Notes & Queries

L. K. Y. will find directions for lacquering brass on p. 283, vol. 31. The Minotti battery is described on p. 26, vol. 32.—H. M. will find a full description of artesian well boring tools on p. 54, vol. 33.—A. F. H. will find a recipe for aquarium cement on p. 202, vol. 28.—W. R. will find a recipe for paste for labels on tin boxes on p. 253, vol. 30.—J. W. C. P. will find directions for casehardening iron on p. 202, vol. 31.—J. B. will find a description of paper boats on p. 163, vol. 27.—C. B. H. can calculate the power of his engine by the rules given on p. 33, vol. 33.—L. M. S. will find directions for making an æolian harp on p. 330, vol. 26.—D. O. will find a recipe for filling for walnut wood on p. 315, vol. 30.—P. V. J. will find a recipe for cement for gas bags on p. 395, vol. 32.—W. B. will find directions for making Pharoah's serpents on p. 315, vol. 32.—R. R. W. will find a full description of the Carré ice machine on p. 82, vol. 33. Salicylic acid is described on p. 96, vol. 33.—E. R. & W. will find a recipe for copying ink on p. 123, vol. 32.—L. K. L. will find a description of blue lacquer on p. 75, vol. 22.—W. B. H. can destroy ants by sprinkling salt plentifully over their holes.—P. C. H. will find a recipe for indelible ink on p 112, vol. 27.—A. C. H. will find that the construction of a windmill is fully described on p. 241, vol. 32. There is no government foolish enough to offer a premium for a perpetual motion.—A. O. will find formulas for engine fly wheels on p. 251, vol. 32.—H. E. H. will find directions for expelling rats on p. 66, vol. 32.

(1) C. M. asks: Why does the sun shine in at the north door in latitude of a house 40° N. in the summer? It seems to indicate that the sun is further north than 40°, though the sun never comes further north of the equator than about 23·5°. A. Were the earth so poised in space that the sun were vertical at the equator throughout the year, it would, of course, rise exactly in the east, and set exactly in the west throughout the year, for this is what the sun does do on March 21 and September 23, when it shines vertically at the equator. As the earth's inclination from a perpendicular to the plane of its orbit is the same throughout the year, thus causing unequal day and night, alternately north and south of the equator, when the sun shines vertically at the equator it shines obliquely, more or less, according to the latitude toward either pole; and the moment that it deviates from a perpendicular at the equator, it must shine beyond the north pole, as in our summer, or beyond the south pole, as in our winter. When the sun's declination is 23° 28′ north of the equator, as at the summer solstice, it, of course, rises 23° 28′ north of an east direction, and then will shine in at a north door for a portion of the morning and evening, until, in its oblique course through the heavens, it reaches those points where it will be south of an east course in the morning, and south of a west course in the evening. At the north pole, at the summer solstice, and for 23° 28′ this side of the pole, the sun will shine directly into a north door at midnight; and at the exact pole it will, at that hour, occupy a position in the sky 23° 28′ above the horizon.

(2) A. E. P. asks: Will a three horse engine give power enough to run a small planing machine to plane boards about one foot wide? A. It may not run the machine at full speed, but it will probably answer quite well.

(3) G. B. says: The pump on our boiler suddenly stopped working, without any apparent cause. It cannot be made to force water into the boiler in any amount, though it will pump when there is no pressure. The water is merely forced both ways between the cistern and pump valves. The packing around the plunger is perfectly tight. The valves have been refitted and well ground into their seats. Every part is in as good repair as a machinist experienced in making engines and pumps can make it. Where can be the defect? A. As you state the case, it is indeed a mystery. But if the pump continues running when turned on to the boiler with the cylinder full of water, and still does not deliver any water, it is reasonable to suppose that there is a leak. You can try the experiment, and settle the matter conclusively.

(4) J. P. asks: Can I draw water through a ½ inch lead pipe, out of a well, over a hill, to my house, the distance being about one hundred rods, and the rise from bottom of well to top of the hill 25 feet, and the fall from the top of hill to the house about 35 feet? A. Yes, if you make provision for drawing off the air that will collect at the highest part of the pipe. You must also be very particular to lay the pipe without kinks and bends, and with easy curves, whenever it is necessary to curve it at all.

(5) T. C. H. asks: I have had an argument as to the value of a glass gage on a boiler. My friend claims that a gage glass is more liable to get stopped up than gage cocks, and therefore is useless and not reliable. He also claims that the glass is not of any value in detecting the foaming of a boiler, and that the only way to tell if a boiler foams is by carrying water over into the cylinder. I claim that the glass is the best. A man in charge of a boiler is not supposed to rely on the look of the water in the glass to determine the water line in boiler, unless he is sure that the openings of the tube are free from stoppage. It is as easy to try your glass as your gage cocks. I say also that, if the piston has a large clearance, it might carry a great amount of water in the cylinder without its being detected. Which is right? A. A glass gage is a very useful appendage to a boiler, and it is as easy to tell whether it is in working order as to determine the same for a gage cock. For several reasons, if it is necessary to make a choice between a glass gage and gage cocks in determining the fittings of a boiler, it is generally better to take the latter. When a boiler foams, it is frequently indicated in the glass gage, though the gage cocks give a more certain test. Glass gages are frequently fitted up in such a manner that foaming can readily be detected. A boiler containing clean fresh water may foam, if badly proportioned, or if the fire is violently forced.

