pestle, the mortar is given a slow revolving motion, while a scraper, pressing against the bowl, brings all the ore under the pestle. The mortar is held in place by four thumbscrews in four posts suitably placed to hold the sides of the mortar. One of these posts can be dropped down when the set screw is loosened, which allows the mortar to be taken out, the pestle being previously pushed up about 1½ inches. This is all done in a few minutes, it not even being necessary to stop the revolution of the pestle. The power required to operate this grinder is small and could probably be obtained from a small water motor, if electricity is not available. We have four of these grinders in daily use. Leather belts can be used for connections, but after trying several kinds we find the steel spring belt is best.

C. B. MURRAY.

EDGAR THOMSEN STEEL WORKS.

Loss of Sulphur in Preparing Ash of Plants.—It is generally known that the sulphur contained in an ash does not necessarily represent the sulphur content of the plant. Berthelot[1] states that the determination of phosphorus and sulphur when the plant is burned to an ash is often incorrect, and discusses the conditions theoretically necessary that no loss take place.[2] S. Bogdonow[3] states that the estimation of the sulphur content of a plant by determining the sulphur in the ash, is incorrect. He determines the sulphur in the plant preferably by the method of fusing it with caustic potash and potassium nitrate. Comparing his analyses of cereals made by this method with Wolf's tables of ash analyses, he concludes: (1) That the sulphur in the ash does not give even an approximate idea as to the sulphur in the plant; (2) that plants contain considerably more sulphur than has been supposed; (3) the sulphuric acid of the soil is of practical importance. It may be added that he found fertilization with sulphates advantageous to certain Russian soils.

The following experiments were made to test whether sulphur was lost on incineration of vegetable substances. No case was

[1] Compt. rend., **128**, 17.

[2] Wiley ("Principles and Practice of Agricultural Analysis," Vol. III, p. 37) states, that unless special precautions are taken, a portion of the organic sulphur and phosphorus may escape during the combustion. The method of determining sulphur in protein is described: Same volume, p. 446.

[3] J. russ. phys. chem. Ges., **31**, 471.

found in which all the sulphur of the plant was contained in the ash.

The determination of the sulphur was made by two methods: *a*. 10 grams were burned to an ash at the lowest possible temperature, and the sulphur determined in it; *b*. 10 grams substance were burned with the addition of 20 cc. of a solution of calcium acetate containing 29.2 grams per liter, as recommended by Dr. A. E. Shuttleworth.

SULPHUR FOUND IN PLANTS.

	b. Burned with calcium acetate. Per cent.	*a*. Alone. Per cent.	Loss. Per cent.
Oat straw	0.158	0.151	4
Crimson clover hay	0.173	0.137	28
Green rape	0.503	0.471	6
Wheat bran	0.055	0.000	100
Corn silage	0.098	0.082	16
Timothy hay	0.085	0.076	11
Cottonseed meal	0.222	0.071	68
Soy beans	0.161	0.091	58
Linseed meal	0.091	0.038	58

The sulphur obtained when the ash was burned by itself is from 4 to 100 per cent. less than when burned with calcium acetate. Whether the calcium acetate retains all the sulphur or not, is a point which requires further study.

The differences in the above table may in some cases seem insignificant, but owing to the quantity of material employed, it requires 0.0007 gram barium sulphate to produce a difference of 0.001 per cent.

It is plain that the determination of sulphur in an ash prepared in the usual way, far from giving any idea as to the sulphur in the plant, may prove very misleading. Any conclusions drawn from such analyses are liable to prove erroneous.

This work was performed in the laboratory of the North Carolina Experiment Station, with the permission of Professor W. A. Withers, chemist.

G. S. FRAPS.

A Simple Test to Distinguish Oleomargarine from Butter.—In the March (1900) number of this Journal, Hess and Doolittle refer