Bleaching. Under this head are included general receipts for bleaching and decolorizing. The methods employed for special purposes, such as bleaching fabrics for dyeing, removing stains, &c., will be found in their proper places by reference to the index.

1715. To Bleach Cotton Pure White. Boil for 3 hours in water containing 1 gill to the gallon of either caustic potassa or caustic soda; wash well from the lye, then lay the yarn or fabric to steep for 4 or 5 hours in cold water containing 1 pint of bleaching liquor (*see No.* 104) to the gallon; then lift out and steep for an hour in a sour of 1 wine-glassful of sulphuric acid to the gallon of water; lift, and wash well; then boil for 2 hours in a caustic lye, half the strength of the first; wash from this, and steep again for 4 hours in the bleaching liquor; wash from this and steep again for 1 hour in a clean sour, made in the same manner as the first; wash well from this, and dry. A little smalt blue is put into the last washing water to clear the white.

1716. To Bleach Wool. The first kind of bleaching to which wool is subjected, is to free it from grease. This operation is called scouring. In manufactories, it is generally performed by an ammoniacal lye, formed of 5 measures of river water and 1 of stale urine; the wool is immersed for about 20 minutes in a bath of this mixture heated to about 130° Fahr; it is then taken out, suffered to drain, and rinsed in running water. This manipulation softens the wool, and gives it the first degree of whiteness. It is then repeated a second, and even a third time; after which the wool is fit to be employed. In some places, scouring is performed with water slightly impregnated with soap; and indeed, for valuable articles, this process is preferable; but it is too expensive for articles of less value. Bisulphide of carbon and benzine have been employed in cleansing wool. The fat may be saved by distilling off the solvent, which may be used over and over again. (*See No.* 439.) Sulphurous acid gas unites very easily with water; and in this combination it may be employed for bleaching wool and silk.

1717. Sulphuration. The process by which silk, cotton, woolen, and straw goods,

&c., are bleached or decolored by exposure to the fumes of burning sulphur. This is effected in a close chamber of a size proportioned to the scale on which the operation is conducted, and supplied with only just sufficient air to keep up the slow combustion of the sulphur, the fumes of which are sulphurous acid. (*See Nos.* 360 *and* 364.)

1718. To Prepare Sulphurous Acid for Bleaching. Sulphurous acid is used either as gas or in solution in water, which dissolves 50 times its volume of the gas. In the former case sulphur is burned in a close room in which the stuffs (moistened) are hung; for small articles a barrel with a lid answers well. 2 exposures, of 24 hours each, suffice for wool. (*See No.* 360.) To get a solution of sulphurous acid, the cheapest and best plan is to heat in a glass retort 12 ounces sulphuric acid and 2 ounces sulphur. The gas, which comes off quietly, is collected in a large glass bottle partially filled with water; or, better, a series of bottles so connected together that the gas must pass successively through the water contained in each.

1719. A New Wash for Wool and Silk. Instead of using the fumes of sulphur, M. Frezon proposes the following mixture: 4 pounds oxalic acid, 4 pounds table salt, 200 quarts water. The goods are laid in this mixture for an hour. They are then generally well bleached, and only require to be thoroughly rinsed and washed. For bleaching straw it is best to soak the goods in caustic soda and afterwards to make use of chloride of lime or Javelle water. (*See Index.*) The excess of chlorine is afterwards to be removed by hyposulphite of soda, called antichlor.

1720. To Bleach Straw Bonnets. Get a deep box, air-tight, if possible; place at the bottom a stone, on the stone a flat piece of iron red hot, or a pan of charcoal, on which scatter powdered brimstone; close the lid, and let the bonnet remain a night. There should be hooks on the box, on which to hang the bonnets. (*See last receipt.*)

1721. To Bleach Sponge. Sponge may be bleached almost snow-white by repetitions of the following process: Soak it in diluted muriatic acid 10 or 12 hours, then wash it with water and immerse in a solution of hyposulphate of soda to which a small quantity of diluted muriatic acid has been added. Wash and dry it.

1722. Blanched Sponge. Soak the sponges for several days in cold water, renewing the water and squeezing the sponges occasionally. Then wash them in warm water, and place them in cold water to which a little muriatic acid has been added. Next day take them out and wash them thoroughly in soft water; then immerse them in an aqueous sulphurous acid (specific gravity 1.034) for a week. They are afterwards washed in plenty of water, squeezed, and allowed to dry in the air.

1723. To Bleach Lac. Dissolve the lac in a boiling lye of pearlash or caustic potash, filter it and pass chlorine through the solution until all the lac is precipitated. Collect the precipitate, wash well in hot water, and finally twist into sticks, and throw them into cold water to harden. Lac thus purified is used to make pale varnishes and the more delicate tints of colored sealing-wax. Shellac bleached by this method is liable to stain furniture inlaid with brass. The following process is free from this objection, and has the additional advantage of being much cheaper:

1724. To Bleach Shellac with Animal Charcoal Any quantity of yellow shellac, previously broken in small pieces, is conveyed into a flask, alcohol of .830 specific gravity poured upon it, and the whole heated on a stove, or, in the summer, in the sun, until the shellac is dissolved; upon this so much coarsely powdered animal charcoal is added to the solution that the whole forms a thin paste; the flask is closed, not quite air-tight, and left so for some time exposed to the sun; and in 8 to 14 days a small sample is filtered, sufficient to ascertain whether it has acquired a light yellowish brown color, and whether it yields a clear, pure polish, on light colored woods. If this be the case, it is filtered through coarse blotting paper, for which purpose it is best to employ a tin funnel with double sides, similar to those employed in filtering spirituous solutions of soaps, opodeldoc, &c. The portion which first passes through the filter may be preserved separately, and used as a ground or first polish. Then some more spirit is poured over the charcoal upon the filter, and the solution used as a last coating. The solution of shellac purified by animal charcoal has a brown yellow color, but it is perfectly clear and transparent; when diluted with alcohol, the color is so slight that it may be used in this state for polishing perfectly white wood, such as maple, pine, &c., without the wood acquiring the least tint of yellow.