(6) G. W. H. asks: Will it increase or decrease the power of an engine to raise numerous pyramids on the face of the piston head, so as to increase its surface? A. There would be no change as far as the effective area of the piston is concerned.

(7) J. A. B. asks: Do you know of a seed called bird pepper? If so, can you tell me any other name by which it is known? A. We are unacquainted with it under that name. It may be *capsicum annuum* or *piper nigrum*.

(8) B. T. asks: What are the names of the explosive agents that explode at a very low temperature, and what are the degrees of heat, respectively, at which they explode? A. There are many compounds known to chemists which explode with violence at temperatures below that of boiling water; but owing to their properties of undergoing spontaneous decomposition, as well as instantaneous explosion from the slightest cause, such as friction or contact with metals, etc., they are exceedingly dangerous to handle. Gun cotton might answer your purpose, but as regards the temperature at which it ignites, statements differ; it has been in some instances dried at a temperature of 90° to 100° without any dangerous consequences, while it has been found to ignite at 43°. In one instance a small magazine of guncotton situated in the Bois de Vincennes, Paris, was exploded by the sun's rays.

(9) A. L. K. says: The water in my cistern smells as though it were putrid. How can I render it pure and odorless? A. Place several bushels of animal charcoal in the bottom of the well.

(10) J. N. says: For the past six months my hair has been continually falling off. How can I remedy it? A. Try the following: Iodine (crushed small) ½ drachm, olive oil (lukewarm) ¼ pint; agitate them together in a small phial until solution is complete. It may be scented with a little essential oil of almonds or lemons; but it is better without it. Most of the other oils cause the gradual decomposition of the hair. It has been very highly recommended as a hair oil for daily use, in partial loss of hair and baldness, also to rub indurated glands, etc., with.

(11) O. W. B. asks: What can I put in with common glue to make it dry quickly and become hard? A. Try a little sulphate of lime (plaster of Paris).

(12) W. H. W. asks: Is it possible to decolorize a solution of copper and ammonia and still retain the copper in solution? A. Salts of copper, except in very dilute solutions, always reveal their presence by their characteristic blue or bluish green color; and in the presence of an excess of ammonia, the color, even in extremely dilute solutions, is of a strong, deep blue. In the presence of ammonia, therefore, the solution of the salts of copper cannot be rendered colorless.

(13) C. W. asks: By what process is crude coal tar refined and made into a paint? It is used extensively for roofing purposes. A. The tar is placed in large low iron stills, and heated to about 176° to 212° Fah. for the purpose of distilling off the lighter hydrocarbons along with the ammoniacal water the tar may contain. After about 36 hours, the residue, consisting of the refined coal tar, or coal tar asphalt as it is sometimes called, is drawn off by means of a tap in the lower part of the still.

(14) W. V. W. asks: What is the philosophy of death by sunstroke? A. *Coup de soleil* or sunstroke is thus mentioned by Tanner: "Causes: In its perfect form, it is met with only in the tropics. It has been noticed that those attacked have often been affected for a few days previously with suppression of perspiration. The nights have been sleepless, while attacks of vertigo and a sense of weariness have been complained of. Such men, too, may have been irregular in their habits; while perhaps they have also been indulging freely in alcoholic drinks, and prowling about under exposure to an almost vertical sun for two or three days previous to the seizure. Symptoms: These are generally faintness, thirst, great heat, and dryness of the skin, with prostration. As the disease advances, the heart's action becomes violent, the man can scarcely be roused, the face gets pallid and perhaps an attack of vomiting ushers in the stage of coma. The affection sometimes comes on very insidiously. A man will be seen to be listless and stupid; but he makes no complaint beyond saying that his head feels a little queer. Yet in twelve hours he may be dead. Dr. Morehead agrees with those observers who refer the phenomena of sunstroke to depressed function of the cerebro-spinal and sympathetic nervous systems. The three most urgent things to be performed in treatment are: Cooling the body, removing listlessness and oppression, and increasing the respiratory action.

(15) T. G. says: The inside of a store was painted with guaranteed pure white lead and pure raw linseed oil. All the white and light colored paint has turned yellow, even as dark as yellow ocher. Why is this? A. The trouble is probably due to the presence of some salt of iron in the materials.

(16) J. R. asks: I. In making plaster figures I use gelatin molds, made of glue. In summer the gelatin melts and I cannot work. How can I prevent this? Will tannic acid be of any use? A. No. Melt the gelatin in a small quantity of water by heating it over a water bath until a thick paste is formed; add glycerin in the same quantity by weight as the (dry) gelatin. Then stir the mixture and allow the excess of water to evaporate. It may then be poured on a marble slab or in a mold, and allowed to harden. The above, we think, will answer your purpose. 2. How can I melt pure rubber and make it into molds? A. Pure rubber may be softened by steam or hot water; but if melted by application of heat, it suffers partial decomposition, and does not gain in solidity. Caoutchouc dissolves in naphtha by heat and agitation. This is accomplished over a water and sand bath, or by means of a steam jacket, in closed vessels.

