(27) G. W. I. writes: Please state the difference of draught of two cars of same dimensions and weight, one running on a two foot gauge track and the other on a four foot gauge? A. On four foot gauge—as the running gear will be heavier and the friction greater—with same size of wheels.

(28) W. P. T. writes: We have four boilers, 20 feet long and 48 inches in diameter, set in a battery with steam drum, carrying 80 pounds steam. We have two engines coupled together on one shaft and supplied with one steam pipe and one governor. The steam pipe branches, after passing the governor, one branch running to each engine of course. The engine cylinders are each 16 inches in diameter and have 20 inch stroke of piston. The governor is the same distance from each engine, *i. e.*, 3 feet, but is 53 feet from the governor to the steam drum, with two square turns between the governor and steam drum. The engines have common slide valves, and run 160 revolutions per minute. The steam feed pipe is 5 inches in diameter and governor is a 5 inch one, made by Allen Governor Company. Now the question is: Is the feed pipe large enough to supply the engines fully in hard labor, or do we lose power in putting the steam through so small a steam pipe? And how large should the steam pipe be to get the best result? A. If you use a cut-off on your engines, the pipe is large enough. If you work whole stroke, it would be necessary to apply an indicator to determine whether the pipe is too small. Your loss of power, if any, must be small.

(29) J. H. R. asks (1) how far apart steam pipes 2¼ inches in diameter should be from outside to outside in order to obtain the best results from the fire (soft coal). A. You do not state whether the fire is outside or inside the tubes. If outside, they can be placed at such a distance as necessary for draught, and this will depend upon arrangement of flues. If inside, not less than ¾ inch, and would be better if ⅞ or 1 inch. 2. How much higher should the end of a twelve foot pipe be at one end than at the other to allow the steam to escape freely? A. A rise of one inch to the foot will answer well. But more would be better if there is intense fire. 3. At which end of the pipes should the fire be placed, the highest or the lower end, to get the best effect of the fire? A. Lowest end. 4. What is the greatest pressure it would be safe to carry steam in lap-welded boiler tubes, 2½ inches outside diameter, tube weighing 2¾ pounds to the foot? A. 200 to 250 pounds per square inch. 5. How many pounds is about the greatest strain threads will bear in Seller's system of screw threads and nuts? A. The strength of the thread is intended to equal that of the bolt, if the nut fits well and is equal in thickness to the diameter of the bolt.

(30) J. C. L. asks: Do you know of any material or substance that is perfectly transparent (similar to glass) yet impervious or so reflective of the sun's rays as to prevent its usual fading effect on a delicate alkaline color? A. We know of no such substance.

(31) C. J. asks: Which would afford the greatest amount of power at the same pressure of steam, say 60 lb. to square inch, two engines, 3½ by 8 inch stroke, both connected to one shaft, or one engine 7 by 8 inch, to work from same shaft? What would be the difference in the power and also in fuel? The boiler is 54 inches long by 32 inches diameter; 34 two inch tubes; locomotive type. A. The 7 inch cylinder by 8 inch stroke would give double the power (with same pressure and speed) that would be given by two cylinders 3½ by 8 inch stroke, and with slightly greater economy of fuel.

(32) J. L. writes: I should like a receipt for a cement that will do for kerosene lamps. Can you give me a receipt through your columns? I have tried plaster of Paris and various other things, but without success. A. Plaster of Paris made into a paste with a sirupy solution (aqueous) of water glass, and used immediately, makes a very good cement for this purpose. Hot soft soap is used in connection with plaster in a similar manner for this purpose. See "Cements," page 2510, SUPPLEMENT No. 158.

(33) W. G. B. asks: Will you kindly tell me how to make the common liquid ammonia and alcohol of commerce; also camphor in small quantities? A. Dissolve about 10 pounds of sugar in 5 gallons of water; add a little yeast, and set aside in an open vessel in a cool place to ferment. As soon as the fermentation subsides put the liquid in a retort and apply heat. When the liquid begins to boil attach a coil of small copper pipe so as to receive the steam or vapor, and immerse this coil in a tub of cold water so that the vapors will be condensed within it, and drip out the lower end into a receiver. The spirit thus obtained will contain much alcohol. It is rectified by careful redistillation, and called alcohol. To make liquid ammonia mix 10 pounds powdered sal-ammoniac with about 6 pounds pure lime (previously dry slaked); put this mixture into an iron retort, and apply a moderate heat. Pass the ammonia gas given off through a series of bottles half filled with cold water; the water will absorb the gas, and when enough of the gas has thus been absorbed the water in the bottles becomes aqua ammonia (ammonia water). Consult Wagner's "Chemical Technology" and the United States Pharmacopœia.

