? A. You probably mean bisulphide of tin ($Sn S_2$), known also as mosaic gold; it forms a beautiful yellow flaky compound, which is obtained by preparing an amalgam of 12 parts of tin and 6 of mercury; this is reduced to powder and mixed with 7 parts of sublimed sulphur and 6 of sal ammoniac. This mixture is introduced into a flask with a long neck, and is heated gently so long as any smell of sulphuretted hydrogen is perceptible; the temperature is then raised to low redness calomel and cinnabar are sublimed, and a scaly mass of $Sn S_2$ remains. If the heat be pushed too far, part of the sulphur is expelled and the operation fails; the sal ammoniac appears by its volatilization to moderate the heat produced during the sulphuration of the tin, which would otherwise rise so high as to decompose the bisulphide.

(13) F. C. and others.—Most medical authorities agree that the right side is the better to sleep upon; but this is not always the case, the number of persons who sleep upon the left being as many as those who use the right side. It is simply a matter of convenience and ease, it being folly to insist upon a person to use one side when it is a discomfort.

(14) J. W. asks: 1. What is the tenacity of gold? A. It will take 24·20 lbs. weight to break a gold wire having a sectional area of a square millimeter, if the gold be annealed. If the gold be drawn, it will require 61·60 lbs. to break it. 2. When gold is consumed by fire, what is the color of the flame? A. Molten gold exhibits a sea green color. 3. What is the color of light transmitted through a pellicle of silver? A. Bluish. 4. When silver is consumed by fire, of what color is the flame? A. The spectrum of silver is green. 5. How can cinnabar be converted into a yellow pigment? A. Continued pulverization will change the brick red color of cinnabar to an orange yellow.

(15) F. W. B. says: I have some white silk which has become yellow by washing. How can I restore it to its original color, without injuring the silk? A. Try steeping it for a short time in vinegar or lemon juice, after having perfectly cleaned it. Rinse in cold water.

(16) J. H. L. asks: How can I illuminate tableaux with a strong light, and have changes of color without resorting to the use of disagreeable compounds? How can I prepare and use the calcium light for the above purpose? A. The magnesium light is sometimes used for this purpose. The method of obtaining it consists in burning maguesium ribbons which may be obtained from any chemist or dealer in theatrical goods. In the calcium or lime light, an ignited jet of the compound gas (oxygen and hydrogen) is caused to impinge against a small cylinder of caustic lime. In the apparatus used for this purpose, the gases are conducted by separate tubes to the burner, which they enter at opposite sides, a few inches from the tip of the burner. The burner or jet should be bent towards the vertical surface of the lime at an angle of about 45°. The lime should approach the tip of the jet within $\frac{1}{16}$ of an inch. The gases are kept in separate bags of india rubber. The oxygen gas is obtained by heating together, in an iron or copper bottle, chlorate of potash with one quarter its weight of peroxide of manganese. Hydrogen gas may be obtained by acting upon scraps of zinc in a large bottle with dilute sulphuric acid. The first portions of the gas, if obtained in this manner, should be allowed to escape, otherwise its mixture with the air in the apparatus forms a very explosive mixture. Ordinary illuminating or coal gas, if obtainable, will answer the purpose as well as pure hydrogen. Both the above gases are washed before being allowed to enter the bags. This is arranged as follows: A small bottle is obtained, which is partially filled with water; through a tightly fitting cork in the mouth of the bottle pass two glass tubes, one of which passes down and dips beneath the surface of the water, the other barely passes through the cork. In order to use this washer, the tube which dips under the water is attached by rubber tubing to the generating flask, and the end of the other tube, which just passes through the cork, is attached to the receiving bag. Thus arranged, the gas as generated is required to pass through the water. Care should be taken (in the generation of the oxygen) at the end of the operation that the water in the bottle does not run back into the generating flask, otherwise an uncontrollable quantity of steam will be generated from contact of the moisture with the hot metal.

(17) F. N. J. and others.—The statements made as to the preparation of musk are on the authority of a work recently published on perfumery, and presumably reliable.

(18) D. S. M. asks: 1. What effect will alum water have on flour when used for dampening wheat before grinding it? A. Probably the same as when applied after the wheat is ground, as is often done by bakers. 2. Will it toughen the wheat so as to give a better yield? A. We think not. 3. Is it injurious to health? A. Yes. This method of whitening the bread is prevented by heavy fines and penalties in England.

(19) S. C. B. asks: Does soap boilers' refuse contain anything unfavorable to its use for agricultural purposes? A. Not that we know of.

(20) W. O. P. says: We frequently find melted lead flowing from stove and grate in which we are burning coal. A boy once showed me a piece of what I presume was lead ore; I could cut it with ease with my pocket knife. A few days ago we heard a snapping report in the stove, and melted lead splashed out on the floor and burnt my brother's hand. Are not these facts indications of lead in quantity somewhere in the district? A. Yes. 2. If so, would it be found above or below the coal vein? A. It might be found below as well as above. 3. If there be lead, how could the vein be most easily found? A. By carefully examining the exposures of the rocks for the vein, and by surface indications of minerals containing lead.