(17) J. M. H. says: Recently a frightful flash of lightning fell from the gathering clouds, striking a lightning rod, breaking it in two, and melting the metal, which ran down in drops. The house was somewhat damaged, pieces of the second floor being torn out and scattered over the room. The rod was only about three feet in the ground, and I think it had not a sufficient connection with the earth. Am I right? A. If the rod had been in proper connection with the ground, the currents would doubtless have passed into the earth without damage to the building. See p. 386, vol. 32.

(18) J. R. asks: 1. Under what conditions will common coal gas become a liquid? A. The requisites are a sufficiently low temperature and an adequate pressure. 2. What is the process of distilling coal oil or crude petroleum, and how are the lighter constituents collected? A. The crude oil is pumped into stills holding from 200 to 1,000 gallons each, and submitted to a gradually increasing heat, the vapors being passed through a worm immersed in cold water. At first, there comes over a very light, mobile, and volatile liquid, exceedingly inflammable. As the operation proceeds, the product is tested from time to time; and when the specific gravity corresponds to about 90° Baumé's hydrometer, the receiver is changed, and the operation of testing, but by a different standard, is again repeated. The receivers are changed several times, or until, at a high temperature, paraffin and illuminating gas constitute the bulk of the products of the distillation. At the end of the operation there remains in the retort, as the heat has been greater or less, a thick tarry matter, or a porous coke. The products of the distillation are commonly classified as follows: Those products whose densities are below 90° Baumé are termed gasolin; those between 70° and 80°, naphtha; from 60° to 70°, benzine; those between 40° and 60°, kerosene; and finally the heavier products, fit only for lubricating purposes, and paraffin.

(19) C. T. V. says: Please publish directions for welding iron rings without scaling. A. We know of no reliable compound for this purpose; but you might try the Belgian recipe. It is: Iron filings 1,000 parts, borax 500 parts, resinous oil of any kind 50 parts, sal ammoniac 75 parts. Pulverize completely and mix; heat the rings to a cherry red, powder the parts with the mixture, and join them together.

(20) T. H. asks: 1. Of what lenses are the most improved opera or field glasses composed, and what is their arrangement? What power is attainable in those of moderate size? The common telescope or spy glass is obtainable, of convenient size, to powers of 15 to 20 diameters, but it is inconvenient to use, being difficult to hold steadily without a rest, and it taxes the eyes more than a field glass. Is there any portable instrument having a power of 15 or 20 diameters? A. All opera and field glasses are constructed on the principle of the Galilean telescope, that is, with a convex object glass and a concave eyepiece. In the better class of instruments, all the glasses are achromatic. The object glasses are generally made with two lenses (crown and flint); and if the eyepieces are not achromatic, those are known as six-glass (three in each tube). Sometimes the object glasses and eyepieces are each triple achromatic, having three lenses in each, in which case the instruments are known as twelve-glass, and are so marked. In the best opera and field glasses, the power rarely exceeds 6, and is seldom more than 5. For a power of 15 to 20 diameters, you can get nothing that will be as good or as cheap as a telescope.

(21) M. H. V. says: I have just made a refrigerator, filled in on all sides with charcoal. There is a partition up and down through the center, with 4 holes 3 inches square through the partition. We put in 20 to 30 lbs. ice, and yet my butter, milk, etc., sours almost as though there were no ice in the refrigerator. There is a discharge pipe for waste water, 1 inch in diameter, running down from the ice box, which is of zinc. What is the trouble? A. We would suggest the removal, in part, of the partition. Also place in one corner a quantity of caustic lime, in such a position that water from the melting ice will not reach it, and see that the box is closed as tightly as possible.

(22) Bicycle.—You can probably buy good bicycles through carriage dealers at your place.

(23) M. E. J. asks: 1. Who was the first man who invented the self-rake on a reaper? A. The earliest instance of a self-acting rake on a reaper appears in an English patent granted to Mr. Gladstone in 1806. 2. Who invented the first reaper? A. The first account of a machine to reap grain appears to be given by Pliny the Elder, who was born, it is thought, in A. D. 23. And the first patent for a reaping machine was granted in England to Joseph Boyce, July 4, 1799, and in the United States to Richard French and J. T. Hawkins, May 17, 1803.

