E. C. will find directions for dyeing silk silk black on p. 107, vol. 30. We do not understand his other question.—H. B. H. will find directions for dyeing several materials black on p. 107. vol. 30 —C. R. will find Professor Bottger's recipe for removing superfluous hair on p. 20 of *Science Record* for 1874.—C. W. K. will find a good recipe for black ink on p. 203, vol. 26 —J. L. H. can make a colorless varnish by the directions on p. 150, vol. 29. Marking ink is described on p. 251, vol. 29.—E R. W. will find full directions for making waterproof paper on p. 346, vol. 30.—J. M. will find a description of the field camera on p. 58, vol. 31.—C. will find directions for treating cider on p. 10, vol. 29.

(1) W. T. H. says: I read that oleate of soda, mixed with glycerin, would make tough soap bubbles. What is this? A. Oleic acid combines with soda to form oleate of soda, which is a hard soap, and enters largely into the composition of what is known as Marseilles soap. The corresponding salt of potash is a soft soap, and is the chief ingredient in the so-called Naples soap.

(2) T. I. H. asks: I am about to build a levee, and would like to know if the angle towards the water should be equal to or greater or less than the angle towards the land. It will be a trapezium in cross section, 15 feet at base, with a 4 foot brow parallel to the base. What are the best inclinations for the other two sides? A. The dimensions given by you are the horizontal and not the surface dimensions. It cannot, therefore, be deduced from them what is to be the hight of the levee, and yet upon this depends the grade of the slopes. The shape and size of a dam or levee is not usually determined by the dimensions and form necessary to resist the pressure of the water, so much as by those necessary to contend against the filtration of the water through the levee, and the effects of that filtration on the work itself. The pressure, however, is greatest at the base of the levee, and therefore, for this alone, requires the greatest resistance there; if the waterrises 6 feet above the base of the levee, the pressure on the first foot will be 6 times that on the highest foot —and this latter will be only 62½ lbs. per square foot of the surface. But an embankment erected of earth, simply to resist this pressure, would soon be worked away by the filtration of the water through it; it becomes, necessary, therefore, to construct it of much greater dimensions, and this in accordance with the character of the earth of which it is constructed. It should be of a good binding earth, the surface soil removed under it, and the deposit rammed in layers not over a foot thick. If possible, a stratum of puddling clay should be built up in the center of the levee, from bottom to top. To prevent the washing of the current, the slope towards the water should be the greatest, and may be from three to six base to one perpendicular; the reverse slope need only be a little more than the natural slope of the earth. The roots of plants have a tendency to hold the earth in place, and their growth upon the sides of the embankment is therefore favorable to its stability.

(3) T. A. W. asks: What is concrete? Can particles of brick, too small to be laid in mortar, be utilized in building? If so, with what should they be mixed, and in what proportion? A. If you mix one measure of a good quality of cement with three or four measures of sand, gravel, small stones, stone chips, or pieces of brick, and add enough water to combine the whole and saturate the ingredients, so that the cement and sand may assume the form of a paste, the cement will soon set, and the whole composition become as hard as some kinds of stone. This is called concrete, and is extensively used in building.

(4) J. S. says: I am a mechanic and have been reading the SCIENTIFIC AMERICAN for the past 10 years, and it affords me great pleasure to say that it has been the means of saving me hundreds of hours of labor. I would not be without it for ten times its subscription price. No other paper I have ever read gives me such useful knowledge. A. All readers will agree to the testimony of our correspondent concerning the useful character of the SCIENTIFIC AMERICAN.

Is it practicable to use a common plunger pump to take water from a well 140 feet from pump and 28 feet deep, using a check valve in the well 6 feet from the bottom? I have a well 22 feet deep, of 4½ inches bore, in which the supply of water used to be good. But now it is pumped dry in a few minutes, all other things being the same as when the supply is ample. Can you give me a remedy? A. The plunger pump, if well made and placed within say 20 feet of the water, will operate. To the delivery nozzle of the pump, a pipe containing a check valve conducts the water up to any desired hight. The pump piston is worked by a lever above the mouth of the well, a rod extending from the lever down to the piston. We advise the use of a first class force pump instead of a common pump. Perhaps some of our readers can give information about the drying up here spoken of.