(21) K. B. F. asks: Is carbolic acid a poison taken internally or applied outwardly? A. It is a poison in both cases. It acts similarly to creosote.

(22) S. T. asks: How are paper magnetic fish made, so that when they are put in the palm of the hand they will draw up and turn over as if alive? A. They are made of thin gelatin, called gelatin paper. Collodion films may also be used for the same purpose.

Will tobacco smoke have any effect upon soft rubber tubing? Will vinegar corrode it? A. Neither will have any permanent effect.

(23) J. S. & Co. ask: What is a good solution for tempering steel for drilling rock? A. Be careful not to overheat it in hardening and forging, and quench in salt water, drawing to a brown color.

(24) J. P. S. says: I recently came across a strange stone; it weighs 2 or 3 tuns, and is formed of small stones about the size of a hen's egg. It seems to have been ground off on the outside, for it is perfectly smooth. It lies half a mile from a small stream, and on a hill fully 100 feet above the stream. What is it? A. Such rocks are called conglomerates, and are quite common in some parts of New England and elsewhere.

(25) O. A. Jr. asks: How can I drill hard cast iron, without annealing it? A. Harden the drill to a straw color, and run it slowly.

Should an icehouse be set on or above the ground? A. See p. 251, vol. 31.

(26) W. W. B. says: An apparatus for gold and silver plating is constructed as follows: Bath: 4 ozs. cyanide of potassium and 4 ozs. carburet of ammonia, dissolved in 1 gallon rain water. Then add 12 grains gold (or silver), apply battery, and add blue vitriol until a blue color is obtained. Battery: Put nitric acid in the porous cup, and diluted sulphuric acid in the outer. Suspend a carbon plate in the porous, and zinc in the outer, with small copper wires. I use the gold solution hot. I am very careful to clean thoroughly the articles plated, but the work will not last six months. Can you inform me of a process by which I can do plating that will last one, two, or three years? A. To make a silver solution, dissolve the silver in four parts of nitric acid and one of water; the diluted acid is heated in a vessel and the silver added by degrees. After the metal is dissolved, put it in a large vessel and dilute with water. Then add a solution of cyanide of potassium so long as a white precipitate is formed. When the precipitate of cyanide of silver has settled, the clear solution is carefully decanted, and the vessel filled with water, which is again decanted as soon as the precipitate has settled. Repeat this three or four times, and then add a solution of cyanide of potassium until the precipitate is all dissolved. The solution is then ready for use, after filtering. Dilute the cyanide of potassium so that the plating solution shall contain one ounce of silver to a gallon. A preparation of solution of gold is prepared by dissolving gold in three parts muriatic acid and one of nitric acid, which forms the chloride of gold. This is digested with calcined magnesia, and the gold is precipitated as an oxide. The oxide is boiled in strong nitric acid, which dissolves any magnesia in union with it. The oxide, being well washed, is dissolved in cyanide of potassium, which gives cyanide of gold and potassium. A Smee or Daniell battery is better than a carbon battery for silver and gold plating.

(27) B. D. T. asks: How are plow castings chilled? A. Cast them in an iron mold, and let them cool in the mold.

(28) L. G. asks: 1. What kind of grease is best to use in the oil cups of engine cylinders? A. Tallow. 2. Which oil is best to use on engine slides? A. Lard oil.

(29) Y. P. says: I have made a nickel solution of 1 lb. sulphate of nickel, and 4 ozs. sal ammoniac or chloride of ammonia to a gallon of sul-

phate of nickel. I used fluid ammonia to make it neutral. I use a 3 cell Smee battery. The work comes out black. Can you give me a remedy? A. Dissolve the nickel in nitric acid and then add carbonate of potash to precipitate the metal. Wash this well and dissolve it in cyanide of potassium. Use a plate of nickel for a positive electrode. Dissolve your platinum wire in a mixture of nitric and muriatic acids. Wash your silver plate in nitric acid and brush it until a frosted appearance is obtained. Then wash it in water thoroughly, and place it in a vessel containing dilute sulphuric acid and a little nitro-muriate of platinum. Place in the vessel a porous tube containing a few drops of dilute sulphuric acid. Put in the tube a piece of zinc and connect the zinc with the silver plate. In a few seconds the platinum will be deposited upon the silver as a black powder, and the platinized silver is ready for use.

(30) H. M. D. asks: What is the best method of truing up an ordinary carpenter's grindstone? A. Use a ¾ bar of iron, or a gas pipe, for a turning tool, below the center of the stone.