(24) J. C. C. asks: 1. Are metal roofs superior to lightning rods as a means of protection to dwellings? A. If the metal roof be connected with the ground properly, by means of several stout rods of copper or iron, which should also have connection with all the interior metal work of the building, this method will afford excellent protection to the property. 2. In what manner should metal roofs be constructed, of what metal

and how should the connection be made with the earth? A. It will be necessary for you to erect metallic rods, extending five or six feet above the highest points of the roof, tipped with some metal not readily oxidized, and also having a sufficiently large surface connection with the metallic roof to avoid the melting of the sheet metal in case of a heavy discharge. In the construction of some of our large public buildings, this simple yet efficient method of protection from lightning has been employed, differing from the above only in the respect that the ground connections are made directly with the main water and gas service pipes of the city. 3. In an article on protection from lightning, to which reference was made by you a few weeks since, you say the extremities of lightning rods "should be put in connection with water or moist earth if possible." In the same article, a little further on, you say that "water and moist earth, which are so frequently recommended as terminals for lighting rods, are among the poorest of conductors." Is not this a contradiction? A. It is true that both water and moist earth are, in comparison with the metals, very poor conductors of electricity, but it is equally true that the resistance of any conductor is inversely as its sectional area; hence the necessity of a large terminal contact surface with the earth. From the above facts it is obvious that, if the earth connection be sufficiently extended, the resistance of the earth may be reduced almost to zero.

(25) C. Z. M. says: I am building a small engine with link motion. Where is the proper place to get the radius of the link from? A. The center of the engine shaft.

(26) G. S. W. says: I have a Wardian case of my own make, and ferns or anything else will not prosper in it; they mold, rot, and die away. New shoots come up, but they in turn are killed off long before maturity. When I open my case, there is a very musty smell. What is wrong? A. The moisture which falls on the inside of your glass probably falls upon your plants, and kills them by what is termed damping them off. The case must be left open an hour or two every day, to prevent this. Also bore some holes in the bottom of your case, to afford drainage.

(27) ●. W. I. says: I made a mixture of 1 oz. nitric acid and 4 ozs. muriatic acid and then put in a $2.50 piece of gold; and when it was all cut and dissolved, I put in 2 ozs. sulphate of potash in 1 pint rain water. It will not precipitate the gold. I then dissolved 1½ ozs. sulphate of potash, and it makes no impression on it. What shall I do to recover the gold? A. Evaporate your solution nearly to dryness in order to expel as much of the free acid as possible, and redissolve in pure water. Then add to the liquid a strong solution of sulphate of iron (common green vitriol) until no further precipitate forms. Allow the precipitate to subside, and then filter, and thoroughly wash the precipitate on the filter with water. Allow the filter paper with its contents to dry, and then place it together with a small quantity of borax in a Hessian crucible, and fuse. By the above method you will obtain the gold in a very pure state.

What is used for charging a battery composed of two zinc plates and one copper plate? A. Use 1 part oil of vitriol to 12 parts water.

(28) E. K. asks: How can I obtain the silver out of old broken black lead crucibles? A. Pulverize the crucible and digest it in nitric acid for several hours. Decant off the clear liquid and add to it muriatic acid until no further precipitate forms. Allow to settle and again decant the clear liquid, wash the precipitate several times with clean water, dry, and fuse in a small crucible with a quantity of carbonate of soda.

(29) W. T. P. asks: What kind of gas are toy rubber balloons inflated with? How is it generated? A. The gas is hydrogen; it is obtained by acting upon small pieces of zinc with dilute oil of vitriol.

(30) J. S. & Co. ask: What amount of power is required to run a grindstone 5 feet in diameter by 8 inches face at 300 revolutions per minute, for grinding plowshares? A. Use a steam engine with cylinder of 6 inches diameter and 8 inches stroke, cutting off at ¾, with a steam pressure of 60 lbs. per inch.

(31) D. P. H. asks: 1. If two locomotives are on a level track one mile long, and No. 1 is fired up, No. 2 being filled with water up to the second gage cock, with valves open to go ahead while it is getting towed backward, and at the end of the mile the engines are uncoupled: will No. 2 have any pressure in boiler? A. If the slide valve were held firmly to its face, there would undoubtedly be a pressure pumped into the boiler equal to about 40 per cent of that of the steam; but as the slide valves of locomotives are not held to the cylinder faces save by a light spring, and sometimes are without even that, the valve would lift, and the air from the cylinder would flow in and out of the steam chest. There would undoubtedly, however, be a slight air pressure in the boiler under the conditions named. 2. Will there be enough to carry it back to starting point? A. No.

(32) L. C. S. asks: Are not portable fire extinguishers filled with water and effervescent matter, and have they to be re-charged when the charge is exhausted? A. Yes.

(33) E. says: I differ with you as to the advisability of conducting lightning rods into wells. The patent lightning rod man who put up my rods held your opinions, and down the well went his rod. Our water, which had always been noted for its purity, became after this at times unpleasant in taste. It seemed as if we had opened into a mineral spring of nauseous fluid. One suggested foul air; another, dead rats. The well was pumped dry and examined, but the trouble remained undiscovered. For a while again, good water; then a repetition of a sulphur spring, to our great annoyance, and so it went on for years. One day, after a violent thunderstorm, our eyes were opened to the difficulty by the sudden change in the taste of the water. Then out came our rod from the well, and since then the old well has regained its reputation for pure tasteless water "fit for the gods." Do not put your rod into a well.

(34) W. C. B. asks: 1. How much power is required to drive a pair of millstones, to grind 8 bushels of fine meal per hour, the runners to be 20 inches thick and 42 inches in diameter? A. About 4½ horse power. 2. How much power is required to drive a 20 inch pony or panel planer? A. About 2 horse power.

