NOTE ON THE COMPOSITION OF GAS LIME.

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VERY few analyses of gas lime have been published; consequently the following analyses made in the laboratory of the Department of Agriculture of the University of Cambridge may be of interest to readers of this *Journal*.

The samples of gas lime were obtained from the Cambridge Gas Works. One was what is known as carbonated lime, that is to say, lime which had been used for purifying the gas after it had previously been purified by hydrated ferric oxide. This sample, as shown by the analysis, is practically moist calcium carbonate. It was obtained in a perfectly fresh condition. The second sample was described by the Works Manager as "sulphided lime." It had been used for purifying gas without the previous use of ferric hydrate. A sample was taken from the centre of a large heap which had been standing for about a year.

The following method of analysis was used:

Moisture and loss on ignition were determined in finely ground samples in the ordinary way; bases were determined by evaporating a sample with hydrochloric acid to complete dryness, moistening the residue with hydrochloric acid, boiling with water, and filtering off the silica. Ferric oxide, alumina, and traces of phosphates were precipitated from the filtrate by ammonia, and weighed together. Lime was precipitated with ammonium oxalate. The filtrate from this precipitate was evaporated to dryness, and the residue ignited. The magnesia was weighed as oxide, and the alkalies as chlorides. Carbon dioxide was determined by weight after absorption in caustic potash, the sulphuretted hydrogen having been previously absorbed in hot silver nitrate solution. Free sulphur was determined by extraction with carbon bi-sulphide, sulphocyanide by titration with standard potassium permanganate. Cyanides were estimated by precipitating

them from the water extract as Prussian blue, which was filtered off, dissolved in soda, and titrated with potassium permanganate.

The analyses are given below :

	Carbonated lime	Sulphided lime
Moisture	26.62	29.06
Silica	3.81	3.82
Fe ₂ O ₃ , Al ₂ O ₃ , etc.	1.86	1.99
CaO*	35.37	34.08
MgO	0.39	0.28
Alkalies as chlorides† ...	0.86	1.26
CO ₂	24.74	23.65
H ₂ S	None	0.17
SO ₂	Slight trace	2.66
Free sulphur	None	0.407
HCNS	Slight trace	0.710
HCN	None	0.18
Ether extract	None	0.488
* Free lime...	1.825	None
† KCl	0.359	0.296
Loss on ignition.....	30.19	25.82

The analyses show clearly that gas lime possesses little fertilizing power beyond that of chalk. Carbonated lime seems to be quite innocuous. Sulphided lime contains small but definite quantities of free sulphur, sulphur compounds, and cyanides, which may be harmful to crops or possibly may give the substance some fungicidal power.

To test these two points, solutions were made from each sample by shaking in 100 c.c. of water 0.1, 1.0, 10.0 grams. These solutions were then used to moisten cress and clover seeds which were germinating in Petri dishes on filter paper. The rate of germination and the growth of the seedlings was observed for some days. The average length of seedlings grown in the various solutions was found to be :

	Average length of seedlings grown in						
	Pure water	Carbonated lime			Sulphided lime		
		0.1%	1.0%	10%	0.1%	1.0%	10%
Cress	19	21	17	10	19	17	9
Clover	32	31	28	19	29	32	12

It will be seen that in the weaker solutions the seedlings grew practically as well as in pure water. The strongest solution however

was distinctly a check on growth, especially in the case of the sulphided lime.

A further trial was made by spraying solutions of the strengths mentioned above on to the leaves of seedlings of cress growing thickly in pots.

The stronger solutions produced some slight amount of scorching, but did no permanent damage.

It may, therefore, be concluded that neither of the samples of gas lime examined were likely to prove dangerously poisonous to crops growing on land to which they might be applied.

The next point was to test the possible fungicidal power of the samples. This was done by dissolving in the solutions of the strengths described above, the requisite amounts of sugar and salts for the growth of fungi. Hanging drops of each solution were then inoculated with the spores of *Penicillium glaucum*, and examined from time to time.

Duplicate experiments were also made with larger volumes of the solutions placed in watch glasses and kept in a moist chamber.

In both cases it was found that the solutions of carbonated lime had no appreciable effect on the germination and rate of growth of the spores.

A 1.0% solution of the sulphided lime was found to retard germination and growth very considerably, and a 10% solution prevented most of the spores from germinating.

Apparently, therefore, sulphided gas lime has a certain fungicidal power, due in all probability to the sulphur compounds and cyanides it contains, and possibly to the small amount of tarry ether extract.

In the sample examined, however, the fungicidal power does not seem to be strong enough to give the substance any practical value.

Finally, I must not omit to thank Professor T. B. Wood, at whose suggestion I took up this work, for his advice and guidance.