(5) A. L. C. asks: 1. How many asteroids have been discovered up to the present time, and what is their average diameter? A. One hundred and thirty-seven. The largest are: Pallas 600 miles, Juno 360, Vesta 300, Ceres 220: the rest probably number 100,000, and are too small to measure. 2. Allowing the earth to be 7,912 miles in diameter, and the moon to be 2,160 miles in diameter, how much depth of the earth would it take to make a body as large as the moon? A. About 40 miles. 3. Allowing the sun to be 886,000 miles in diameter, how much depth of sun would it take to make a body as large as the earth? A. The sun's mass is 355,000, and his volume 1,400,000, times that of the earth.

(6) W. B. asks: When is the date of the nearest approximation of the earth to the planet Jupiter? A. Jupiter will be in aphelion, or furthest from the sun, at 0h. on October 24, 1874.

(7) E. A. D. asks: 1. In the conjunction of the planets Jupiter and Venus, is there a point on the earth at which Venus will appear to pass over the face of Jupiter, in other words, where the conjunction will become an occultation? A. No. At the conjunction of August 12, Venus was 58 minutes south of Jupiter. 2. Is there a rule by which the distance of the planets from each other at the time of their conjunctions may be calculated arithmetically? A. See Loomis' "Astronomy," p. 219.

(8) J. P. asks: Will you put your method of calculating the power of an engine so that a man without education can understand it? Your answer No. 51, on p. 219, current volume, seems to be simple, but I do not understand it. A. It is impossible for a man without any education to make calculations. We do not understand your difficulty? Do you not know what is meant by multiplying and dividing? We would be glad to hear from you again, and perhaps we can simplify the rule.

Is galvanized sheet iron as good for a small boiler as plain charcoal iron? A. Yes, if it is of the same quality.

In your answer No. 57, p. 219, current volume, what do the figures 1·5, 13·2, 50·1, 54·8, etc., mean? A. They represent the number of pounds of the various constituents in 100 lbs. of corn meal.

(9) A. C. asks: How much steam can I safely carry in a boiler 2 feet long by 14 inches in diameter, with five 1½ inch flues, and a stay bolt? The shell is of ¼ inch iron and doubly riveted. A. About 175 lbs.

(10) C. McC. asks: How far can steam be carried through one inch pipe from a ten horse boiler, to drive a small one horse engine? A. Several thousand feet, with proper precautions.

(11) W. C. F. asks: What is the centrifugal force of a 1 lb. weight swung round in a 12 inch circle at 1,000 revolutions per minute? A. About 170 lbs.

(12) M. S. T. asks: 1. Has nitrate of ammonia ever been employed for making gunpowder? If so, by whom? A. Yes, by Messrs. Noirbin and Ohlson, of Stockholm; but it requires too high a temperature for its decomposition. 2. Who was the first discoverer of gunpowder, and when was it discovered? A. The date of its invention is involved in obscurity. It has been said that it was used in China as early as A.D. 85, and that the knowledge of it was conveyed to England from the Arabs on the return of the crusaders to Europe; that the Arabs made use of it in the siege of Mecca in 690; and that they derived it from the Indians. 3. Are there any gunpowder mills in the vicinity of New York city? A. We believe not.

Is ozone soluble in any kind of oil? A. Some oils are rapidly oxydized in its presence.

(13) G. F. L. says: How are perishable flowers made lasting? A. *The American Agriculturist* gives the following directions: The flowers must be carefully surrounded by perfectly dry, fine sand, in such a manner that they will hold their form, the pressure of the sand upon all surfaces being alike. Any fine clean sand will answer; it should be sifted to remove all coarse particles. and then washed in successive waters until dust and all earthy and clayey matters are washed away, and the last waters when poured off are perfectly clear. The sand is then to be dried and then placed over a fire in a proper vessel, until quite hot, hotter than the hand can bear, and when cool it will be fit to use. After heating, it should be used at once, before it can absorb moisture from the air. We have had good success by taking a clean, thoroughly dry flower pot, the hole in the bottom of which was stopped by a cork. This was filled a third full of the dry sand; the flowers set carefully in the sand, and then more sand slowly added, so as to surround and cover the flowers inside and out, and set in a warm place. At the end of 24 hours, the cork was removed from the hole in the flower pot, and the sand allowed to run out in a small and gentle stream. The flowers were left in the pot, perfectly dry.

(14) A. V. D. V. asks: Can nitrogen be compressed like atmospheric air? A. Yes.