(31) A. J. G. says: I have a tin roof laid on matched boards, which is 20x34 feet. It is nearly airtight, without any windows. In cold weather, a very heavy coat of hoar frost collects inside; and when it thaws, the moisture drops down to the plastering and is spoiling all of the ceilings in the upper stories. Can I prevent the hoar frost collecting by putting a ventilator in the center of the roof? If so, what construction is best? A. The appearance of water in such quantities under your roof would seem to indicate a concealed leak in the tin; but if the frost shows itself in every part, and there is evidence that it arises from the condensation of water from the atmosphere, it is, to say the least, rather unusual, and the remedy should be sought in an increased ventilation. Your best plan to effect this will be to provide openings under the eaves of the house, and on two opposite sides thereof, so that the air may pass through the roof space: these may be placed close under the roof cornice, so that they may be protected from the entrance of rain, etc.

(32) W. M. L. asks: What kind of treadle should I put on a foot lathe to use either end of the lathe? A. Make your treadle as long as your lathe bed.

(33) F. E. W. says: In your answer to W. E. W. you say that musk is prepared from a root. In Griffith's "Universal Formulary" may be found the following: "Musk is a peculiar concrete substance obtained from the *moschus moschiferus*, a small animal of the deer kind, inhabiting the mountainous regions of Central Asia. The musk is secreted in the male, in an oval sac, situated near the generative organs. It is found in commerce in these sacs; it is concreted or granular, of a brownish color, soft and greasy to the touch, of a powerful, penetrating odor, and of a bitter, unpleasant, and somewhat acrid taste. From its high price, it is very liable to adulteration. It is antispasmodic and stimulant, and has been much used in spasmodic diseases of all kinds, as well as a stimulant in low states of the system. The dose from five to ten grains."

(34) W. M. N. asks: How can we temper steel springs made from the ends of Bessemer rails? A. Try a very low red heat, and quench right out in water.

(35) S. C. C. D. says: 1. F. wants an internal gear made with pinion turning on same center, both to revolve in definite proportions (say two or three to one). I contend that there must be an intermediate to transmit the motion. Am I right? A. Yes. 2. Please give the relative proportions. A. The proportions are the same as for outside gears. See p. 187, vol. 29.

(36) J. L. H. asks: 1. How can I temper cold chisels and punches? A. Heat to a red, and quench in water, drawing to a blue. 2. Can I make knives (for a shaping machine) out of vertical mill saws $\frac{3}{16}$ inch thick? A. They are excellent material for the purpose. 3. How can I anneal and temper them? A. Anneal in lime, and draw to a brown color.

(37) W. P. S. asks: Will a circular cutter on a lathe mandrel answer for beveling the edges of pasteboard for bookbinding? A. No. Such material should be cut with shears, to avoid a burr on the edge.

What kind of wood is best for cutting screws with a chaser or screw box? A. Boxwood.

(38) R. T. W. asks: What can I use in lard oil to prevent it from chilling or becoming thick? A. A good variety of kerosene oil would answer your purpose much better.

How can I procure the drawings, etc., of all machinery patented in the United States? A. Apply by letter at our office for copies of the patents. See our prospectus in this issue.

I have a mercurial thermometer which indicates −55° Fah. this winter. Can it be correct? I thought mercury congealed at −39°. A. Mercury freezes at 39·5° Fah. Lower temperatures are measured by thermometers in which the mercury is replaced by colored spirits of wine.

(39) H. L. C. asks: How much fuel is required to melt 1 tun of cast iron? A. Probably 2 or 2½ times the weight of the iron.

(40) N. D. S. says: I have a water tank made of two inch pine planks. It is round and hooped like a barrel, and is about 4 feet high and 4 feet in diameter. It is about 20 feet above the supply. I want to attach a supply pipe to the tank, put in a check valve with a safety valve on the top, and fill the tank with steam: and as it condenses, let it fill itself by the supply pipe. Will the tank stand the pressure? A. It will most likely be difficult to make your wooden tank steam tight and keep it so. A better way to fill it by the direct action of steam is to provide a small cylinder below, supply the steam at the top of it, and have two pipes leading from the bottom, one down to supply the water to the cylinder, and the other up, through which to force the water to the tank. Provide proper valves to these pipes. Let the steam enter at the top and expel the air; condense the steam by a jet and the water will enter from the supply pipe and fill the cylinder; let the steam enter again on top of the water and it will force it down and out through the rising pipe to the tank; then condense the steam again, and the operation will be repeated. Now, if you make your valves work automatically, you have an automatic pump.

(41) N. C. H. asks: What will remove a coating of paint from windows? A. Try turpentine and linseed oil.

(42) W. B. W. asks: 1. Are the carbon points used for electric lights the same as used in Bunsen's batteries? A. Yes. 2. Would a double convex or a plano-convex lens increase the brilliancy of an electric light any more than a plain window glass with a strong reflector placed behind it? A. No.