1725. To Bleach Gutta Percha. Dissolve 1 part gutta percha in 20 parts hot benzole, shake the solution with $\frac{1}{10}$ part freshly calcined plaster, and set aside, with occasional agitation, for 2 days. The clear pale brownish-yellow liquid is then decanted into another vessel containing double its bulk of alcohol fortius (*see No.* 1439), when the gutta percha will be precipitated in the form of a brilliantly white tenacious mass, which is pounded together in a mortar, and rolled into cylindrical sticks.

1726. Bleaching Woolen Rags. These are most effectually bleached by the application of sulphurous acid. Of course, in many instances, the color of the rags, supposing the same to be dyed or printed goods, will be also destroyed. Chlorine cannot be used for this purpose, because it causes woolen and silk fabrics to become yellow, and impairs the strength of the fibre, by entering into chemical combination with the wool, silk, and other similar substances of animal origin; as, for instance, sponge, animal gut, isinglass, &c., all of which, if requiring bleaching, are bleached by sulphurous acid.

1727. New Method of Bleaching Feathers. This process is an entirely newly-discovered one, whereby the feathers of ostriches and other birds may be bleached, even if these feathers are naturally black or dark gray colored. The feathers are placed for from 3 to 4 hours in a tepid dilute solution

of bichromate of potassa, to which, cautiously, some nitric acid has been added. After this lapse of time the feathers will be found to have assumed a greenish hue, owing to the oxide of chromium precipitated on the substance; in order to remove this, the feathers are placed in a dilute solution of sulphurous acid in water, whereby the feathers become perfectly white and bleached. Care is to be taken that the solution of bichromate be not made too strong, and especially that not too much nitric acid be used, which would cause an irremovable yellow color.

1728. Table Showing the Number of Parts of a Weak Bleaching Liquor, Required to be added to 1 Part Bleaching Liquor of 6° Twaddell, to Produce a Liquor of a given Strength. According to Mr. Crum, the strength of liquor for bleaching cotton should be less than 1° Twaddell; the following table enables an operator to increase the strength of a weak bleaching liquor with a great degree of accuracy. The left hand column gives the strength of the weak liquor, expressed in $\frac{1}{12}$ parts of 1°. At the head of the other columns stands the degree of strength required, and under these headings will be found the number of parts of weak liquor required to be added to 1 part of a liquor of 6° Twaddell, to produce the required strength of the mixture. (*See No.* 68.)

Strength of Sample.	Strength Required.			
	$\frac{8}{12}$°	$\frac{6}{12}$°	$\frac{4}{12}$°	$\frac{3}{12}$°
Water.	8 parts	11 parts	17 parts	23 parts
$\frac{1}{12}$°	9¼ "	13½ "	23 "	35 "
$\frac{2}{12}$	11 "	17 "	35 "	71 "
$\frac{3}{12}$	13½ "	23 "	71 "	
$\frac{4}{12}$	17 "	35 "		
$\frac{5}{12}$	23 "	71 "		
$\frac{6}{12}$	35 "			
$\frac{7}{12}$	71 "			

1729. Properties of Charcoal. This article, when fresh, possesses the property of taking lime and other saline matter from syrups and other aqueous solutions, especially organic ones, at the same time that it decolors them. As a decolorizer and deodorizer, animal charcoal (prepared from bones) is vastly superior to vegetable charcoal. Charcoal should be fresh burnt and fresh powdered and preserved from contact with the air. Unless these precautions be observed it rapidly loses its valuable qualities. (*See No.* 1752.)

1730. Aluminized Charcoal. This is recommended by Dr. Stenhouse as a cheap and very efficient decolorizing agent. Dissolve in water 54 parts of the sulphate of alumina of commerce, and mix with 92¼ parts finely powdered wood charcoal. When the charcoal is saturated, evaporate to dryness, and heat to redness in covered Hessian crucibles till the water and acid are dissipated. The charcoal contains just 7½ per cent. of anhydrous alumina.

1731. Charcoal from Coal-Tar. Heat gently in an iron pot till it melts, 1 pound coal-tar pitch. Add 2 pounds fluid coal-tar, and mix. Stir in 7 pounds hydrate of lime in very fine powder. The thick mass is now roasted, stirring all the time till it is reduced to a fine powder. It is then ignited in a covered crucible till all the vegetable matter is carbonized. The charcoal, when cold, is digested with dilute hydrochloric acid, and finally washed with water in a filter, and dried. Dr. Stenhouse recommends this as an admirable form for decolorization. For such liquids as decoction of logwood it is four times as efficient as animal charcoal.