Of what is illuminating gas composed? A. It consists chiefly of hydrogen and carbon.

Can I cast brass in plaster of Paris molds, and how should the molds be prepared? A. Mix the plaster with water, form the molds, and thoroughly dry them.

Where can I get the back numbers of the SCIENTIFIC AMERICAN, and covers for binding them? A. At this office.

I am 19 years of age; am I too old to go to college and take a degree? A. No.

(15) I. G. H.—Several kinds of cigar making machines are in use.

(16) J. C. asks: Does the zodiacal light appear at regular intervals during the spring and summer equinoxes? When and how may it be observed? I have seen it somewhere stated that, on watching the reflection of the western skies after sunset on a smooth sheet of water, the line of the light could be distinctly traced in the reflection; but I have failed to find it. A. The zodiacal light, as its name imports, invariably appears in the zodiac, or, to speak more precisely, in the plane of the sun's equator, which is 7° inclined to the zodiac, and which plane, seen from the sun, intersects the ecliptic in longitude 78° and 258°, or so much in advance of the equinoctial points. In consequence it is seen to the best advantage at or a little after the equinoxes, after sunset at the spring, and before sunrise at the autumn, equinox. At the vernal equinox, the appearance of the zodiacal light is that of a pretty broad pyramidal, or rather lenticular, body of light, which begins to be visible as soon as the twilight decays. It is very bright at its broader or lower part near the horizon, and (if there be broken clouds about) often appears like the glow of a distant conflagration, or of the rising moon, only less red. We do not see the advantage of viewing it by reflection.

Some months since you published a prescription for catarrh, consisting of ammonia, alcohol, carbolic acid, and distilled water, saying: "Mix and inhale the vapors." In your last issue you remark that the vaper of ammonia is hurtful if inhaled. How do you reconcile these two items? A. We were speaking in a general way of the effects of inhaling the vapors of ammonia. It is only dangerous when a strong solution is used, such as "*aqua ammoniæ fortioris*, the stronger water of ammonia. This, applied to the skin, causes pain, redness, vesication, and destruction of the part; thus acting first as a rubefacient, then as a vesicant, and lastly as a caustic or corrosive. Its emanations are also irritant; when they come in contact with the conjunctival membrane, a flow of tears is the result; when inhaled, their powerful action on the air passages is well known. Persons in syncope are observed to be almost immediately raised from a deathlike state by merely inhaling the vapor of this solution. In cases of insensibility, it must be employed with great caution, for if used injudiciously serious or even fatal consequences may be the result. When swallowed it acts as a powerfully corrosive poison. In small or therapeutic doses, such as we are accustomed to employ in the treatment of diseases, ammonia acts as a diffusible stimulant, excitant, or calefacient. It produces a feeling of warmth in the mouth, throat, and epigastrium. The heat of the skin is sometimes increased, and there is a tendency to sweating, which, if promoted by the use of warm diluents and clothing, frequently terminates in copious perspiration. If we compare the effects of ammonia with those of other stimulants, as camphor, wine, and opium, we observe, in the first place, that the influence of ammonia is principally manifested in the ganglionic and true spinal systems, while the other stimulants above mentioned affect the cerebral system. Thus the effects of ammonia are usually exhibited on the circulation, respiration, secretion, and the spasmodic actions; but camphor, wine, and opium, though they also affect these functions, yet principally affect the intellectual functions. Secondly, the effects of ammonia are more transient than those of the other agents just referred to. Thirdly, the vascular excitement caused by wine and opium is attended by diminished mucous secretion, and is allied more to an ordinary febrile attack. —*Pereira.*

(17) C. F. S. asks: 1. How high a degree of heat can be obtained from gas flame, by the use of the Bunsen burner, upon a sheet iron surface? A. This depends upon the quantity of gas consumed in a given time, as also its quality and the construction of the burner, which is variable. 2. Is there anything better than the Bunsen burner for procuring a high heat from gas flame? A. There is nothing that will compare with it in point of economy.