(34) C. H. B. asks: What can be used as a substitute for glycerine in printer's rollers besides sugar or molasses? A. We know of nothing that could be used with advantage as a substitute for these in this connection.

(35) H. A. L. asks: 1. How shall I go to work to make an electric light? A See "Simple Electric Light Apparatus," in SUPPLEMENT, No. 159. 2. What chemical will soften silver enough to join two pieces together? A. We know of no chemical that will soften silver so that it may be joined. Silver solder is usually employed for joining pieces of the metal. 3. Will common sweet oil do in place of olive oil for that phosphoric oil as described in No. 318? A. Yes.

(36) C. A. C. writes: On page 208 of *Science Record* for 1875 is a description of a new artificial light I have been to considerable expense in making it, but I can only get a very dim light, and the smoke is very hard to get rid of, there being so much of it. I used oil of vitriol, supposing it to be sulphuric acid. Will you please advise me as to what the trouble is, and how I can improve the light? A. The apparatus referred to is not designed to produce a very brilliant light. The faint blue flame, however, possesses sufficient actinic power to make it, in some cases, serviceable for photographic purposes. A glass chimney can be made to confine and conduct the smoke to a flue. The greater portion of the products of combustion are readily absorbable in moist slaked lime. Common sulphuric acid is commercially known as oil of vitriol.

(37) M. N. writes: I want to make a large slab of artificial marble. Can you inform me of a composition for such which will become as hard and strong as marble itself? A. Try the following: Reduce marble dust or white limestone to a very fine powder by grinding and sifting, mix with it intimately about one-fourth its weight of zinc oxide (zinc white) and one-eighth its weight of Portland cement, and mix thoroughly into a thick paste with a sufficient quantity of a hot aqueous solution of water-glass, containing about 40 per cent of the glass. Mould the paste under pressure while warm, and expose the moulded form for a week or ten days to warm dry air, before finishing. See "Water-glass," page 16, vol. xlv.

(38) J. A. H. asks: 1. Can soapstone ground fine be moulded into different shapes by mixing with some ingredient, and hardened for bricking or ornamental purposes, such as mantels, table tops, etc.? A. Soapstone powder mixed with water-glass (see SUPPLEMENT No. 317) can be moulded when moist into various forms, which, when dried, become quite hard and closely resemble the natural stone. This artificial stone does not, however, stand heat as well as the native rock. 2. From what quarries do the New York dealers procure their soapstone? A. Chiefly from Vermont and the Carolinas. For the other information you should address some dealer in soapstone. 3. Will the quarry widen as you go down? A. We have no means of judging—probably not.

(39) D. J. C. asks: Will you please state what are the proper ingredients and proportions and how to mix and apply them to brick work, to stain the latter to represent red brick? A. The color is clear red ocher or Indian red, and the vehicle a thirty-five or forty per cent aqueous solution of good soda water glass (see SUPPLEMENT, No. 317). The pigment and vehicle must be well ground together. It is preferably used hot.

(40) R. E. N. asks: How can I make oxygen to use with the appliance described in SUPPLEMENT No. 20, 1876, under the head of "Soldering," by George M. Hopkins? A. See page 5013, SUPPLEMENT, No. 314.

(41) D. L. asks: Will you kindly give me a receipt for making printer's composition rollers for power cylinder presses? A. An equal quantity of concentrated glycerine and good glue are weighed out; the glue is softened by soaking it over night in a little cold water, and then dissolved in the glycerine by aid of heat over a waterbath. The heating is continued for several hours to expel the water taken up by the glue in softening, and then poured into the oiled metal moulds. A small quantity resin soap is added to the composition by some makers, and sometimes part of the glycerine is substituted by molasses.

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

A. A. St. J.—We cannot undertake to analyze the substance—it is a complex mixture of drugs and organic substances.—M. B.—The crystals are calcite—lime carbonate; the rock is dolorite trap.—F. F. & W. F.—1. Barium sulphate or heavy spar—used to some extent by paint manufacturers. 2. An impure quartzose sand containing films of mica and a small quantity of iron sulphide—of no value.—T. B. H.—The liquid will require an analysis. We cannot tell what it is composed of by an examination.—A. E. A.—It appears to be chiefly composed of cork dust, chalk, plaster of Paris, water glass, and cologne spirits.

NEW BOOKS AND PUBLICATIONS.

