lost in causticizing the liquor is made up in settling time.

DUST AND HEAT LOSSES IN BURNING

Contrary to the usual supposition, there is practically no dust produced by a properly designed plant.

At one of the plants now in operation the temperature of the waste gases as they leave the kiln is maintained around 350° F., which is about the limit even for good boiler practice.

CONCLUSIONS

The development of the long rotary kiln in the cement industry together with improved methods of filtration and dewatering have made the recovery of the lime sludge from causticizing operations a perfectly simple and feasible proposition. To all soda fiber mills and to most alkali works there is such a wide margin of profit that an installation cannot but be a profitable investment, one likely to pay for itself in two or three years.

202 NORTH CALVERT ST.
BALTIMORE, MD.

A LARGE INCUBATOR FOR LABORATORY USE

By F. ALEX McDERMOTT

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In view of the large number of incubators for laboratory use which have been described or listed in the catalogues of dealers in chemical apparatus, it might seem that the design of further apparatus of this type was rather superfluous. However, the apparatus here described has proven so easily and cheaply constructed and set up and so satisfactory that it is believed others may profit from our experience with it.

The first incubator constructed on the plan here described was 5 ft. long, 3 ft. high and 2 ft. deep outside. The walls, including top, bottom and doors, were made of two thicknesses of one-half inch poplar, separated by a one-half inch space; this space was filled with powdered cork. (In constructing further apparatus of this type, the writer would make this space one inch.) Four doors were provided, the two upper ones opening upward until they were flush with the top of the incubator, where they were held by a slotted brass rod and pin, while the two lower doors dropped down and were held pendant from the bottom of the incubator. Median vertical and horizontal cross-pieces in the front of the box were provided, upon which were placed the door catches. These cross pieces were beveled at an angle of 45°, as were also the front edges of the box, and the doors. The doors thus formed a fairly tight joint when closed. An upright was placed against the back, inside, and shelf brackets were placed between this upright and the front vertical cross-piece and also at the ends of the box, inside. The shelves rested upon these brackets. The shelves were made of galvanized iron, perforated with 1/2 inch holes, spaced on about 4-inch centers, and each shelf had two "V" shaped braces on the under side for the sake of rigidity.

The heating and temperature control were both entirely electrical and both were operated on a 110

volt lighting circuit. The heating (for 30° C.) was secured by means of four coils each containing 50 ft. of No. 26 Nichrome wire, two sets, each set of two coils in series, being connected in parallel, the total heating current being about one ampere. In these heating coils or elements, the wire was wound on a frame consisting of two strips 1/2 inch square in cross section and the necessary length (in this case 8 inches) of heavy, hard asbestos board, spaced at the desired distance (14 inches) by means of 3/16 inch bolts; extra nuts on the ends of these bolts served as binding posts for the terminals. Each element was supported by cylindrical, porcelain insulating knobs, such as are used in electrical work. Two elements were fastened to the ceiling and two to the floor of the incubator.

For the temperature control, a 200-ohm main line relay arranged for back contact, was connected in series with a 10 watt carbon lamp and an electrical contact thermometer (Eimer and Amend, No. 6838) constructed for the desired temperature. Of course, the S. M. Co. incubator thermostat may also be used. The total current in the temperature control circuit was about 0.08 ampere. A small 110 volt motor with a 6 inch fan was placed upon the upper shelf at one end of the incubator and connected in parallel with the sets of heating units, to secure more even distribution of temperature. The contact thermometer, which was constructed to close the circuit at 30° C., actually closed it at about 29.75° C. and the temperature in the incubator held, according to a large incubator thermometer placed centrally, at 29.5 to 30.5° C., depending upon the temperature of the room. The above regulation is sufficiently close for many purposes and the range of variation would be considerably reduced in a smaller apparatus. The outside of the box was painted white with two coats of bath-tub enamel over two coats of ordinary white paint.

A number of modifications of the design are possible. The contact thermometer may be obtained so constructed as to close the circuit at any one of a number of points, and a small incubator has been constructed on this principle to hold 45°, 50° or 55° C. A three-point battery switch was provided to cut in and out the different leads. In this case, an ordinary double-wall steam oven was used for the box and a single heating element was used. Instead of the 10 watt lamp, it is better to provide an adjustable resistance, as the sensitiveness and smoothness of operation of the relay may thereby be improved; for this purpose the student's rheostat (made by Jas. G. Biddle, of Philadelphia) has been found satisfactory. A similar resistance may be employed in series with the heating system in order to vary the temperature of the heating coils. The apparatus, as described, works well on direct current. On alternating current it is necessary to adjust very carefully the tension of the relay spring, the distance of the poles from the armature, length of travel of the armature, etc. Attempts to utilize the electrolytic valve rectifier in the temperature control circuit were unsatisfactory. The humming of the relay on alternating current is, of course, objec-

tionable, but by proper adjustment may be largely eliminated. While no trouble was experienced in the breaking of a 110 volt circuit at the contact thermometer, using as low a current strength as here employed, it is advantageous to run the temperature control circuit on the secondary of a small toy or bell-ringing transformer giving 10 or 15 volts.

