(Water.

used by the analysts of the Eastern States during the present year:

used by the analysts of the Eastern phosphate in simple form as follows:

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Lime

Ph. Acid-Solub	le in water, 8cts. p. lb
" Reve	rted form, 71 "
" Fish,	fine bone, 7 "
" Fine	med. bone, 6 ".
" Medi	um bone, 5 "
" Coars	ser bone, 4 "
" Fine	gr. r'k ph. 2 "

A value is thus arrived at by considering the solubility, the size of particles, and the source.

Let us next distinguish between soluble, reverted or partially soluble, and soluble phosphates. We shall take the different phosphates of lime. The relationship of the various forms can be most easily seen from the following arrangement:

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Or, in chemical notation :

H2O	H2O
H2O	H2O
H2O	C2O
$ \begin{array}{c} H_2O \\ C_*O \\ C_*O \end{array} $	$ \begin{array}{c} C_{a} O \\ C_{a} O \\ C_{a} O \end{array} $ P2Os

The change from the pure acid to the insoluble form is a removal of water and an introduction of lime. In our rock phosphate, and in bones, the form is that of the insoluble phosphate. The treatment by sulphuric acid changes this, more or less, into soluble phosphate, the lime that is removed being changed into sulphate of lime or gypsum. Superphosphate thus made, therefore, consists of soluble phosphate, gypsum, and variable quantities of the other two phosphates.

In harmony with the above, we can represent the formation of super-

2-Sulphuric [Acid.]	+ Lime Lime	Ph. Acid =
Water) Water Ph. Ac Lime	id. + 2	${ {\rm Lime.} \\ {\rm Sulphuric} \\ {\rm [Acid.} } }$
Or, in chemi	ical notat	ion :
$2 \begin{pmatrix} H_2 & O_4 \\ S & O_3 \end{pmatrix} +$	$ \begin{array}{c} C_a O \\ C_a O \\ C_a O \end{array} $	$P_2 O_5 =$
$H_2 O P_2 O C_3 O$	+	

Sulphuric acid and insoluble phosphate of lime react on each other, forming soluble phosphate of lime and sulphate of lime or gypsum.

Bone superphosphate, or dissolved bone, is considered more valuable than mineral or rock superphosphate. The mixing of lime with superphosphate tends to change the soluble phosphate back to the less soluble form, the *reverted*. Decaying organic matter, whether in a compost heap or in a soil, will have the effect, to a small extent, of changing the insoluble forms to soluble.

Phosphates are of most service with organic fertilizers on black humus soils, along with farm-yard manure or nitrogenous fertilizers, and are of less benefit in connection with lime.

Phosphatic fertilizers give good results when applied to pastures, cereals and roots, especially turnips.

SOURCES.

I. Farm-yard manure contains from 0.15 to 0.75 per cent. of this acid, having an average of about 0.50 per cent., or 10 lbs. to the ton. Poultry droppings have about four times as much.

II. Ashes (fresh and leached) have from $\frac{3}{4}$ to $1\frac{1}{4}$ lbs. per bushel.

III. Fresh bones (sold as crushed bone, bone meal, or float bone, according to texture) should contain

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