(35) H. R. asks: 1. I have a boat, 15 feet long by 4 feet beam by 2 feet depth. She is built to cut the water easily. The engine is 2 inches bore by 4 inches stroke. The horizontal boiler has a smoke bonnet all around, is 25 inches long by 16 inches diameter, and has twelve 12 inch flues; and the heat runs from the front end to the back end into a smoke box, whence it runs through the flues into a smoke box fixed on the front end, and escapes into the chimney. The firebox is 25 inches long and 14 inches high. I cannot make the boiler larger. Is the engine large enough to run the boat? A. The power of your engine depends on the pressure of steam used, but your cylinder is too small in any case. 2. Is the boiler large enough to run the engine? A. The boiler is too small for the engine or the boat. 3. How thick ought the heads and shell of the boiler to be to stand safely a pressure of 100 lbs., and how thick to stand 150 lbs.? A. To stand the pressures you name, make the shell of the boiler ⅝ and the heads $\frac{3}{16}$ inch, if of steel, or the shell $\frac{3}{16}$ and the heads $\frac{5}{16}$ inch, if of wrought iron. 4. Of what size, pattern, and pitch should the propeller be to give the highest speed that can be got with so small an engine? A. Propeller for the size of your engine should be about 16 inches in diameter and of 20 inches pitch; but for the boat, it should be 18 inches in diameter and from 2 to 2½ feet pitch. 5. Will coke give enough heat? A. Yes, if you maintain a good draft. 6. How fast will she run? A. This is best ascertained by experiment. 7. Will a steam gage, as used on large boilers, show 100 lbs. pressure in my little boiler just as well as on a large one? A. Yes. 8. If the boiler (25x16) should not have enough steaming capacity, please give the proper dimensions and thickness of heads and shell. A. The boiler should have 25 feet of heating surface. the shell being $\frac{3}{16}$ and the heads $\frac{5}{16}$ inch thick. 9. Can you tell me of a good book on the proportions of a steam engine? A. Bourne's "Handbook of the Steam Engine." 10. Will good boiler iron answer to make the boiler? A. Yes.

(36) E. B. W. says: I am exceedingly annoyed by the flies eating the ink lines of my drawings. Can anything be put into the ink to prevent their depredations? A. Not that we know of. They are ravenous for it.

(37) F. W. H. asks: What amount of animal heat is required to develop hen's eggs, and what ought to be the temperature of an incubator? A. The temperature of the incubator should be about 106° Fah., which will impart to the egg 104° Fah., the proper heat.

(38) G. S. B.—The size, shape, and length of the steam ports, the amount of condensation, and many other considerations affect the initial velocity of steam. We are not aware of any means, save actual test, of ascertaining this initial velocity; and an actual test, under any particular conditions, would not be sufficiently accurate for general application.

(39) Constant Reader.—We have not heard of any reward offered of $50,000 or other sum for a plan for the removal of oil from marble.

(40) T. S. asks: Is there any way of making tissue paper airtight without adding materially to its weight? A. We do not know of any.

(41) A. B. asks: 1. What is the dispersive power, respectively, of Chance's flint and crown glass? A. The dispersive power of flint glass being 0·043, that of crown glass is 0·0246. 2. What form is generally used for convex lenses for achromatic telescope objectives, plano-convex or double convex? A. The best telescopic objectives are made by combining a double convex lens of crown glass with a concavo-convex lens of flint glass.

(42) E. A. B. asks: I took a semi-concentrated solution of bichromate of potash, in a stone bottle, and added $\frac{1}{10}$ part of No. 1 gelatin to 1 part of solution, and boiled these ingredients until I was certain that the gelatin was dissolved. In a darkroom I poured this on a glass plate, dried it, and exposed to light with a photograph under it. I wetted it in cold water. Result after repeated trials was that the plate was rough, due, I think, to the formation of crystals of bichromate of potash. There was no sign of an impression. What was the matter? A. You should allow the gelatin bichromate to cool, and filter it before attempting to use it. In exposing the prepared paper in the printing frame, the photographic negative (on glass) should be on the top, that is, between the paper and the light, and with that side of the plate which contains the picture pressed tightly against the paper. On removing the paper from the frame, it should immediately be placed in a large quantity of clean, cold water, in a dark place, and allowed to remain immersed for some time.

(43) A. W. W. says: 1. I hear a great many complains of water from galvanized iron and zinc lined water coolers. Is it injurious, and what effect has it on the system? A. The use of zinc or galvanized iron for this purpose is not wholly without objection. The presence, in the water, of any appreciable quantity of soluble sulphates, chlorides, or free acids, is apt to corrode and partially dissolve the metal. Salts of zinc act upon the animal system in much the same manner as verdigris or corrosive sublimate, although not so violently. 2. How would a cooler lined with ordinary earthenware and metallic plate, with springs attached to the lower part, placed in the cooler to keep the ice from breaking the bottom, answer? A. Earthenware will answer the purpose admirably, but by far the best arrangement for this purpose is composed of a deep, porcelain-lined iron pot, having an iron or nickel plated faucet near its base. The vessel is placed in a box of any desired shape, leaving a space of two or three inches between the pot and the inside of the box. This space is packed closely with good dry charcoal, in powder, and sealed around the top by molding or otherwise. The lid of this water tank is a tightly fitting iron cap, and over this is one of wood, having between it and the iron cap a piece of clean felting.