What is the boiling point of crude petroleum? A. Petroleum cannot be said to be a homogeneous substance, but must be looked upon rather as a mixture of an indefinite, and apparently unlimited, variety of similarly constituted compounds. So interminable is the number of these compounds, and so infinitesimal are the shades of difference between each member of the series and the next in order of succession, that the only practical method of classifying them has been to group the products of distillation into classes, according to their specific gravities, designating the number of the series belonging to each class with one generic name. When petroleum is subjected to distillation, the lightest and most volatile of the substances which compose it distils over at first, the products growing heavier and less volatile as the distillation proceeds and the heat is increased; and it is by taking advantage of this circumstance that the distiller is enabled to separate the several oils of which it is composed, according to any desired classification, the lines of demarcation being determined by the specific gravity of the liquid which distils over. This is what is known as fractional distillation. The classification usually adopted by distillers is as follows: All above 88° of Baumé's hydrometer is called chymogene, from 88° to 70° gasoline, from 70° to 50° naphtha, from 60° to 50° benzine, from 50° to 35° kerosene, from 35° to 28° lubricating oil.

(18) J. T. and others ask: How is rosin oil made? A. It is a product of the dry distillation of rosin. The apparatus used consists of an iron pot, a head piece, a condensing arrangement, and a receiver. In the distillation, a light oil comes over first, together with water. As soon as a cessation in the flow of the distilate occurs, the receiver is changed, and the heat is further raised, when a red colored and heavy rosin oil comes over. The black residue remaining in the pot is used as pitch. The light oil, called pinoline, is rectified, and the acetic acid water, passing over with it, is saturated with calcium hydrate, filtered, and evaporated to dryness, and the calcium acetate obtained is employed in the manufacture of acetic acid. The rosin oil, obtained after the light oil has passed over, has a dark violet blue color, and is called "blue rosin oil." The red oil is boiled for a day, the evaporated water being returned to the vessel; next day the water is drawn off and the remaining rosin oil is saponified with caustic soda lye of 36° Baumé, and the resulting almost solid mass is distilled so long as oil passes over. The product obtained is rectified rosin oil, which is allowed to stand in iron vessels, protected by a thin layer of gypsum, whereby after a few weeks a perfectly clear oil is obtained, free from water. The oil of first quality is obtained by a repetition of the foregoing operation upon the once rectified oil. The residues of both operations are melted up with the pitch.

(19) J. S. J. asks: What is the bursting pressure of a cylindrical boiler of 50 inches diameter of ¼ inch plates, with a single row of rivets? What is a safe working pressure? A. Bursting pressure is about 250 lbs. per square inch; working pressure 30 lbs.

(20) P. S. asks: What do traveling glass blowers burn in their lamps to make such a great heat as they produce? I have seen them blow up a ball in the middle of a glass rod, and then, by suction with the mouth, bring some kind of a melted liquid into said ball, and silver it over on the inside. A. They generally use alcohol. 2. What do they use for the silvering? A. The following alloy is frequently used: 3 parts lead, 2 tin, 5 bismuth.

(21) H. L. C. says: 1. What appearance has porcelain clay in its natural or crude state? A. Clays are naturally white, yellow, blue, or green. Pure clay is white; colored clays are the result of several admixtures. White clay contains but small quantities of protoxide of iron, and becomes after burning yellow or red; these colors, originating from the numerous organic substances, disappear after being volatilized by many firings. The colored clays change their color during firing, becoming red or red yellow. Fine clays are prepared only from those becoming white by continued burning. 2. Would a good mine of porcelain clay be of great value? A. You had better have a sample analyzed, and so determine its exact value. 3. What is the proper name for porcelain clay? A. The technical name is kaolin.

(22) H. A. M. asks: What will harden coal tar, so that the heat of the sun will not cause it to run or melt? A. The only process that we know of in this connection is the distillation of the tar, to obtain pitch or asphalt.

What would be the results attaching a force air pump to the steam tube leading to the cylinder and forcing air in with the steam? Our engineer thinks the expansion of the air would add to the power, and prove a saving. A. Sufficient data are not sent. In general, this plan would be anything but economical.

(23) W. E. L. asks: Could not photographers place a looking glass in such a position that anyone sitting for a picture could look at themselves, and be sure to get the desired expression of countenance? A. They could. It is an old idea.

(24) F. M. H. asks: How can I ascertain how many feet a belt runs at any given speed of rotation of pulley? A. Find the circumference of a circle whose diameter is equal to that of the pulley on which the belt runs increased by the thickness of the belt. Multiply this circumference by the number of revolutions that the pulley makes per minute.

What are the principal questions that are asked of a person in order to get an engineer's license? A. You should apply to the local supervising inspector.

