The variation in the proportion of both nitrous and nitric acids under different conditions is very marked, as shown in the samples of air collected in the river valley, the West Side, and McHenry St.

From the results of this examination it is evident that a city atmosphere, contaminated by the universal consumption of bituminous coal, where no efforts are made to prevent the escape of soot, soon reaches a stage in which it is destructive to property and not conducive to health. In this respect the atmosphere of Cleveland is, doubtless, no worse than that of other cities, and, perhaps, in a better condition than some that use the same fuel. Under the usual conditions of life in cities, sanitary regulations require careful attention and constant supervision.

A NEW FORM OF WATER-OVEN AND STILL.[1]

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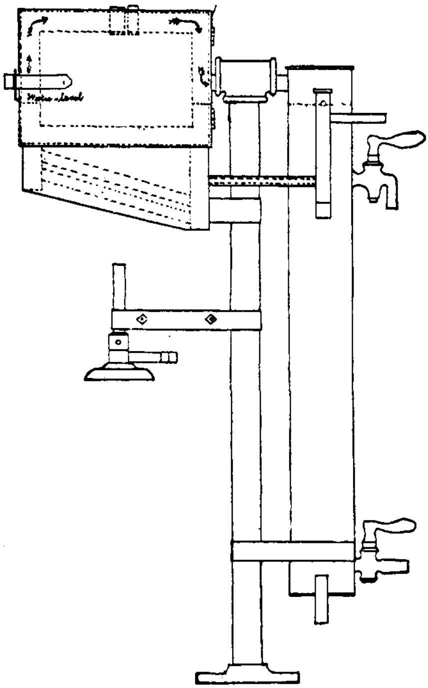
In the use of the ordinary form of water-oven we have been impressed with the fact that there are several disadvantages connected with that form of this apparatus. For instance, there is the necessity for refilling it from time to time, with the consequent fall in temperature and loss of time; there is the waste of steam which might be condensed to the always-useful distilled water, and we have had trouble in obtaining a constant temperature of 100° C. To obviate these difficulties we have devised the combined oven and still which we describe here—a piece of apparatus that has an automatic feed, a worm for condensing the steam and an arrangement of the heating surface so as to provide for perfect circulation and quiet boiling, with steady and abundant generation of steam.

The combination of still and oven is not new, for in the April, *1892*, number of the *Journal of Analytical and Applied Chemistry*, Herbert M. Hill describes such a piece of apparatus in use in the Buffalo University laboratory. Except for the combination it bears little resemblance to our apparatus.

In our form of apparatus, the heating surface consists largely of a series of pipes, connected with water boxes at each end.

[1] Read before the Cincinnati Section, October 15, 1894.

These pipes, through which the water circulates, are inclined so as to afford an easy ascent for the steam generated in them, as



the result of the heat applied to their outer surface. The source of heat is an ordinary Bunsen burner, used with a wing-tip, so as to spread the flame over the surface of the pipes. The pipes are of small diameter so as to afford a large heating surface in proportion to the amount of water passing through them.

The steam is carried off at a point about half-way up the side of the oven and passed through a block-tin condenser. To reach the condenser the steam must pass over the top of the drying-chamber, as the water-level in the oven is kept about one-fourth of the distance between the top and bottom, thus acting as a lute and compelling the steam to pass up and over in order to escape. The water used in cooling the worm also serves as feed-water for the oven, and as it passes from the bottom to the top of the condenser, absorbs so much heat as to enter the water-box already heated almost to the boiling-point. The feed-pipe is so small that the circulation between condenser and oven is slow but constant. A stop-cock is provided at the top of the condenser, for drawing off hot water if desired. A small hole in the door and another in the top provide for ventilation of the drying chamber. Sedimentation takes place in the condenser so that almost clear water goes into the heating-pipes.

To the factory chemist, having always a plentiful supply of condensed steam at his disposal, this piece of apparatus may not seem of much value, but to the analyst, a combination of still and water-oven means a saving of time, trouble, and, in some cases, expense.

The advantage derived from the arrangement of pipes for receiving heat, (an idea borrowed from the Babcock-Wilcox boiler,) may be conceived from the statement that while in the oven which we have, the heating surface measures 82.8 square inches, but seven square inches of this area is the bottom of the oven, the rest being made up by the pipes and the sides of the water-boxes at each end.

Now as to the work done by the apparatus. The oven which we have in our laboratory will get up steam in four minutes after the flame is lighted, and at the expiration of six and two-tenths minutes will be delivering distilled water. This is with a Bunsen burner consuming three cubic feet of gas per hour. With a burner consuming twice as much gas, one and three-tenths minutes is gained in steaming, and two and two-tenths minutes in delivering water.

The still delivers water at the rate of two and one-fourth quarts per hour or thirteen and one-half gallons in twenty-four hours—this with a three-feet gas-burner. A patent automatic still which we have hitherto been using, consumes six cubic feet of gas per hour, and delivers two quarts of water an hour, or twelve gallons in twenty-four hours, although the claim made for it by the makers is fifteen gallons in twenty-four hours.

The temperature in the drying chamber of our form of apparatus ranges from 98° to 101° C., so that it may be said to average 100°.

The advantages claimed for our form of apparatus are as follows:

A constant temperature of 100°, which in our experience, can not be obtained with the ordinary form of oven.

A large yield of distilled water, with a small expenditure of heating material, and practically no cost, as the water-oven is nearly always in use in a working laboratory.

Hot water always at command.

Small space occupied by both oven and still.

General convenience of arrangement.

MT. AUBURN, CINCINNATI,
November, 1894.