(43) F. B. asks: What are the arrangements of the circuit in an induction coil, and what is the best material for the core? The coil is intended for a shocking machine. A. An induction coil consists of a primary and secondary coil wound into a bobbin, or each may be wound on a separate bobbin, and the one placed inside the other. The primary coil is made of wire $\frac{1}{16}$ of an inch in diameter and covered with cotton or wool; the secondary coil is made of silk-covered wire $\frac{1}{80}$ of an inch in diameter, and is ten or twenty times as long as the primary. The core consists of a bundle of iron wires. Attach a battery to the two ends of the primary coil, and when the circuit is closed or broken, a shock will be produced by taking hold of the two ends of the secondary coil.

(44) W. E. D. asks: 1. Which is the strongest magnet, one wound with fine or with coarse wire? A. For lifting weights, coarse wire; for working over long telegraph circuits, fine wire. 2. Does the size of the iron of which the poles are made make any particular difference as to the strength of the magnet? A. The iron should be about one third as thick as the coil. 3. I have made a magnet with spools 2½ inches long x1¾ inches diameter, outside measurement, and made the poles of ½ inch iron. I wound the spools with No. 26 insulated wire, putting 600 feet on both spools. The power is not as strong as I expected it would be. What is the cause? A. If you use more battery, your magnets will be stronger. 4. Will lightning strike insulated wire? A. Lightning will strike anything. 5. Supposing a line of galvanized wire is used outside, and is connected with insulated wire where it enters the house, would that be dangerous if I do not use lightning arresters? A. It would be dangerous to the instruments. You had better use the arresters.

(45) B. J. K. asks: 1. Is it true that, with Edison's automatic telegraph, 500 words can be transmitted per minute? A. Yes, on short lines, say 100 miles long or less. 2. Do you think it will ever be generally adopted and drive the sounder out of use? A. No. 3. Can you give me a description of it? A. It is substantially the same as Bain's telegraph. The additions are a new mechanical puncher and a method of neutralizing, to some degree, the static charge. 4. What books should a telegraph student read to obtain a perfect knowledge of telegraphy? A. Culley's, Sabine's, Pope's, Turnbull's, Shaffner's, Prescott's, Jenkin's, and Bakewell's in English. In German, Schellen's is the most complete work.

(46) A. F. O. says: I have heard just enough about the single fluid bichromate of potash battery to cause me to desire to know more about it. If it is, in point of simplicity and efficiency, what it seems to be, it is a most desirable addition to the laboratory. It uses but a single fluid, that can be kept in bottles for any length of time; the zincs and carbons cannot deteriorate when laid away, and must be ready for immersion at any time. No porous cells are needed. What are the chemical reactions, and in what manner does the exciting fluid deteriorate, how may it be renovated, and when must it be renewed? A. The single fluid bichromate of potash, or Grenet, battery is a very good form of an experimental battery where constancy of current is not required, as, for example, in the laboratory and mechanical workrooms. The cell is in the form of a bottle, and contains a mixture of 2 parts bichromate of potash, dissolved in 20 parts hot water and 1 part sulphuric acid. The top is provided with a brass frame, to which is fastened a wooden cover. To this cover are attached two carbon plates which permanently dip into the fluid; and between the carbon plates a zinc plate is suspended, which may be plunged into the fluid or withdrawn at pleasure. When the zinc is withdrawn, the action ceases. The battery gives a powerful current for a short time, but rapidly polarizes. The length of time during which the fluid will retain its power depends upon the use which is made of the battery. It is not suitable for continuous use; but in all cases where a powerful current is required for a brief period, it is a very desirable and economical apparatus.

(47) C. E. G. asks: Can I warm a three story wooden building, 80x45 feet, thoroughly by putting two hot air furnaces in the cellar? A. Your building is not so large but that it may be heated by two good sized ordinary hot air furnaces. Apply to the party from whom you intend to procure your furnaces before you build, so that the location and size of the flues (which should be large) may be properly determined.

(48) I. O. T. says: 1. I am making an induction coil; it is 7½ inches long, has a center bundle of soft iron wires of ⅝ inches diameter, and I propose to make it with a diameter of about 4 inches. The inducing coil consists of copper wire (100 feet to 1 lb.) and there is about 40 yards of it. On this is now coiled 700 feet of wire (14,000 feet to 1 lb.) and I get quite a strong shock. How much more of a smaller size (18,000 feet to 1 lb.) ought I to coil on this to get a spark of at least ¼ inch long? A. You would require to add a condenser to accomplish this. 2. My battery is of the Callaud gravity kind, made in quart glass jars. How many of these will equal one of the Daniell kind? A. One. The electromotive forces of the Callaud and Daniell battery are similar. 3. In these batteries, what would be the effect of leaving the wire from the copper plate on the bottom of the jar uncovered? A. It would be eaten off. 4. If the strength of the induced current depends upon the intensity of the inducing current, why not pass the current into a small induction coil and then use the induced current as an inducing one for a larger coil? A. It does not depend upon the intensity, but upon the quantity. 5. What is the black substance that falls from the zinc to the bottom of the jar? A. Copper, deposited in a metallic form. 6. Does it do any harm to let it collect? A. It ought to be removed occasionally. 7. The zinc is sheet zinc, amalgamated. Is this right? A. It ought not to be amalgamated. 8. What is the best form of battery that can be transported, and used while it is being transported, or while the liquids are agitated a little? A. Daniell's or Léclanché's. 9. What is the white salt-like substance that accumulates in the top of the jars? A. Sulphate of zinc, crystalized.