(25) J. D. W. asks: How are glass globes, reflectors, etc., silvered? How can I silver a bent glass without having to use a hot solution or the ordinary method of tinfoil and quicksilver? A nitrate of silver solution would be too costly, as it would take too much and the waste would be of no use. A. We can give you no recipe that will answer all your requirements.

(26) C. B. W. says: 1. I have tried to construct a cheap telescope as described by you, but it will not work. The lenses are a meniscus of 1½ inches diameter and 48 inches focus, and a plano-convex ½ inch in diameter, 1 inch focus. Which way should the lenses be set, convex side toward the eye or otherwise? A. Otherwise. 2. Will not a straight tube do as well as a tapering one? A. Yes. 3. How far should the above lenses be from each other? A. 49 inches.

(27) C. J. W. says: I intend to make a telescope with a two inch achromatic object glass of 30 inches focus. 1. How can I make a terrestrial eyepiece for it, having a power of 80, and another having a power of 20. A. The equivalent focus of a terrestrial eyepiece is about equal to the mean of that of the first and last lenses. Thus if the object lens (A) is 1·5″ focus, amplifying lens (B) 2″, field lens (C) 1·6″, eye lens (D) 1·2 focus; the equivalent focus will be 1 35″ and the power 22 If you wish a pancratic or variable power eyepiece, make the foci (in sixteenths of an inch): A 19, B 24, C 24, D 11; the apertures respectively 9,7,9,7. From A to B = 27, C to D = 20. From A to D = 74, when the draw tube is shut; A to D = 124 when it is open. Power 16 shut, 30 open. Diaphragm aperture 2, distant 18 from A toward B. Ditto aperture 5, distant 8 from C toward D. 2. Has the Huyghenian eyepiece any advantage over a single equivalent lens? If so, what is it? A. There is less aberration. 3. How do you tell the focal length of the Huyghenian eyepiece, when given the focal length of the two lenses? A. Divide focus of objective by ½ focus of field lens. 4. Will you please give me a formula for making a terrestrial eyepiece of any power for any focal length of object glass? A. Sir D. Brewster's formula is; Foci, 14, 21, 27, 32. Distances, 23, 44, 40. Apertures 5·6, 3·4, 13·5, 2·6; diaphragm at inside focus of eyelens. 7.

(28) Z. says: I have an object glass 2 inches in diameter and of 2¼ inches focus. I wish to increase the length of the focus by means of a concave lens placed between the object glass and the eyepiece, so that my telescope shall be equal in power to an ordinary telescope of 48 inches in length with an object glass two inches in diameter. What must be the size and focus of the concave lens, and at what distance must it be placed from the object glass? How is the calculation made? A. Place, 12 inches from your objective, a concave achromatic lens of 1 inch aperture, and 24 inches virtual focus. For optical formulæ, see any work on physics.

(29) W. B. asks: What is the cause and what is the remedy in case of a person's hair getting prematurely gray? Is it poverty of the particular constituents of the blood, which furnished sustenance for the hair? If so, what should be added to enrich it in that respect? A. It may be congenital or accidental, depending upon some constitutional peculiarity in the organization of the individual; causes which have been observed to cause it are mental emotion, disease, and injuries. Grief and terror have been known to cause it, varying in time from a few hours to years. Bichat says: "The different passions of the mind have a remarkable influence over the internal structure of the hair; often, in a short period, grief effects change in its color, blanching the hair, probably by means of absorption of the fluids contained in its tissue." The treatment is to remove the causes of debility existing in the constitution by tonics, especially chalybeates and phosphoric acid, and (where defective nutritive power prevails) by means of preparations of iron and arsenic, and to stimulate the skin locally by abundant brushing and some gentle stimulant, such as cologne and aqua ammonia used at the same time.

(30) R. H. says: If you sprinkle salt on a fly which is dead from drowning, it will come to life again and fly away. What is the cause? A. The fly is not dead, although he may be apparently lifeless. The salt absorbs the water from the breathing apparatus of the insect, and so restores animation.