(44) L. K. Y. asks: How can I make gutta percha soft like wax? A. Warm it.

In what country is aluminum mined and worked? A. See p. 91, vol. 32.

(45) S. V. P. asks: Does hydrogen gas behave exactly like air in the matter of giving out heat by compression and taking it back by expansion? A. Yes.

(46) F. D. says: I am making two tin cylinders for use in learning to swim, connected by a strap passing under the chin; they are slightly conical in front, in order to overcome the resistance of the water. The object is to keep the chin and mouth out of the water and give the arms and legs free play. How long ought they to be? A. Make them about 4 inches in diameter and 12 inches long.

(47) J. F. asks: 1. Can an hydraulic press be worked with a column of water in a stand pipe? A. Yes. 2. Can air be compressed by hydraulic pressure until it will attain an expansive force of 10,000 lbs. per square inch? A. Yes. 3. Can all the results of the Keely motor trick be attained by such an apparatus with compressed air? A. Yes, all of which we have seen an account.

(48) M. V. O. asks: Does a fan blower require more power to drive it when the discharge or blast pipe is open, than when it is closed wholly or in part? If so, how do you account for it? A. The action is just the same as that which occurs on partially closing the discharge valve of a pump. If the same speed of pump or blower be maintained, the resistance is increased.

(49) G. S. R. says: Your account of the appearance of the bull's eye at 1,000 yards distance has provoked a great deal of discussion. Some contend that it would appear to be about a six inch square dot, and others that it would be like a dot about half an inch square. You say the bull's eye would appear of about the same size as a dot half an inch square held at a distance of some three yards from the eye. Please explain. A. The remark did not refer to relative, but to actual size, that is, the bull's eye looked exactly the same size as the dot.

(50) R. asks: What are rotary steam boilers? In what respect do they differ from ordinary boilers? A. We do not know anything about this class of boiler, unless you refer to the kind in which only a small quantity of water is evaporated at a time.

(51) B. K. D. asks: If a person should succeed in perfecting a simple water elevator which would work automatically, with no apparatus to get out of order, and with no expense excepting the price of the necessary length of pipe and of a simple attachment (costing probably $2.50), is it probable that such an elevator would have a great demand? I have been successful on a small scale, drawing water freely 6 feet from source of supply, by a simple device. Would the probabilities warrant some expense in experimenting upon a larger scale? All of the elevators of which I am aware depend upon some mechanical force or power; but I need no power other than that contained in air and water. A. As we understand it, you propose to do work without incurring any expense for the necessary power. You can judge of the demand such an invention would create by reading about Mr. Keely's experience.

(52) W. H. B. asks: If a man in the car of a balloon were to work an apparatus like a common pump, the pipe running through the bottom of the car, would the balloon be drawn downwards? A. No, as we understand your meaning.

(53) C. B. A. asks: Can isinglass be dissolved in water? I got a piece such as is used in stove doors, and put it in a cup and kept it on the stove 36 hours, but it did not dissolve. A. You used mica. You will have no trouble in dissolving isinglass.

What keeps the ball against the jet of water in the fountains shown in some stores? A. As soon as the ball gets much over to one side, it fills, and descends on to the jet of water in the conical base of the apparatus.

(54) A. H. M. asks: What lubricant is best for high pressure horizontal engine cylinders? A. There are a number of oils in the market which are well spoken of and recommended for use in cylinders; but we imagine that none of them are superior to sperm oil in any particular except that of first cost.

(55) B. F. R. says: I have a theory in regard to the manner in which Nature affected the crystallization of the diamond. It is generally conceded that it could not have been done by fusion; might it not have been from solution? Do you not think there may possibly be a solvent for carbon in some of the uncombined forms? A. The diamond has probably proceeded, like mineral coal and oil, from the slow decomposition of vegetable material, or even from animal matters, either source affording the requisite carbon; but it has been formed under those conditions as to heat that has produced the metamorphism of argillaceous and arenaceous schists and auriferous quartz veins, since it is found exclusively in gold regions, or in the sands derived from gold-bearing rocks. The schists that were altered at the time may have previously been shales impregnated with petroleum or other carbonaceous substances (hydrocarburets) of organic origin. Chancourtois observes that the formation from a hydrocarburetted vapor or gas is analogous to that of sulphur from hydrosulphuretted emanations. In the oxidation of the latter by the humid process, the hydrogen becomes oxidized, and only a part of the sulphur changes to sulphurous acid, the rest remaining as sulphur. So in the humid oxidation of a carburetted hydrogen, the hydrogen is oxidized, part of the carbon becomes carbonic acid, and the rest remains as carbon and may form crystallized diamond.