The total cost of material of the large wooden box incubator was about \$50.00. The labor cost would vary with the circumstances of construction.

MELLON INSTITUTE OF INDUSTRIAL RESEARCH
UNIVERSITY OF PITTSBURGH
PITTSBURGH

A PROPOSED NEW STANDARD LOOP FOR USE IN BACTERIOLOGICAL TESTS OF DISINFECTANTS

By A. D. ST. JOHN

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The work described herewith was undertaken with a view to obtaining a method of transferring small quantities of a liquid from one containing vessel to another, with rapidity and a fair degree of accuracy; with special reference to the use of such method in the inoculation of broth cultures, as practised in the principal tests of the antiseptic value of disinfectants.

As is pointed out by Duyser and Lewis,¹ the main objection to these tests lies in the unreliability of the "standard loop," which (1) transfers too small a quantity of liquid, *i. e.*, about 0.003 cc., and (2) transfers a quantity which varies as much as 80 per cent from the average.

Tests made in connection with this paper confirmed the second of these objections and indicated that the variation was due to two principal causes:

I—The position of the loop on leaving the surface of the liquid.

II—The rate of removal from the surface.

The variation between removing the loop slowly edgewise, and rather quickly flat to the surface, was from 0.002 to 0.008 g., respectively.

In order to obviate the variation due to position two loops placed with their planes at right angles to one another were tried; and this arrangement gave about equal results when lifted out at any angle perpendicular to the supporting wire, but varied from the result when lifted out with the wire support vertical to the surface of the solution.

Hence a third loop was added with its plane perpendicular to the wire support, giving three concentric loops, the plane of each at right angles to those of the other two. As a tendency of the drop to break away from the wire at a point farthest from the junction of the wires had been observed, this loop was further modified by changing the spherical shape of the loops to squares, joined at the corners. The loop, or rather cage, thus formed, has the appearance of the outline of a cube, supported by a wire from one corner, and measuring about 3 mm. on an edge. The corners should be welded rather than twisted. The wire of the cube is conveniently made of No. 28 B. and S. Pt wire, and that of the support of No. 25.

This last described loop gave drops varying in weight

¹ THIS JOURNAL, 6, 199.

from about 0.019 to 0.021 g., according to the angle at which it was lifted from the solution; while the most unfavorable results obtained, varying the rate of lifting out from as slowly as possible, to a quick jerk, was from 0.017 to 0.023 g., respectively; while with ordinary care, several consecutive results of from 0.020 to 0.021 g. were obtained.

Up to this point the measurement of the drop was made by hanging the wire quickly on the balance and weighing by swings. Only slight error was caused by evaporation, as the drop was rather large.

The results with the cube-shaped loop appeared, however, to justify further trials, and tests were now made according to the method of Duyser and Lewis (above), *i. e.*, by dipping out drops of a strong iodine

solution, placing in distilled water, and titrating, using dilute thiosulfate. Eight consecutive tests gave the following ratio:

Thiosulfate		Thiosulfate	
cc.		cc.	
1.....	35	5.....	38
2.....	36	6.....	35
3.....	36	7.....	36
4.....	35	8.....	36

Putting the mean, 35.9 = 100.0, we get a maximum variation of 6 per cent.

It will also be noted that the volume of the drop carried by this loop is about 0.020 cc., or over six times the volume given by Duyser and Lewis as that of the present "standard loop," thus overcoming largely the first objection advanced by them in the article quoted.

It would therefore appear that a loop such as the one described above would eradicate some of the difficulties at present encountered in making determinations of the antiseptic value of disinfectants by the methods mentioned.

The valued aid of Mr. Walter Erlenkotter, of this laboratory, in connection with the preparation of this paper, is gratefully acknowledged by the author.

STANDARD TESTING LABORATORY
BOARD OF ESTIMATE AND APPORTIONMENT
NEW YORK CITY

NOTE ON SUBSTITUTE FOR THE BLAST LAMP

By PAUL J. FOX¹

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To the many substitutes for the blast lamp, the writer begs to add one, which, though extremely simple, he has not seen in use in any laboratory that he has visited. It consists of an ordinary assayer's crucible of convenient dimensions, of which the bottom has been ground or sawed off, forming a jacket

¹ Scientist in Soil Laboratory Investigations, Bureau of Soils, U. S. Dept. Agriculture, Washington, D. C.