(49) C. M. B. asks: Should the follower pinch the rings of the piston, or should they be loose so as to be acted on by the springs? A. Let them be just movable by hand.

(50) C. F. B. says: 1. I made a battery of two cells, which fails to give a current. I filled the outer glass jar, 6 inches deep and 4 inches in diameter, two thirds full of a concentrated solution of sal ammoniac. In this I put an amalgamated zinc electrode (5 inches long by ¾ inch diameter. The carbons were packed tightly into the porous cups with a mixture of finely powdered black oxide of manganese and gas carbon, 3 parts of former to 1 of latter. Where is the mistake? A. You should use coarsely powdered manganese oxide. 2. In the battery made by C. and F. Fein, of Stuttgart, how are the platinum plates used to make the connection between the copper wires and the charcoal plates? A. They are clamped together. 3. How large are the plates? A. They vary according to the size of the jar. 4. How many Leclanché cells are required to ring an electric bell with 300 yards of ordinary telegraph wire, insulated? A. About 4.

(51) A. M. R. asks: How can I get intermittent rotary motion of a wheel, 12 inches in diameter, by cogs, an 8 inch wheel being on the driving shaft? A. Have cogs on the driving wheel that only act during a portion of the revolution.

Is there a dry color lighter than blue that will dissolve in water when cold? A. We think it quite likely. Apply to a manufacturing chemist.

(52) R. B. R. asks: How does the engine, illustrated as operating the water belt on p. 278 of *Science Record* for 1875, operate? A. A reciprocating engine will answer, as all that is necessary is to make the large wheel revolve at a high speed. In the engraving it appears to be a rotary engine.

(53) J. V. asks: Will ice form on the bottom of a river as well as on the surface, on either rocky or sandy bottom? A. No.

(54) E. B. T. asks: What is a good preparation with which to cover the deck of a boat? A. Good timber, well seasoned, is advisable. There are numerous patent processes for preserving timber by which it is said that green wood is rendered durable.

(55) X asks: Why does the lead eccentric on any kind of a link motion engine wear away more quickly than the other? A. It ordinarily does more work than the other.

(56) H. P. asks: What sizes of cast iron and wrought iron screws are necessary for a cotton press, pressing 500 or 600 lbs. bales with one horse? A. Cast iron, 3 to 4 inches diameter; wrought, 2 to 3 inches. 2. Will an ordinary lifting pump raise water 32 or 33 feet? A. No. 3. What is the probable horse power of an engine, with a cylinder 6x12 inches stroke, pressure 50 lbs. at 100 revolutions per minute? A. From 10 to 12.

(57) F. H. H. asks: 1. Will any object sunk in very deep water remain suspended after reaching a certain depth? A. It is quite probable. 2. Is it true that divers have to hang weights upon themselves so as to keep at their work? A. It is frequently necessary, because the diving suit increases the displacement, and the water at the bottom is more dense than at the top.

(58) C. asks: Which part of a wheel revolving on the ground travels fastest going horizontally through the atmosphere? A. The top.

(59) L. E. D. asks 1. Does a native of a tropical climate suffer as much from cold in his own country as in a temperate one? A. A person accustomed to a tropical climate suffers more from cold. 2. Will he, going from a colder climate into a warmer one, suffer as much from cold as in the colder climate? A. He will suffer more by a certain fall of temperature in the warm climate than by the same decrease of temperature in the cold climate.

(60) W. L. says: I have a private telegraph line about one quarter of a mile long, and use a return wire instead of the ground. During a recent storm, a bracket came off one of the poles and for about one hundred feet the wires are wound one around the other. I supposed that the current from the batteries at either end would follow one wire to where they came together, and then return by the other wire to its original battery, and so make two local circuits, but no through current. But on opening my key, I found I could communicate with the office at the other end without any difficulty whatever, and we have been working with the line in that condition for a week with scarcely any inconvenience. It recently rained nearly all day, and for a short time I was unable to get a circuit; with that exception I have had no difficulty. I have come to the conclusion that the wires are very rusty and thus insulated. The wires swing enough to scrape all the rust off of each of them. Am I right in supposing that they are insulated by the rust? A. When two or more paths are open for the passage of an electric current, it will follow each in proportion to the facilities afforded. In the case in point a portion of the current returned *via* the cross, but enough got through to work the instrument. If the two wires had been a couple of hundred miles in length, very little of the current would have reached the distant end. If your two wires were laid on the ground without any insulation, they would work, because the current follows the wire in preference to the earth for so short a distance.

