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 these 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.