If the per cent. of the sodium oxide were taken by difference, it would be:

	I. Per cent.	II. Per cent.	III. Per cent.
	20.59	0.20	1.99
Difference	+0.19	+0.24	—0.23

Another method is to drive off the boric acid by repeated evaporations with methyl alcohol and then to determine the alkalies by one of the ordinary methods, but it is open to the following objections:

(1) The evaporation must be repeated six or seven times and even then there is some boric acid left.

(2) It leaves an undesirable residue of carbonaceous matter which is very hard to get rid of.

On this account I think the method first mentioned is to be preferred.

RAPID DETERMINATION OF BORIC ACID IN BORAX.

By K. Jacobi.

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The well-known method of titrating boric acid in the presence of glycerine depends upon the fact that solutions containing boric acid are neutral to methyl orange, but acid toward phenolphthaleïn and very distinctly so in the presence of glycerine. When titrated with alkali, after adding glycerine, the neutral point corresponds to the conversion of the boric acid to a metaborate, $K_2B_2O_4$. I have found that if glycerine is added to a solution of borax, the solution becomes acid toward phenolphthaleïn, and on titration, the neutral point corresponds to the formation of the metaborate, as before. It is evident that, in this case, just one-half as much alkali will be required as would have been required if all of the boric acid were in a free state. In practical effect, the reaction for titration is:

$$Na_2B_4O_7+2NaOH = 2Na_2B_2O_4+H_2O.$$

The method is as follows: Dissolve 2 to 4 grams of borax in water, add excess of glycerine, a few drops of phenolphthaleïn and titrate with N/2 potassium hydroxide. Deduct the correction for the glycerine from the number of cubic centimeters used and multiply by 0.0175. The product is one-half of the total boric acid present. Carbonates interfere with the end-reaction.

EXPERIMENTAL.

The borax used was dried for some time so as to expel part of the water and make it rich in boric acid, after which it was thoroughly mixed. Three samples of 2 grams each were first taken and worked according to R. T. Thomson's method for the determination of borax as it is given in Sutton's "Volumetric Analysis."

	I.	II.	III.
	cc.	cc.	cc.
Titration with N/2 potassium hydroxide..	49.90	49.90	49.85
Correction for glycerine.....	0.40	0.40	0.40
Leaves.....	49.50	49.50	49.45
	Grams.	Grams.	Grams.
Multiplied by 0.0175 gives boric acid in 2 grams.....	0.86625	0.86625	0.86538
	Per cent.	Per cent.	Per cent.
Or per cent. boric acid.....	43.31	43.31	43.27

Average per cent. = 43.30.

Next, three samples of 4 grams each (so as to make the titration about the same) were weighed out, dissolved in water, phenolphthaleïn and glycerine added. Of the last named, as much was used as in the three first samples, thus making the correction the same. The results were:

	I.	II.	III.
	cc.	cc.	cc.
Titration with N/2 potassium hydroxide..	49.65	49.60	49.70
Correction for glycerine.....	0.40	0.40	0.40
Leaves.....	49.25	49.20	49.30
	Gram.	Gram.	Gram.
Multiplied by 0.0175 gives boric acid in 2 grams (= one-half boric acid in 4 grams).....	0.861875	0.86100	0.86275
	Per cent.	Per cent.	Per cent.
Or per cent. boric acid.....	43.09	43.05	43.14

Average per cent. = 43.09.
Making a difference of —0.21 per cent.

As can be seen from the above, all the results from the short method fall a little below the others, but this can be accounted for by the small amount of monoborate that is in most cases present in borax.