(61) I. M. W. asks: What is the difference between a galvanic and a faradic current, or between galvanization and faradization? A. The term galvanic is sometimes applied to currents produced directly from a battery, and faradic to those produced by induction. In other words, the former term is applied to primary and the latter to secondary currents. The distinction is rather fanciful, and not sanctioned by the best authors.

(62) T. B. S. asks: What is the rule for determining the electromotive force necessary to overcome a given resistance? A. The force required depends upon the power you wish to develope. The Atlantic cable can be operated with a battery consisting of a percussion cap, a bit of zinc wire, and a pinch of salt. This minute battery, which has an electromotive force of only half a volt, is sufficient to overcome the resistance of a wire extending across the ocean, and then to possess power enough to work Thomson's galvanometer. On the other hand, a small electric motor frequently only has 50 feet of coarse wire, and requires a battery of 50 volts to work it. The power or strength of current is ascertained by dividing the electromotive force by the resistance. Thus if E represents the electromotive force, R the resistance, and P the power of the current, then the following formula will always give it correctly:

$$P = \frac{E}{R}.$$

(63) F. G. asks: What is the momentum of 1 lb. after 17 inches fall? What is its momentum after 198 inches fall? What is the formula used to solve such problems? A. Multiply the weight in lbs. by the time in seconds.

(64) J. L. B. says: 1. I am running an 8 horse power portable engine, and am troubled with foaming. What causes it, and how can I prevent it? A. It is probably caused by dirty water. Clean the boiler, and blow off frequently. It may be due to a defect in the boiler. 2. The barrel of my boiler is 30 inches in diameter, of ¼ inch iron, the firebox being a little thicker. According to Bourne's rule, I make the highest safe working pressure about 80 lbs. per square inch. Would it be unsafe to carry 100 lbs., which would be but little more than ⅙ of the bursting pressure? A. We would not recommend it. 3. In a recent issue you recommend a good feed water heater and frequent blowing off to prevent scale. Do you mean to blow off a portion of the water from the bottom of the boiler? A. Yes. 4. Suppose two tight cylinders or barrels, each having a perpendicular pipe inserted, the pipes being of equal hight but of different diameters (¼ inch and two inches respectively), and all these filled with water, would the pressure per square inch be the same in each barrel? A. At the same relative point in each, it would.

(65) W. H. G. asks: How is brass spun? A. The brass is secured to a pattern on a revolving mandrel, and a blunt tool is pressed against it. 2. Is there any work on the subject? A. We think not.

What is meant by mule spinning? A. The mule is a technical name of a machine for spinning cotton.

(66) W. H. C. says: 1. I supposed that water is only slightly condensed by the greatest pressure, but Steele's "School Philosophy" says the water at the bottom of the ocean is very much condensed by the great pressure. Is this correct? A. Water is compressed about 0·0000033 for each pressure of one atmosphere that is applied. 2. How much does this condensation amount to at the greatest depths? Is it true that, in the deepest parts of the ocean, heavy bodies, such as rocks or even iron and lead, do not sink to the bottom? Does the great pressure upon deeply submerged substances tend to increase their buoyancy independently of the condensation of the water? A. It is easy to see that, even with this slight compression, water may become much more dense at great depths. A submerged body is pressed downward by its own weight, and upward by the weight of an equal volume of water, so, of course, if the water is sufficiently compressed, any substance will float in it. 3. Do you think the freshly drowned human body, divested of clothing, will sink to the bottom of the deep sea? A. No.

(67) E. G. says: 1. I am making a sawing machine to run by foot power. What sized saw can I use? A. About 6 inches in diameter. 2. How many revolutions per minute should the saw run? A. About 400 or 500. 3. How many revolutions should a bit in a boring machine run per minute? A. About 400 or 500.

(68) T. B. K. says: Our steam tug ordinarily draws 9 feet of water, when loaded 10 feet. Her propeller is 7 feet 1 inch in diameter, with 4 blades; the greatest width of blades is 30 inches. It is placed as low down as admissible, so that its ordinary immersion is 2 feet below the surface of the water. It is driven by an upright 24 inch direct action cylinder, of 24 inches stroke. With 45 to 50 lbs. of steam she handles the wheel like a toy, and tows well. We are about to build a new hull, with same draft of water. We can carry 80 to 100 lbs

Can we not, with perfect propriety, carry a larger wheel? Our present shaft is 5½ inches. If we enlarge the wheel, will it be necessary to enlarge the shaft? A. We think that you can safely increase the diameter of wheel to 8 feet, and that a 5½ inch shaft will be large enough.

