

### THE ELECTRIC STEEL FURNACE.

It is probable that portions of the testimony recently given by Mr. Charles M. Schwab before the Ways and Means Committee at Washington will be very generally considered by those interested in iron and steel. Mr. Schwab pointed out the superiority of open-hearth steel, but affirmed the certainty of his opinion that within ten years, these furnaces would become practically useless because of the development of the electric steel furnaces. Naturally, much weight is attached to the evidence of such a witness before such a tribunal. The conditions may well warrant his conclusion. It has been recognized that there is sufficient difference between the value of the iron and other components of a high-grade tool steel and the prevailing price of the combination plus necessary labor, to pay for any electrical energy likely to be used in the electrical processes. There seems to be an essential disparity between the prices of a cent a pound for 97 per cent. iron and fifty cents a pound for 99 per cent. iron. Probably this difference, which is due to conditions inherent in crucible-steel manufacture, will be the first to attract the attention of the steel producers to the electric furnace. It was pointed out by Mr. Schwab that the electric furnace could be used for improving the quality of the lower grades of steel, such as rails. Here there does not seem to be a great chance for saving in cost of production of identical product. The refining of already molten open-hearth steel by treatment under the conditions supplied by the electric furnace (high temperature, slag- and composition-control, and reducing atmosphere) will doubtless not exceed a very few dollars a ton, if indeed it is not less than one dollar per ton.

Judging by the magnitude of the past fluctuations in prices of rail and structural steel, it would seem a small matter if the cost of production were even doubled, provided the quality was essentially improved. No one of our useful metals seems likely to be soon reduced cent per cent. by any conceivable change in the cost of production. Therefore, the premonitions of great reduction in cost of tool steel are particularly interesting. The open-hearth production is nearly one hundred times as great as the crucible steel production, so that any proportionately smaller ripple of improvement on the surface will represent a much greater real commercial wave of advance.

W. R. WHITNEY.

### AN AMERICAN INSTITUTE OF CHEMISTRY.

THERE is a real need for an American Institute of Chemistry. In any given trade or profession, it is impossible for any body to accurately estimate the fitness or capability of any particular member of it, except another and experienced member of that same trade or profession. All through human effort it is the case that it takes a fellow craftsman to judge intelligently a worker's efforts. Therefore, to safeguard employers, and at the same time help deserving workers, the principle of the proposed Institute of Chemistry is a principle that should be applied in every department of industrial activity, and doubtless in time will be so applied.

As a matter of fact, it is to-day applied in many lines: medicine, law, dentistry, civil and mining engineering, etc. The doctor's diploma for instance gives from experienced and able men in the same profession, assurance to the public that the holder has a good knowledge of the rudiments of his business. It serves exactly the same purpose and is based on exactly the same principle as a certificate later on from an Institute of Medicine, supposing there was such a thing. And it would be well if there were such a thing, because the original diploma certifies merely to the rudiments and gives no hint with regard to after-standing. Take two graduates in medicine and in ten years the one may far outstrip the other in knowledge and efficiency. Yet, as far as the information conveyed by the original diploma is concerned, they are still on the same level. But if an "Institute" would be a good thing in the medical profession, where there is always a diploma to start with, far more would it be a good thing in the chemical profession where there is no diploma at all—or rather, no diploma that corresponds to the medical diploma. The medical diploma certifies that the holder has spent a certain number of years in the exclusive study of his profession. The chemist's, on the contrary, testifies that he has not spent these years in the exclusive study of his profession, but has spent them in the study of science in general with chemistry merely as an appropriate (though it is true, an exaggerated) incident.

In other words, the chemist's degree certifies to employers merely that the holder is not a chemist but a general scientist who has made a specialty of chemistry. This is much but leaves plenty of room for the Ph.D. degree and the M.S. degree, and these latter in their turn, though far above the proposed Institute certificate in dignity and

importance, still leave room for the Institute certificate. Although the need for something like the proposed Institute is a need that exists in every business high and low, yet there is no business where it is needed so badly as in analytical chemistry, for there is no other business where the employer is more absolutely incapable of judging for himself whether or not his employee is capable and deserving, and as matters now stand, the analytical chemist must rely for advancement and appreciation rather upon his engaging personal qualities, if he has any, than upon his professional capabilities. In fact, it is hardly too much to say that in the iron trade at least, the latter are a bar rather than a help to advancement, if the employer has no outside sources of information about his chemist, for if the chemist has professional capability, and professional pride, in his work, he will rarely succeed in satisfying his employers in the matters of speed and output of work. A far closer approach to the steel man's ideal in these respects would be made by a laboratory boy ignorant of chemistry, and innocent of conscientiousness, and it is by no means a reckless or random statement that in the iron trade, the better the chemist, the lower his employer's opinion of him, if the employer has nothing to guide him but his own impressions. With conditions as they are to-day, with employers almost unanimous in the conviction that chemical analysis is quick and easy work, and with the great majority of chemists seeking to humor and adapt themselves to this foolish misconception, rather than to combat and correct it, the lot of the conscientious analyst would be hard indeed without the testimony and the support of college degrees and other honors that he may succeed in gaining. Let us have more on the same principle as the College degree!

The College degree is the first thing; it is most important but it is not enough. It certifies to college study. But study does not end with the closing exercises of college. At that point it may be said to begin. What have we now to certify to this real serious life study that begins only as college ends? We have the Ph.D. degree and it is a glorious thing. But that it leaves nothing more to be desired, and that its testimony represents the acme of human effort, and human achievement, we have to deny. Admirable as is the Ph.D. degree, and of more dignity and importance than anything else in the same line, still there is room for more in the same line. The question confront-

ing the chemical profession in America is this: Since the College degree is a good thing, shall we develop the underlying principle of it further, or shall we stop there and be content?

GEORGE AUCHY.

## ORIGINAL ARTICLES.

[CONTRIBUTION FROM THE LABORATORY OF THE FUEL ENGINEERING COMPANY, CHICAGO, ILLINOIS.]

### THE AMOUNT OF INERT VOLATILE MATTER IN THE MINERAL CONSTITUENTS OF COAL.

BY W. BRINSMAID.

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Chemists working on the analysis of coal have long known that the non-volatile mineral matter that they weighed and called ash did not truly represent the weight of the inorganic matter, when in its original form in the unburned coal.

They have also known some, if not all, of the sources of error but have not been able to calculate the amount.

The combined water in fire clay and gypsum, and the presence of carbonates that give off carbon dioxide on heating may be mentioned as probably the principal sources of error in weighing an ash correctly.

Pyrite also loses weight when burned to ferric oxide and is thus a source of loss. In case the amount of pyrite present in the coal were known, then the addition of five-eighths the weight of its sulphur content to the ash would correct for this loss. Unlike the other cases, however, this loss is accompanied by combustion and develops some heat. We might, therefore, call the iron in the pyrite inert matter and the sulphur a combustible and deduct the weight of the oxygen that unites with the iron, when the pyrite is burned to iron oxide. However, the determination of the amount of pyrite in coal is attended with some difficulty. The usual method has been to calculate the pyrite from either the iron present or from the total sulphur.

As coal may have iron present in other forms than pyrite, and generally has organic sulphur and sometimes gypsum present, it can readily be seen that any determination of pyrite in coal that is based on total iron or total sulphur may be the reverse of accurate.

In speaking of the determination of oxygen by difference in ultimate analysis of coal, Prof. Lord