infusion is added and the temperature maintained at 60° to 65° for a half hour. The starch reaction having disappeared the solution may be filtered off washing the residue thoroughly, the filtrate warmed with a few cc. of acid to complete the conversion into dextrose and finally neutralized, made up to definite volume, and titrated. It remains to be seen what the effect of this process may be upon the pentosans or other similar bodies, concerning which there are few data at hand. I have made some preliminary tests which indicate that these bodies are not affected by diastase. One gram of the xylan, already mentioned, after boiling with water received ten cc. of a fairly strong infusion of malt and was kept at 65° C. for a half hour. At the same time a sample of starch was boiled to a paste, and treated with the malt infusion in the same way. The starch reaction disappeared and the solution reduced Fehling's solution strongly but the xylan did not change the Fehling's solution in the least nor did it appear to have been altered.

It seems, therefore, that in this last method the difficulties presented by the more common methods are to be avoided. The ordinary inversion methods on the other hand furnish no accurate conclusion when applied to the determination of starch contained in vegetable tissues.

For assistance in much of the analytical work cited I am indebted to Mr. D. B. Hoffmann.

NOTES ON THE HARDENING OF MORTAR.[1]

By Wm. P. Mason.

THE following is extracted from the graduating thesis of Mr. J. A. McPherson, of the class of 1894, Rensselaer Polytechnic Institute, the work having been done in my department:

It is common belief among builders, that it is better practice to mix lime mortar and let it lie in a heap some days previous to use, rather than to employ it directly after preparation. In order to test this point, samples of mortar were taken, on successive days, from two separate heaps, of large size; briquettes were made therefrom, and, after an interval of some weeks, were broken for estimation of tensile strength with the following results:

[1] Read at the Brooklyn Meeting, August 16, 1894.

	Days in heap after mixing.	Days exposed to air as a briquette.	Average breaking weight in pounds per square inch.
Mortar No. 1.....	3	50	34.6
" "	4	49	38.6
" "	6	48	38.1
" "	7	46	39.3
Mortar No. 2.....	4	48	36.0
" "	5	47	38.0
" "	6	46	41.2
" "	7	45	41.5

As concerning the formation of calcium silicate through the action of the lime upon the sand, the amount of such formation was found exceedingly small, even after great intervals of time.

After extended experiments with mortar taken from the old Van Rensselaer mansion at Albany, built about 1760, and with mortar from a very ancient tower in the valley of the Lahn, the quantity of calcium silicate found therein was 0.34 per cent. of the total weight of the mortar, an amount altogether too small to be considered as a factor in the hardening of the mortar.

The influence of tempering hydraulic mortar with water containing sugar (one-half pound of sugar to one gallon of water) is shown by the following averages, the mortar used having a tensile strength when tempered with pure water of sixty-three pounds per square inch.

Average tensile strength of sugared briquettes exposed to water during thirty-eight days was 62.75 pounds.

Similar briquettes exposed to air during same period was 65.4 pounds.

There is, therefore, a gain of three and eight-tenths per cent. over the water-tempered mortar in cases where the mortar is used in air, but no advantage when the mortar is intended for subaqueous work.

In South America there has been occasional use of bullocks' blood for tempering hydraulic mortar. In view of this, a number of experiments were made with the same mortar which was used in the sugar experiments, but the tempering was made

with bullocks' blood diluted with one-third its volume of water. The resulting briquettes set somewhat more quickly, and were very hard and firm. Their average tensile strength was:

After exposure to water during thirty-seven days, 68.3 pounds.
" " " air " " " " 69.8 "

Thus showing a gain over the water-tempering of ten per cent. for the briquettes set in air.

RENSSELAER POLYTECHNIC INSTITUTE,
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SOME ALLOYS OF IRON WITH MOLYBDENUM, TUNGSTEN AND CHROMIUM AS SOLUTIONS.

BY JAMES S. DE BENNEVILLE.
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THE results obtained by the action of silver nitrate on a ferro-tungsten of markedly heterogeneous character appeared to make a study of the reactions of the alloys of iron with the sixth family of interest. In the former paper[1] it was indicated, that a connection existed between the combining ratio of the two constituents and the chemical action of the compound toward reagents. The probable high valency of the iron atom in these metallic compounds, indicated by the fact that all that element appeared to be in combination with the tungsten; the chemical stability of the alloy and the very marked influence of the constituent tungsten on the compounds were noted, as also the nature of the alloy regarded as a solution. The work involved in the present paper is an attempt to broaden the scale of this previous investigation of one compound of a very interesting series. Alloys of the ferro compounds with the tungsten group were examined. The physical properties of these compounds as influencing their chemical properties were noted and the compounds analyzed and their quantitative composition established. The action of the weak solvent, silver nitrate, has been determined as also the reactions of the alloys with liquid and fused solvents. The discussion of the results obtained and their application to these alloys as solutions involved a short summary of the opinions expressed by others on valency and the nature of solution and the intimate connection between that state of matter and alloys.

[1] This JOURNAL, May, 1894.