(31) W. P. H. asks: 1. How is the concave surface of a glass reflector for a reflecting telescope silvered on the inside? A. Draper's method of silvering glass: Dissolve 560 grains Rochelle salt in 3 ozs. of water. Dissolve 800 grains nitrate of silver in 4 ozs. of water. Add silver solution to an ounce strong ammonia until brown oxide of silver remains undissolved. Then add alternately ammonia and silver solution carefully until the nitrate of silver is exhausted, when a little of the brown precipitate should remain. Filter. Just before using mix with the Rochelle salt solution and dilute to 22 ozs. Clean the mirror with nitric acid or plain collodion and tissue paper. Coat a tin pan with beeswax and rosin equal parts. Fasten a stick ⅛ inch thick across the bottom. Pour in the silvering solution. Put in quickly the glass mirror, face downwards, one edge first. Carry the pan to a window and rock the glass slowly for half an hour. Bright objects should now be scarcely visible through the film. Take out the mirror; set it on edge on blotting paper to dry. When thoroughly dry, lay it face up on a dusted table. Stuff a piece of softest thin buckskin loosely with cotton. Go gently over the whole silver surface with this rubber in circular strokes. Put some very fine rouge on a piece of buckskin laid flat on the table, and impregnate the rubber with it. The best stroke for polishing is a motion in small circles, at times going gradually round on the mirror, at times across, on the various chords. At the end of an hour of continuous gentle rubbing, with occasional touches on the flat, rouged skin, the surface will be polished so as to be perfectly black in oblique positions, and, with moderate care, scratchless. It is best, before silvering, to warm the bottle of silver solution and the mirror in water heated to 100° Fah. 2. What is the best composition for a metallic speculum for a reflecting telescope, and what proportion should the metals have? A. Copper 126·4, tin 58·9 parts. 3. How can I grind and polish a concave metallic speculum for a reflecting telescope? A. Coarse, fine, and elutriated emeries, then rouge, must be applied to the surface in curves, at first circular, then in adjustable hypocycloid curves, by appropriate machinery or by hand. The hollow is ground by lead and by iron surfaces, and is polished by pitch tempered with rosin.

(32) T. S. K. asks: How can I cement a broken crucible? A. We know of no authentic recipe that answers your purpose.

(33) G. B. asks: How can the black scale on sheet steel be removed most efficiently? Cold acid will not touch it; and for a small quantity, the expense of a lead bath and apparatus is too great. A. We know of no method other than those you mention.

(34) R. A. says: I have a Rhumkorff induction coil. The connections are perfect as far as I can see, and I have a Smee's battery of two elements. Is the battery strong enough? It will work at times, but will give no perceptible shocks. Occasionally the keeper will tap for a few moments, then stop. If I touch it it will start again, only to stop as before. Can you inform me as to the probable cause? A. It is necessary for the proper working of the machine that the keeper and all connections should be perfectly free from dust, corrosion, etc. Your battery is amply sufficient for the purpose.

(35) W. L. L. says: In Humboldt's "Cosmos," I read that "the early races of mankind beheld in the far north the glorious constellation of our southern hemisphere rise before them, which, after remaining long invisible, will again appear in those latitudes after the lapse of thousands of years." Again: "The places of the north pole will successively be indicated by the stars *Beta* and *Alpha Cephei* and *Delta Cygni* until, after a period of 14,000 years, Vega in *Lyra* will shine forth as the brightest of all possible pole stars." If this be so, are not the zones and climates moving around the earth, slowly but surely, so that what now is the frigid zone was once the torrid zone, and *vice versa*? Again: If, as Herschel says, the sun is leading this system through space, is another glacial period possible? What caused the glacial period? Was it the physical condition of the sun, and was the ice destroyed by the growing heat of the sun? Is the sun's heat increasing or decreasing? Are not all the living beings on this earth doomed to certain extinction through and by the course of the natural laws of the Universe in the distant future? Will not the earth become as the moon is now, dead and nonproductive? A. Glacial periods have occurred in both hemispheres, and may have been caused: 1. By elevation of land 5,000 feet. 2. By changes in the obliquity of the ecliptic, causing an alternate accumulation of ice at either pole. This occurred here from 80,000 to 200,000 years ago. 3. The sun, being now a variable star, period 11 years, may have emitted less heat. 4. The solar system may have travelled in cold spaces comparatively destitute of stars. The life history of a planet is supposed to be entirely comprised in the short period requisite to cool its surface from the boiling to the freezing point of water, being inhabited only for an infinitesimal part of its existence.