(69) L. H. R. asks: 1. I heard a gentleman from Utica say, the other morning, that his mercury thermometer stood at −41° Fah. Is it not to be doubted? A. The thermometer could not quite indicate correctly, as mercury freezes at −39·5° Fah. 2. Has alcohol ever been frozen? A. No.

(70) J. D. S. asks: Why would not the rotary blower, described in the SCIENTIFIC AMERICAN of January 23, 1875, make a good steam engine by admitting the steam at D and exhausting at E? A. It would probably not be economical.

How much will a cubic inch of nitro-glycerin expand on explosion? A. About 13,000 times.

(71) C. S. A. says: The amount of rain that has fallen in this country for the past ten years will average about 46 inches. If a vessel is set to catch rain water, and the water allowed to stand in the vessel as it falls during the year, what percentage of the water will be in the vessel at the end of the year, allowing the water to escape only by evaporation? A. It will vary in different localities, and must be determined by experiment.

What is meant by dry steam? A. It is steam that has no water mingled with it, and is commonly produced in a well designed boiler.

What is the average cost of building a railroad embankment, 6 feet high, with upper base of 10 feet and lower base of 28 feet, of earth dug along the sides of the embankment? A. Your question is too indefinite. You will find some valuable estimates for different cases in Trautwein's "Engineer's Pocket Book."

Are the engineers now at work on the tunnel from Jersey City to New York? A. No.

(72) S. T. says, in reply to L. H. H., who asked what to do with belts that have become glazed and hard: Run the belt very slowly, and sponge with a warm water on both sides; then with a scraper take off the gum, and oil with neatsfoot oil. Attend to it once a month with the scraper and oil; the scraper should not be too sharp nor be straight on edge, but rounded a trifle. If your belt cannot be run slowly, take it off: but it is better to keep it on if possible.

(73) C. L. says, in reply to M. W. H., who asked if cherry tree gum is of any value for mucilage: Having made use of it for two years, I can answer, yes. It is darker, but I think fully as strong as gum arabic.

(74) H. A. H. says, in answer to several correspondents' inquiries regarding the power necessary to propel steam yachts, and the speed to be obtained by the use of a definite amount of power: Assuming that we wish to give the vessel a moderate speed, we calculate the resistance from the greatest immersed section:

$V=\sqrt{\frac{KLH}{A}}$, and $H=\frac{V^3 A}{KL}$ where K = coefficient for speed and horse power, V = velocity in miles per hour, A = area greatest immersed section, H = horse power, L = length of boat on waterline. In words, the speed in miles equals the square root of the length on water line multiplied by the horse power and by a coefficient, K, and divided by area of greatest immersed section in square feet. The second formula is: The horse power equals the square of the speed multiplied by the area of greatest immersed section in square feet, and divided by the length on water line multiplied by the coefficient. The coefficient mentioned above varies with the fineness of the lines, from 1·1 in very full lines to 1·9 in very fine lines. The above rules are found to agree very nearly with the performance of various steam yachts now constructed.

(75) H. M. W. says: It may perhaps interest F. C. G. and others to know of a method of taking off the tin from tinned plate without acid. I read a short account of it in the *Jahresbericht der Chemie*. It consists in boiling the scrap tin with soda lye in presence of litharge. This ought to pay, as there are plenty of objections to the use of acids, which unfit the iron for some uses.

(76) C. says, in answer to G. W. B., who inquires about removing clinkers from a stove: My experience is that if, when the stove is thoroughly hot, a few lumps of lime, or even oyster shells, are placed in the stove, as near the clinkers as possible, the latter will be softened or fluxed; and as the fire burns down, they may be scraped off with a poker or shovel.

(77) W. says, in reply to the question of A. B., asking the distance passed over by a fly on the rim of the driving wheel of a locomotive while the locomotive runs 50 miles, the driving wheel being 8 feet in diameter: The fly passes over a cycloid at each revolution of the wheel, and with such a wheel he will travel 32 feet at one revolution; and while the locomotive runs fifty miles, the fly will travel 63 miles, $3{,}494\frac{4}{10}$ feet.