THE FOOD OF THE JAPANESE PEOPLE. By Thomas B. Van Buren, U. S. Consul General of Japan. Yokohama. 1881.

Among the many reports returned to the State Department at Washington by our consular agents abroad, this report on the food of the Japanese people is of exceptional interest. The subject has been investigated with a thoroughness which makes the report a scientific monograph of no mean order; and the subject itself has especial interest in its bearing on the question how far the characteristics of national life are determined by a people's food. It has happened that most if not all of the more forceful and active nations of the west have been large consumers of meat. So markedly has this been the case that it is commonly accepted as a truth practically demonstrated that a well fed, capable, progressive people must of necessity consume a large proportion of animal food. It gives this theory something of a set-back to learn that the most progressive of oriental nations, the Yankees of the East, as they have been called, are almost exclusively eaters of vegetable food. The masses do not eat meat simply because they cannot afford to eat it. Beef cattle are scarce, and mutton and pork still scarcer. Domestic poultry and wild fowl are so costly that even the well-to-do partake of them sparingly and only on special occasions. Fish are comparatively plentiful and are more largely eaten; so that it is estimated that half the people eat fish every day; one-quarter two or three times a week; the rest perhaps once or twice a month. Nevertheless the food of the masses is nine parts out of ten vegetable. Yet the Japanese are well fed, and though of small stature, are well developed physically, and capable of sustaining severe and long-continued mental and bodily labor. Their physical and intellectual superiority to the rice-eating Bengalese—so far as determined by the nature of their food—may perhaps be attributed in large measure to the prominent place given to highly nitrogenous plants of the class known as leguminous. More than forty varieties of peas and beans are cultivated. The richly nutritive soy bean properly supplements the rice, which plays so large a part in the national diet. After rice the cereals most cultivated are in order—barley, millet, wheat, rye, and Indian corn. The sweet potato takes the first place among tubers, the annual product being sixteen million bushels. This crop is rivaled by that of the large white and highly odorous radish known as "daikou." Carrots, turnips, parsnips, and the like are very largely eaten. The entire list of food plants covers a dozen long columns. Most of them have no western equivalents, though many of them no doubt might be profitably introduced among us. The manner of preparing a number of the leading articles is given according to the practice of the chief cook of a native eating establishment. The value of the copy of the report transmitted to us by Mr. Van Buren has been greatly augmented by extension. It has been interleaved with numerous photographic illustrations of Japanese life, which give one, so to speak, an inside view of the industrial and social life of the agricultural peasantry, the artisan classes, the merchants, doctors, teachers, professional storytellers, and the rest. Among the characteristic features of these views of the Japanese at home, in the field, journeying or pleasure taking, one cannot but notice the general expression of good humor upon the faces of the men, however ugly they may seem to our western eyes; the amiability, sometimes real beauty, of the women folk; and the comfortable open-eyed serenity of the babies.

THE UNIVERSAL CALCULATOR, WITH DIRECTIONS FOR USING IT. By W. H. Wythe. Red Bank, N. J.

A very simple and ingenious application of the principle of the slide rule to a circular chart of several scales with two movable arms. One arm is fixed to a central disk, against which the other arm bears with friction enough to cause it to be retained in any desired position relative to the first arm, while both arms are moved together around the concentric scales. By simple and obvious applications of the rules of proportion all arithmetical problems involving multiplication, division, even powers and roots, percentages, and so on—in short the vast majority of the problems that come before the artisan or the business man, can be quickly solved by an easy mechanical process. Any one who has much figuring to do would be likely to find it a very helpful time and labor saving instrument.

CAWKER'S AMERICAN FLOUR MILL DIRECTORY FOR 1882. Milwaukee, Wis.

The intelligence and care with which Mr. Cawker's work is done was attested in the directory of flour mill owners prepared by him last year. This edition he considers an improvement on the last. It gives the names and post office addresses of all the flour mill owners in the United States and Canada. The total number of addresses approaches twenty-three thousand.

THE USE OF TOBACCO. By J. I. D. Hinds, Ph.D. Lebanon, Tenn. Private print, 16mo, cloth, pp. 38.

An exceptionally temperate discussion of the tobacco habit, historically, commercially, physiologically, and socially considered. The tone of the argument against the use of tobacco is calm, and more than usually cogent in that it avoids extravagant assertion and rant. It is a good book to put into the hands of youth.

[OFFICIAL.]

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FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

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AND EACH BEARING THAT DATE.

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A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 261 Broadway, corner of Warren Street, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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