Dissolve 1 pound of pure sulphate of copper in 25 gallons of water.

*Simple Solution of Sulphate of Copper.*—For soaking seeds previous to sowing to destroy the spores of smuts.

Solution in water, 5 to 8 pounds to 10 gallons.

*Copper Mixture of Gironde, Bordeaux Mixture.*—For treatment of mildew. For downy mildew and black rot of the grape. For blight and rot of the tomato and potato.

Original formula.—Dissolve 16 pounds of sulphate of copper in 22 gallons of water, in another vessel slake 30 pounds of lime in 6 gallons of water. When the latter mixture has cooled, it is slowly poured into the copper solution, care being taken to mix the fluids thoroughly by constant stirring. It is well to have this compound prepared some days before it is required for use. It should be well stirred before applying. A solution containing the ingredients in the following proportions has been recommended for general use: Sulphate of copper, 4 pounds; lime, 4 pounds; water, 12 gallons. The copper is dissolved in 16 gallons of water, while the lime is slaked in 6 gallons. When cool, the solutions are mixed as described above.

*Eau Celeste, Audoynaud Process.*—For downy mildew. For treatment of downy mildew and black rot of the grape. For treatment of mildew and anthracnose. For blight and rot of the tomato and potato. For apple scab.

Dissolve 1 pound of sulphate of copper in 2 gallons of hot water; when completely dissolved and the water has cooled, add 1½ pints of commercial ammonia (strength 22 deg. Baume); when ready to use dilute to 22 gallons. The concentrated liquid should be kept in a keg or some wooden, earthen or glass vessel.

*Modified Formula.*—Sulphate of copper, 2 pounds; carbonate of soda, 2½ pounds; ammonia (22 deg. Baume), 1½ pints; water, 22 gallons.

Dissolve the sulphate of copper in two gallons of hot water, in another vessel dissolve the carbonate of soda in a similar manner; mix the two solutions, and when all chemical reaction has ceased, add the ammonia; dilute to 22 gallons.

*Solution of Ammoniacal Carbonate of Copper.*—For peronospora of the vine.

Prepared as follows: Into a vessel having a capacity of two quarts or more pour one quart of ammonia (strength 22 deg. Baume), add 3 ounces carbonate of copper, stir rapidly for a moment and the carbonate of copper will dissolve in the ammonia, forming a very clear liquid. The concentrated liquid thus prepared may be kept indefinitely. For use dilute to 22 gallons.

*Sulphate of Iron.*—For anthracnose.

Simple solution in water 4 to 8 pounds to the gallon, to be used only as a wash.

*Sulphide of Potassium, Liver of Sulphur.*—For mildew in greenhouses. For mildew on roses. For oidium and erinose of the vine. For orange leaf scab. For celery leaf blight. For pear and apple scab.

Solution in water, ¼ to 1 ounce to the gallon.

*Solution of Hyposulphite of Soda.*—For apple scab. For celery leaf blight. For orange leaf scab

Simple solution of 1 pound of the soda in 10 gallons of water. Must be used at once.

*Liquid Grison. Eau Grison.*—For mildew on grape vines. For powdery mildew.

Prepared by boiling three pounds each of flowers of sulphur and lime in 6 gallons of water until reduced to 2 gallons, when settled pour off the clear liquid and bottle it. When used, mix 1 part of the clear liquid in 100 parts of water.

*Milk of Lime.*—For peronospora of the vine. For anthracnose.

Simple solution in water, 2 to 6 parts lime to 100 parts water.

*Phenic Acid. Carbolic Acid.*—For powdery mildew of the vine.

Solution in water one half pint to 10 gallons.

POWDERS.

*Sulphur.*—For grape mildew. For powdery mildew of the vine.

*Sulphur and Lime.*—For treatment of anthracnose during the growing season.

A mixture of equal weights sulphur and lime.

*Blight Powder and Sulphur.*—For simultaneous treatment of oidium and the downy mildew. For downy mildew of the vine. For tomato and potato blight and rot.

Prepared by thoroughly mixing from 3 to 8 pounds of anhydrous sulphate of copper with 90 to 100 parts of flowers of sulphur,

*Sulphatine, the Esteve Process.*—For the treatment of mildew. For the treatment of downy mildew and black rot of the grape. For the treatment of the tomato and potato for blight and rot.

Mix 2 pounds of anhydrous sulphate of copper with 20 pounds of flowers of sulphur and 2 pounds of air-slaked lime. The proportions may be varied.

*Skavinski's Powder.*—For simultaneous treatment of oidium and downy mildew of the vine. For treatment of mildew.

Mix 22 pounds of finely powdered sulphate of copper with 33 pounds of soot or alluvial earth and 165 pounds of coal dust.

*Sulfosteatite or Cuprique Steatite.*—For the treatment of mildew (*Peronospora*).

An exceedingly fine bluish powder composed of steatite, or talc, and sulphate of copper, the proportion of the latter substance amounting to about 10 per cent. Very easily applied; this is considered the most adherent of all the powders used for these purposes.

*David's Powder.*—For downy mildew and black rot of the grape. For mildew and anthracnose.

Dissolve 4 pounds of sulphate of copper in the least possible amount of hot water, and slake 16 pounds of lime with the smallest quantity of water required. When the copper solution and slaked lime are completely cooled, mix them together thoroughly; let the compound dry in the sun, crush and sift. Apply with a sulphuring bellows of some description furnished with an outside receptacle for containing the powder. The copper coming in contact with the disease will very soon destroy it.

*Podechard's Powder.*—For the downy mildew of the vine. For the treatment of mildew and anthracnose.

Air, slaked lime, 225 pounds; sulphate of copper, 45 pounds; flowers of sulphur, 20 pounds; ashes, 30 pounds.

Dissolve the sulphate of copper in the water; when thoroughly dissolved, pour the solution upon the lime, which is surrounded by the ashes to keep the liquid from spreading; after twenty-four hours add the sulphur, thoroughly mix the compound, ashes and all, and when dry sift through a sieve with meshes of one-eighth of one inch. This preparation may be made several months before it is required for use.

## REFRIGERATING MIXTURES OBTAINED WITH SOLID CARBONIC ACID.

By L. CAILLETET and E. COLARDEAU.

THE authors show that in a mixture of flocculent carbonic acid and ether the latter does not, as commonly supposed, act merely by establishing a more complete contact with the body to be refrigerated, but that cold is produced by the solution of the carbonic acid in the ether. Solid carbonic acid alone produced a temperature of —60° under the ordinary atmospheric pressure, and of —76° in a vacuum. A mixture of solid carbonic acid and ether gave, under ordinary atmospheric pressure, a temperature of —77°, and in a vacuum of —103°. The experiment was repeated with other solvents. Methyl chloride and liquefied sulphurous acid gave each —82°, acetamylic ether —78°, phosphorous trichloride —76°, and absolute alcohol —72°. In a mixture of methyl chloride and solidified carbonic acid in a vacuum a temperature of —106° was observed.

FROM experiments made in the Danish navy, it appears that there is but little difference in the efficiency of the two bladed and four bladed propellers, the same blades being used in each case, so that the loss of one-half of the propeller surface was balanced by the lessened friction. At speeds greater than 12 knots, however, the vibration with the two bladed propeller was excessive.



## TABLE OF CONTENTS.