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

J. F. W.—It is galena, a valuable lead ore.—A. B.—No. 1 is oxide of iron, with silex. No. 2 is copper pyrites, a valuable copper ore. No. 3 is black oxide of iron. Nos. 4 and 5 are talcose schist, not valuable. No. 6 is chlorite schist, not valuable. No. 7 is chlorite and micaceous schist. Nos. 8 and 10 are yellow oxide of iron in schist, not valuable. No. 9 is magnetite in steatite. No. 11 is red oxide of iron in schist. No. 12 is iron ore. No. 13 is copper pyrites, valuable. No. 14 is magnetic iron ore, good. No. 14 is mica schist, containing quartz, silex, and oxide of iron. No. 16 is mica schist. No. 17 is micaceous schist. Two other specimens are schist, somewhat stained with green carbonate of copper, not valuable.—J. M. H.—It is a carbonate of lime and magnesia, containing iron pyrites.—A. E.—No. 1 is clay, colored with hydrated oxide of iron. No. 2 is silicate of lime with augite. No. 3 is augite, a silicate of iron, manganese, lime, and magnesia. No. 4 is copper pyrites.—E. P. C.—It is bog iron ore, containing a large amount of insoluble silicious matter.—W. H. L.—It may be used as a polishing or cutting powder for metals and minerals.—G. S.—It is marcasite or white pyrites, and contains 47 per cent of iron and 53 of sulphur.—J. J. T.—It is composed of the same material as pure sand, which is used in glass making, etc., but it is too common to be of especial value. Finely crystallized pieces are prized as rock crystal. Some of the lower priced ornaments are sometimes cut from the last.—J. H. P.—The finer colored varieties of tourmalines are sometimes used as gems.—W. Y. T.—It is blende, and contains 67 per cent of zinc and 33 per cent of sulphur.—We have received, in a box without any address, 1 specimen of valuable hematite ore, 1 of trap rock, and 4 of a conglomerate containing red hematite, from Bucks county, Pa.

H. L. asks: What kind of a purchase is the best to pull up a drive well pipe with? I have used a chain and two jack screws, but it is a great deal of trouble and hard work to keep the chain from slipping.—C. W. J. asks: What is the best and speediest plant for a good, compact, and secure hedge?—G. W. W. asks: How can I pulverize mica very fine in large quantities?—W. E. C. asks: 1. Has chloride of aniline been successfully employed in the production of a good black on wool, more especially on felt hats? 2. Which is the best mode of dyeing a bright black on felt hats?—G. H. F. asks: What is the ornamental work on stove patterns made of? What will make it adhere to the wooden pattern?—A. J. H. asks: How is a silver gray color produced on fancy panel work, picture frames, etc.?—B. A. asks: Were any plants indigenous to the North imported into the South by means of our armies during the late war (see p. 131, vol. 32)?

COMMUNICATIONS RECEIVED.

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

On Talking Ants. By W. C.
On Alkaloids by Synthesis. By R. B. W.
On Spiritualism. By T. B.
On a New Tempering Composition. By T. J. B.
On a Prolific Snake. By A. A. R.
On High Lakes. By S. T. W.
On Glycerin in Boilers. By W. F.
On Domestic Medicine. By G. H. J.
On Kaolin. By C. T. S.

Also enquiries and answers from the following:

J. M. S.—J. D. H.—A. O.—W. M.—C. B. L.—C. C.—T. B. G.—R. T. P.—E. A. M.—L. A. E.—O. K.—C. S. B.—T. F. M.—S. E. P.—O. M.—W. P.—S. S. A.—O. C.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of enquiries analogous to the following are sent: "Who sells aniline blue dyes? Who deals in manganese? Who makes wooden paper hangings? Who sells horse radish graters? Who sells giant powder? Who sells a substitute for cloth for billiard tables? Who sells the cheapest toy engine? Who sells boilers for heating large buildings? Who will sell a right to use a gold plating process?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

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Whiffletree clip, J. A. Ellis ... 160,262
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Wrench, pipe, C. H. Fulmer ... 160,415

DESIGNS PATENTED.

8,180.—SHOW CARD.—J. Fuld, New York city.
8,181 & 8,182.—STATUARY.—J. Rogers, New York city.
8,183 to 8,185.—SHOW CASES.—L. Wiegel, Cincinnati, O.
8,186.—FOUNTAINS.—J. W. Fiske, New York city.
8,187.—VASE, ETC.—J. Hoare, Corning, N. Y.
8,188 to 8,190.—OIL CLOTHS.—C. T. Meyer *et al*.
8,191.—SODA WATER APPARATUS.—F. H. Shepherd *et al*., Lowell, Mass.
8,192.—CARPET.—T. J. Stearns, Boston, Mass.
8,193.—DENTAL STAND.—S. S. White, Philadelphia, Pa.

TRADE MARKS REGISTERED.

2,262.—WASHING POWDER.—Corbett & Co., Chicago, Ill.
2,263.—WHEAT FOOD.—Durkee & Co., New York city.
2,264.—MEDICINE.—Gowdey & Co., New York city.
2,265.—PICKLES, ETC.—Heinz & Co., Pittsburgh, Pa.
2,266.—WATCHES.—J. W. Tucker, San Francisco, Cal.
2,267.—COTTON MACHINES.—R. H. Allen & Co., N. Y. city.
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2,270.—POULTRY FOOD.—Sherwood & Co., Hartford, Ct.
2,271.—BONNETS, ETC.—S. C. Talcott, Ashtabula, Ohio
2,272.—FANS.—S. C. Talcott, Ashtabula, Ohio.
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2,274.—FRUIT MILLS, ETC.—Higganum M'f'g. Co., Conn.

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