(36) F. O. C. asks: Can you give me a sample test by which I can tell pure oxide of zinc from adulterated, before it is ground in oil? A. Oxide of zinc and its hydrates are white powders, which are insoluble in water, but dissolve readily in hydrochloric, nitric, and sulphuric acids The oxide of zinc acquires a lemon yellow tint when heated, but it reassumes its original white color upon cooling. When ignited before the blowpipe, it shines with considerable brilliancy. You do not state with what you consider the zinc to be adulterated. The substance most commonly used is sulphate of baryta; this substance is insoluble in the acids (except in an almost imperceptible amount) and can be separated from zinc in that manner, the insoluble residue left from a strong acid solution in this instance being baric sulphate.

What is a good test to detect impurities in hydrochloric acid? A. Pure hydrochloric acid must be colorless, and leave no residue upon evaporation. Hydrosulphuric must leave it unaltered, and sulphocyanide of potassium must not impart the least red tint to greatly diluted acid.

I have been told that, in one of Sorel's formulæ for the oxide and chloride of zinc cement, he used a portion of carbonate of baryta. Is this so? A. One of Sorel's cements contains 3 per cent of borax or the same proportion of sal ammoniac, but we have no record of any baryta salt being used.

(37) F. H. B. asks: What vessels have made the fastest time across the ocean, on record? A. We believe that the run of the steamer Adriatic of the White Star line, from Queenstown to the lightship off Sandy Hook in 8 days less 5 minutes, is the quickest western trip on record. The Adriatic is 450 feet long, and has a beam of 41 feet.

(38) E. L. H. asks: How can I set the lenses of an eyepiece to a telescope? It is composed of two plano-convex lenses. A. The Huyghenian eyelens is one third the focus of the field lens, and is placed its own focal length within the focus of the latter.

(39) J. C. B. of Berlin, Germany, asks: 1. What is expected of a mechanical draftsman in America when he takes a position in the drafting room of machine works? A. If he is the head draftsman, he is expected to design and superintend the construction of all work. 2. What percentage on the estimate of an engine does a mechanical draftsman charge for the drawings, etc.? A. No general answer can be given to this question. The compensation received depends upon the ability and reputation of the designer. 3. How do the proprietors of machine works charge for work done in their shops, and also for a man going out to do work? A. From 20 to 25 per cent profit may be considered an average amount.

How many editions of "Uncle Tom's Cabin" have been published altogether? A. It is stated on good authority that the number of copies sold amounts to millions. We do not think that the number of editions is known. The work has been translated into 17 languages.

(40) J. H. F. asks: 1. Will turpentine do to preserve animals in place of arsenic? A. No, because of evaporation. 2. Is there any book on the animals of New York? A. The "Natural History of New York" contains all the information you require.

What is a standard work on civil engineering? A. Mahan's "Civil Engineering."

Is gasoline dangerous to use? A. Yes, very.

(41) W. C B. asks: What is a foot pound? Well's in his "Chemistry" says that is a force sufficient to raise 772 lbs. weight to the hight of one foot; but he does not say how long a time may be occupied in raising it. A. A foot pound is the amount of work required to raise a weight of one pound one foot high, We think you are mistaken in the definition you attribute to Mr. Wells.

(42) H. B. says: Your correspondent J. A. asks where the fallacy is in the following demonstration: $x=1$, $y=1$; then $x=y$. $x^2=xy$. $x^2-y^2=xy-y^2=(x+y)(x-y)=y(x-y)$. $x+y=y$. $2=1$. He might have obtained the same result by a shorter course of algebra: $2\times0=1\times0$; or both sides divided by 0, $2=1$. The fallacy consists in dividing the two sides of an equation by a divisor equal to 0, in which case the resulting equation is not necessarily right, though it may be so in most cases.

(43) B. F C. says, in answer to J. L. L., who asked as to fire clay for a boiler furnace: Take common earth, well mixed with water, to which is added a small quantity of rock salt; let the water stand until the salt dissolves, which will take about 2 or 3 hours. It is then ready for use. Apply it as fire clay is used, and your furnace will stand much longer.

(44) B. F. C. says: I see that a mechanic of Cleveland, O., secured a good draft and succeeded in consuming the smoke from his furnace by the application of steam in small jets, which you seem to doubt. I have a similar apparatus; but instead of two jets there are five, and it not only creates a bright light, but, with careful firing, it consumes at least two thirds of the smoke. Where you have a good draft, I would not advise anyone to use it, as it creates rapid combustion, and would cause a waste of fuel.