(56) J. A. B. asks: By what process is the distillation of glycerin effected? A. The mother liquor is first concentrated by evaporation, the saline matter which is thereby gradually separated being removed from time to time. When the fluid is sufficiently concentrated, ascertained by the boiling point having risen to 240° Fah., it is transferred to the still, and the glycerin distilled off by means of superheated steam carried into the still. The temperature of the steam should not exceed 580° Fah., as otherwise a partial decomposition of the glycerin will take place. The distillate is next concentrated, and brought to the consistence of a sirup in a vacuum pan.

(57) N. S. W. says: 1. I have an electric battery which fails to work. I have increased the strength of the liquid of sulphuric acid so as to destroy the platinum plate, and still the magnet would not vibrate, and no current is perceived in the coil. What is the difficulty? A. The connections between the battery and coil were probably at fault. In arranging the apparatus for use, you should follow the directions to be found, generally, glued on the inner side of the lid of the case containing the coil. See that the ends of the connecting wires are free from all rust, also that the contact points of the small vibrating armature spring are perfectly clean. 2. I wish to make a steel magnet of thin plates. Ought the plates be bolted together, without insulation between them? A. They are joined without insulation. 3. Should it be charged after being clamped together, or should each plate be charged separately and the poles reversed? A. Separately. Join like poles together. 4. I hold that the strongest point of attraction in a magnet is the center of armature between the two poles. Am I right? A. The greatest magnetic force is developed at the poles. 5. Suppose a body of iron were surrounded with a coil of copper wire, slightly excited, would a magnet attract it more readily or not? A. It would. 6. In the electric light, where two carbon points are used, are two charcoal points in effect the same? A. Yes; but they are more rapidly consumed than gas carbons.

(58) J. D. asks: What can I use to thoroughly cleanse freshly made cider of all sediment, for the purpose of preserving it? A. Filter it through a clean linen bag containing some animal charcoal.

(59) S. asks: Can an ice boat travel faster than the wind? A. Ice boats very frequently travel at a faster velocity than the wind that drives them.

(60) L. C. C. asks: 1. What is the size and location of the heaviest gun in the world? A. We believe the largest has a bore of 20 inches. 2. What is the size and weight of ball carried by the large gun at Fort Hamilton, New York Harbor? A. Weight of shell, 1,080 lbs.

(61) M. A. G. says, in reply to A. K., who asked as to building a rain water cistern: One thing is essential, and is very generally neglected. It is to have the water as it comes into the cistern conducted to the bottom. In this way, the water is entirely changed when it rains. When the fresh water simply pours in at the top, it immediately runs off and all the mass of stagnant water remains undisturbed, and soon becomes impure.

(62) J. J. says, in reply to J. G. G., who asks: Why does the second crop of clover produce more seed than the first: Clover blossoms require to be fertilized by some agency outside of themselves. Bumble bees are the chief means employed, and butterflies and other insects to some extent. Honey bees do not trouble the red clover. As very few bumble bees live through the winter, they are not numerous in the early part of the season; consequently but few blossoms are fertilized. If the fore part of the season is wet, there will be but few bees or other insects in the latter part, and but very little seed in the second crop of clover. It has been a wet season here in Illinois, and I do not recollect seeing a single bumble bee. We may leave our clover seed alone this fall, and save ourselves work. J. G. G. may set it down as a rule that, when bumble bees are plentiful, there will be plenty of clover seed, and *vice versa*.

(63) J. C. says, in reply to T. M. C., who asks what is the best remedy to prevent unpleasant odor from the feet caused by perspiration: Sprinkle pulverized alum in your boots once or twice a week for two or three weeks, and then not so often. It will cure the worst case.

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

J. R.—The filaments in motion were specimens of the *anguillula aceti*, a vinegar eel. They can be found in almost all vinegars.—R. F. W.—It is iron pyrites. In 100 parts of the mineral, 53·3 are sulphur, and 46·7 are iron.—J. M.—It is a deposit of carbonate of lime and magnesia. The water charged with carbonic acid unites with the lime, forming $Ca\,Co_3$, which is deposited as in the specimen sent. We cannot form any opinion of the soil over which the water runs, save that it contains a large percentage of lime.—I. R. M.—Box received; but there was no bug in it.—O. P.—It is trap rock. The fine brilliant particles are pieces of hornblende. —W. K.—Your specimens arrived in very poor

condition. We should call them *phytocoris lineolaris*. The history of the insect is yet imperfect. It is found most abundantly in the months of June and July. It has been found in Maine, New York, North Carolina, Pennsylvania, and Missouri. The great increase of these and other noxious insects may fairly be attributed to the exterminating war which has wantonly been waged upon our insect-eating birds, and we may expect the evil to increase unless these little friends of the farmer are protected, or left undisturbed to multiply and follow their natural habits.—J. H. P.—It is hematite. It contains no nickel. The teeth sent, being very imperfect and broken, cannot be named or classified. The bone has been sent to a distinguished naturalist for examination.—G. W. H.—No. 4 only was received. It is hematite.—J. L.—Send us a sample of the water you complain of.—R. J. & S.—They consist of quartz rock and iron pyrites.—J. McC.—Send small samples by mail, marked legibly with name.—S. H.—It is marcasite, or white iron pyrites.—M. J. D.—We will shortly answer your questions in full.—A.A. J.—It is quartz, containing iron pyrites and a small amount of chalcopyrite.—E. P. C.—It is coal of a very poor quality, containing so much silicious matter as to be worthless.—H. F. L.—It is iron pyrites mixed with carbonaceous matter.—S. K. B.—We cannot make a complete analysis. The specimen is hematite, an ore of iron containing, when pure, nearly 70 per cent of iron.—F. C.—It is iron pyrites.—O. D. B.—It is a limestone containing mica, talc, and iron.—F. & B. It consists chiefly of the double sulphate of nickel and ammonia, mixed with a small quantity of organic matter.—N. V. C.—It appears to be a poor variety of elaterite. It contains a large percentage of sand and clay. We do not consider the sample to be of much value.

