be obtained by the common practice of piling with a shovel. After quartering, the portion retained is passed through the cone again, and so on till the sample weighs from 8 to 10 pounds, after which it is passed through a No. 8 sieve and finished in the usual way.

SHOENBERGER STEEL WORKS,
PITTSBURGH, PA.

A LABORATORY GLASS-FURNACE.

By S. R. SCHOLES.

Received June 17, 1912.

Experimental glass-making has always been attended by the difficulty of getting the necessary temperature. We have installed in this laboratory a furnace burning natural gas and using the regenerative principle common in glass-factory practice. The designing and construction of this furnace, following our rough sketch, were undertaken by Messrs. Armstrong and Lytil, furnace builders, of Pittsburgh.

FIG. 1.

The accompanying photograph gives an idea of the general plan of this furnace. It is constructed of standard sizes of furnace blocks. An arched roof of silica brick covers a crucible bench 42×27 inches, at the ends of which the gases enter from the vertical regenerators, through openings 9×12 inches. There is thus a space accommodating several crucibles of generous size, such as size "M" of the Battersea make. The regenerator columns enlarge below the bench to $16\frac{1}{2} \times 21$ inches and are 4 feet high. They are filled with the usual silica checker brick. From the foot of each regenerator a horizontal flue leads to the stack

and connects by a suitable valve with an air inlet. A twenty-five-foot stack is used.

Gas is supplied through one-inch pipes, under a pressure equal to eight inches of water. The gas is not "regenerated" but enters, through a three-eighths-inch nozzle, into each regenerator column just below the level of the bench.

The furnace can be brought from room temperature to its full heat in about twelve hours. It is usually maintained at 1350° – 1400° C. but a higher temperature can easily be reached, which is practically limited by the softening of the crucibles. The best efficiency is obtained by reversing gas and air supply every twenty minutes. The gas-consumption is about 250 cubic feet per hour.

Much of the credit for the design of this furnace is due Prof. S. L. Goodale, of the School of Mines.

INDUSTRIAL RESEARCH LABORATORY,
UNIVERSITY OF PITTSBURGH.

THE DETERMINATION OF CARBON IN STEEL BY DIRECT COMBUSTION IN THE NEWEST FORM OF SHIMER CRUCIBLE, WITH THE AID OF A PERFORATED CLAY DISC.

By FRANK O. KICHLINE.

Received May 31, 1912.

In THIS JOURNAL, for October, 1909, Dr. P. W. Shimer described a simplified form of his crucible for the determination of carbon in steel by combustion. Two improvements have been made in the use of this crucible for direct combustion. These improvements are (1) an increase in the diameter of the crucible, and (2) the use of perforated clay discs instead of asbestos for covering the charge of drillings.

It has been the practice, in the direct combustion of carbon in steel, to place the drillings in a No. 000 Royal Berlin porcelain crucible two-thirds full of silica sand, placing this porcelain crucible inside of the Shimer platinum crucible with a pair of forceps, and covering the charge with a layer of ignited asbestos about $\frac{3}{4}$ inch thick. The asbestos serves to keep the drillings in place and prevents heat radiation to the water-cooled stopper.

A slight increase in the diameter of the Shimer platinum crucible made it possible to use a No. 00 Royal Berlin crucible instead of the No. 000 size. The No. 00 size has at the top an area 1.41 times that of the No. 000 size, and is filled to only one-half its depth with silica sand. This has the obvious advantage of permitting the use of a heavier charge, full factor weight (2.7273 g.), or if the $\frac{1}{2}$ factor weight is preferred it will be less crowded. Dr. Shimer has recently adopted this increased diameter for his standard size crucible.

Ignited asbestos as a covering for drillings is very efficient. While results are not vitiated by the presence of ignited asbestos, it is obvious that the packing in of a layer of asbestos before each burning, and its removal after burning, are both time-consuming and inconvenient, and the source of much dirt around the carbon work table.

In trying to obviate the use of asbestos, the writer

tried various materials made up into the form of discs with perforations for the circulation of oxygen. The best results were obtained with a disc about $\frac{3}{16}$ "

thick, of such diameter as to completely cover the No. 00 Royal Berlin porcelain crucible, perforated with slanted holes, leading from the periphery of the upper side of the disc, slanting toward the center on the bottom of the disc, as shown in the illustration. They are best made of china clay. The clay is mixed with water to the proper consistency, moulded into shape, carefully dried, burned and annealed. One of these discs with proper care will last for 100 determinations, which is also the average life of the porcelain crucible. With a little care these discs can be made easily in the laboratory.

The above work has been carried on by the writer in conjunction with Dr. Shimer.

35 FIRST AVENUE,
BETHLEHEM, PA.

A MODIFIED VICTOR MEYER APPARATUS.

By HAROLD CANNING CHAPIN.

Received June 24, 1912.

The customary way of introducing a liquid to be vaporized in a Victor Meyer vapor density apparatus is to drop, by some external means of control, a capsule previously supported in the cool upper portion of the tube. This capsule then automatically releases its contents by bursting, expulsion of a glass stopper, or melting of a Wood's metal plug. The first method

is preferable, but requiring a completely filled, fragile capsule, is somewhat troublesome. A modification of this, having proved successful with a class of engineering students in this laboratory, seems worthy of more general use. The capsule is made from a piece of 5 mm. tube sealed off at one end and drawn out to a capillary at the other. It is filled to the neck only, bent as shown, and sealed at the tip of the capillary. It is hung in the vaporizing tube instead of being supported in the usual manner from below. For this

purpose the ordinary form of tube will serve, but the right angled form here illustrated is preferable because it is more compact, holds the capsule more securely, and allows this to be placed in position more easily through the short neck. A twist of the rod with its flattened end breaks the capillary and drops the capsule.

WALKER LABORATORY,
RENSSELAER POLYTECHNIC INSTITUTE,
TROY, NEW YORK.

ADDRESSES

THE ANALYST VERSUS THE CHEMIST.¹

By J. S. BROGDON.

Received July 15, 1912.

There is no subject of greater importance in the fertilizer world to-day than that of CHEMICAL ECONOMY. The chemical units of phosphoric acid, nitrogen and potash in the fertilizer factory are the same as and are equivalent to dollars in the bank. In all the nation you will not find a single bank which for one moment would think of doing business without an efficient and adequate method of keeping account of the money, or without a banker to direct the policy of the bank. Yet in fertilizer factories, systems for keeping account of the income and the outgo of chemical units are not common, and many factories are not under the direction of a chemist. As a result, in the average fertilizer factory, there is a most wanton waste of phosphoric acid in the manufacture of acid phosphate and in the manipulation of mixed fertilizers the

losses frequently exceed the profits. To a large extent these losses are caused by improper chemical control or the lack of it.

The days of large profits and splendid dividends in the fertilizer world are over. A new era has dawned—a time of keen competition and close margins—a time when it is necessary that the smallest savings be effected. The wasteful methods of the past cannot be continued and the standard of the quality of the product must be maintained. There is no greater avenue to prosperity for the fertilizer manufacturer than that of applied chemistry. The question naturally arises, who shall apply the principles of chemistry in the fertilizer industry?

Fertilizer managers are occupied with the matter of sales and credits: frequently they are men who have risen from the ranks of the sales force and their training has not fitted them to handle the intricate chemical problems of the factory. On account of this they are accustomed to rely on fertilizer superintendents to look after such matters. The superintendent most

¹ Read before the Convention of The National Fertilizer Association at Atlantic City, July, 1912.