(45) D. M. says, in answer to I. A., who asks: Where is the fallacy in the demonstration given that $2=1$? It should be remembered that multiplying an equation by a factor of the first degree raises the equation one degree and introduces a new solution which is found by making that factor equal to zero. Inversely, if we divide an equation by a factor of the first degree, the quotient is an equation one degree less, and has one solution less, which solution is that expressed by making the divisor = 0. Thus, in the present instance, $x=y$ or $x-y=0$ has but one solution. Multiplying by x, we have $x^2=xy$, or $x(x-y)=0$. which, being of the second degree in regard to x, has the two solutions $x-y=0$ and $x=0$. If we divide by $x-y$, the supposition that $x=y$ disappears, and there remains only $x=0$ From which it appears that in $x+y=y$, the quotient obtained by I. A., x should be made equal to zero. The quantity yy^2, subtracted from each member of the equation $x^2=xy$, since it does not alter the equation, has nothing to do with the result obtained.

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

W. F. S. and G. S. A.—Your insects have been put in the hands of a distinguished entomologist for examination, and will be reported upon as soon as an answer is received.—W. E. D.—It is plumbago.—J. E. B.—They are both specimens of trap rock, and would possibly make such a paint as you desire.—J. B.—No. 1 is bituminous shale. No. 2 is brown hematite, with considerable amount of clay. No. 3 is jaspery hematite. No. 4 is laminated argillaceous brown hematite. No. 5 is clay and sand, cemented with hydrated sesquioxide of iron. No. 6 is fossiliferous yellow and red hematite No. 7 is compact clay. No. 8 is bituminous clay. No. 9 is argillyte. No. 10 is galena.—F. J. R.—It is hornblende and quartz.—C. O. R.—No. 1 is chalcopyrite. No. 2, the gray part is fibrous zeolite; the green is in too minute particles for satisfactory examination. No. 3 is fibrous amphibole. No. 4 is leucopyrite or arsenide of iron. No. 5 is azurite. There was no No. 6 in the box. No. 7 is flesh-colored calcite.

COMMUNICATIONS RECEIVED.

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

On Cribbing in Horses. By D. C.

On the Decomposition of Eggs. By Z. M. P. K.

On Mosquitoes. By W. C.

On the Treatment of Criminals. By H. H.

On Floating Magnets. By H. P. H.

On a Carpenter's Bench. By J. C. P.

On a Boiler Explosion. By M. A. K.

On the Potato Bug. By E. S. W.

On the Phylloxera. By R. J., and by R.B.S.

On Tides. By P. G. McE.

On an Amalgamator for Gold and Silver Ores. By W. T. B.

On Crucibles. By J. D.

Also enquiries and answers from the following:

G. S.—R. H. P.—J. N. B.—E. F. C.—E. L. W.—O. P. S.

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.

We have some queer correspondents: One writes to know if we will not be so good as to send a messenger to an address which he gives—distance two and a half miles from our office—to make certain inquiries for him. It would require one and a half hours' time to do the errand, and not a stamp inclosed. Another wants us to write a letter and tell him where to get a combined thermometer and barometer. Another: "Will you be good enough to give me the names and addresses of several of the makers of the best brick machines"; another wants water wheels another threshing machines; each writer desires our written opinion as to which is the best device, with our reasons, and not one is thoughtful enough to inclose a fee, or to reflect that to answer his request will consume considerable of our time. Another party wishes us to write to him the recipe for making ornaments out of coal tar, where he can buy the mixture ready for use, and how much checkermen will sell for in the New York market. For this information he sends us the generous sum of three cents in postage stamp. Mr. C. wants us to tell him of some valuable invention, of which he can buy the patent cheap, that would be suitable for him to take to sell, on his travels out West, by towns, counties, etc., three cents inclosed. Others want us to put them in communication with some person who will purchase an interest in their inventions, or manufacture for them, or furnish this or that personal information, our reply to be printed in the SCIENTIFIC AMERICAN. We are at all times happy to serve our correspondents, and when they present enquiries which we consider of general interest to our readers, we give space for them in the above columns; but if replies to purely personal errands are expected, a small fee, say from one to five dollars, should be sent.

[OFFICIAL.]

Index of Inventions

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September 22, 1874,

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