J. L. asks: How can I best convey sawdust from a sawmill to a fire 300 feet distant?—E. M. says: In Europe a paste or cream is used to remove the beard from the face, without the use of soap or razor. How is this cream made?—A. A. asks: What sort of varnish is used on the sounding boards of guitars? Are the sounding boards made of heart or sap pine, or both? What is used for dyeing wood black for finger boards, bridges, etc.?

COMMUNICATIONS RECEIVED.

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

On Terrestrial Magnetism. By W. E. S.
On the Altitude of Storm Clouds. By J. M. S.
On the Heavy Rains. N.B.G.
On the Keely Motor. By A. A., and by J. T.
On Motive Power without Fuel. By S.
On Geometry. By E. C.
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Also nquiries and answers from the following:

R. K.—N. J. T.—F. Q.—N. W.—R. B. S.—J. F. S.—C. M.—M. V.—C. K.—E. T.—T. Y. J. H.—L. W. T.

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 inquiries analogous to the following are sent: "Who sells dynamite? Who sells machinery for drying corn meal, etc.? Who sells snow spectacles? Who sells cheap telescopes? Who buys kaolin?" 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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8,497.—CIGAR BOX.—F. Haehnel *et al.*, New Orleans, La.
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8,529 to 8,534.—OIL CLOTH.—C. T. Meyer, Bergen, N. J.
8,535 to 8,545.—CARPETS.—E. S. Ney, Dracut, Mass.
8,546 to 8,549.—CARPETS.—J. H. Smith, Enfield, Conn.
8,550 to 8,553.—FABRICS.—E. C. Clark, Rockville, Conn.

SCHEDULE OF PATENT FEES.

On each Caveat	$10
On each Trade mark	$25
On filing each application for a Patent (17 years)	$15
On issuing each original Patent	$20
On appeal to Examiners-in-Chief	$10
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On filing a Disclaimer	$10
On an application for Design (3½ years)	$10
On application for Design (7 years)	$15
On application for Design (14 years)	$30

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA July 24 to 31, 1875.

5,017.—J. Prentice, New York city, U. S. Cigar mold July 24, 1875.
5,018.—A. G. Haskell, North Andover, Mass., U. S. Life-preserving bed. July 24, 1875.
5,019.—W. L. Pawleson, San Francisco, Cal., U. S Smoke consumer. July 24, 1875.
5,020.—E. Heley, Dublin, Ireland. Printing machine. July 24, 1875.
5,021.—T. Herron, Ottawa. Ont., *et al.* Churn. July 24, 1875.
5,022.—S. Spicer, Goderich, Mich., U. S. Hame lock July 24, 1875.
5,023.—D. R. Proctor, Gloucester, Mass., U. S. Spark arrester. July 24, 1875.
5,024.—S. M. Barré, Montreal, P. Q. Ironing board and stretcher. July 24, 1875.
5,025.—J. Fensem, Toronto, Ont. Hydraulic elevator. July 24, 1875.
5,026.—S. T. Waggoner, Mattson, Mich., U. S. Folding table. July 27, 1875.
5,027.—C. G. C. Simpson, Montreal, P. Q. Railway car wheel. July 27, 1875.
5,028.—F. Dodge *et al.*, Oswego, N. Y., U. S. Peat machine. July 30, 1875.
5,029.—H. Rogers, Eureka, Cal., U. S. Lock. July 30, 1875.
5,030.—A. S. Acker, Lockport, N. Y., U. S. Hoe. July 30, 1875.
5,031.—D. M. McPherson, Lancaster, Ont. Cheese hoop. July 30, 1875.
5,032.—J. Stubbs, Mount Pleasant, Iowa, U. S. Road scraper. July 30, 1875.
5,033.—A. S. Hopson *et al.*, Plainview, Minn., U. S. Vehicle spring equalizer. July 30, 1875.
5,034.—C. L. Riker, Rochelle Park, N. J., U. S. Lining for excluding cold. July 30, 1875.
5,035.—T. F. Gordon *et al.*, Rouseville, Pa., U. S. Process for decolorizing and refining petroleum. July 30, 1875.
5,036.—L. A. Dodge, Keeseville, N. Y., U. S. Nail feeding device. July 30, 1875.
5,037.—A. T. Jones, Clinton, Wis., U. S. Food preserving process. July 30, 1875.
5,038.—J. Rigby, Montreal, P. Q. Gas from petroleum. July 31, 1875.