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AN AUTOMATIC ACID MEASURE,

FOR USE IN TESTING MILK AT CREAMERIES.

G. E. PATRICK.

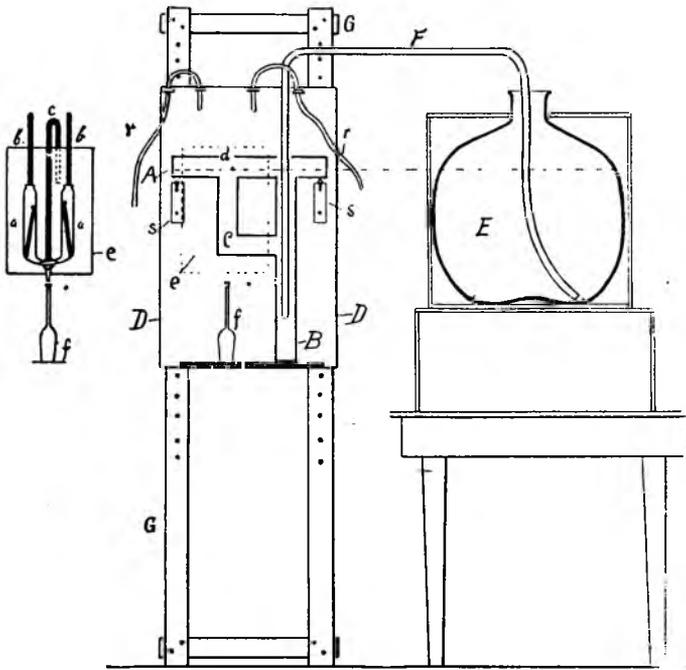
The cut on the opposite page represents an apparatus, devised by the writer, that is being used in the college creamery to the great satisfaction of those who fortnightly test the composite samples. It is for measuring out the charges of acid for the Babcock test.

It may be described in a general way as consisting of two parts: First, a leaden receptacle connected with the acid carboy by a leaden siphon, and second, two glass burettes or measuring cylinders connected with each other and with a glass siphon which draws the acid from the leaden receptacle.

Referring now to the cut, the leaden receptacle is represented by A B C. It is made of lead piping closed at the ends with sheet lead. The horizontal part A is of 2-inch piping, the remainder, B and C, of 1½ inch. The vertical pipe B is 18 inches long, making the total height of the receptacle 20 inches. Possibly there are some carboys of such depth that this dimension might need to be increased an inch or two. In the apparatus now in use—the first and only one made—the horizontal pipe A is 20 inches long; but 16 inches would doubtless do as well and would make the apparatus more compact, therefore it is so represented in the cut.

Two circular holes are cut through the upper wall of A, one at d the other directly above B, to admit the leaden siphon F. The latter is of half-inch piping; our's is heavy walled, but light piping would be more easily bent into shape, beside being cheaper. This ends the description of the leaden part of the apparatus. Any tinner can make it, the piping being provided. When made it is fastened upon a board D D by leaden bands, not shown in cut. Its base rests upon a shelf at foot of the board.

The glass part of the apparatus is shown not in place, but off to the left of where it properly belongs. It is attached to



a board e and when in place the board covers C and a large part of A, as shown by the dotted line; and the glass siphon c, passing through the orifice d, dips an inch or two into the acid, whose surface is shown by the horizontal dotted line. The true position of the siphon is a trifle lower down than represented in the cut.

The burettes, or measuring cylinders a a are each in turn filled and emptied by turning the cock, which is not lettered in the cut and shows but poorly, at the junction of the burettes and the siphon. The connections between the burettes and the siphon (or nozzle) must slant downward toward the latter, as shown in the cut; they must not be horizontal. Each burette terminates above in a thick-walled glass tube with very narrow bore; the tube is movable but fits water-tight into the burette, like an ordinary ground-glass stopper. These tubes are b b in the cut.

When the board e has been secured in place by screwing it upon blocks two inches thick previously fasted to the board D D, the rubber tubes r r are slipped over the ends of the tubes b b, and the apparatus is ready for use.

The dimensions of the glass portion of the apparatus are as follows: Burettes a a about 12cm. high—capacity to deliver 19.5 cc., about; tubes b b, length including the lower end ground as stoppers, 15cm.—diameter at least 10mm., and 11 or 12mm. at smallest part of stopper—caliber of bore 1 to 1.5mm; siphon c, 26 cm. high, caliber of bore 6 to 7mm.—much over 7mm. will give trouble because of difficulty in filling so wide a siphon by suction. The delivery nozzle and borings through the cock should have a caliber of nearly or quite 3mm. to secure free delivery. Said borings are in the form of two separate right angles within the cock.

The burettes are made to deliver more than the right charge of acid of 1.82 sp. gr. (i.e., 17.6 cc as determined by Babcock) because commercial sulphuric acid is sometimes weaker than that standard and consequently a little larger charge is required. The rods shown inside the burettes a a are pieces of sheet lead folded into rods or bars of 1 to 2cc. volume, as may be needed, and dropped into the burettes to reduce their capacity; each bar is bent into a hook at top, that it may be readily withdrawn by a wire. Each carboy of acid

acid, black curd or "mud" means too much. The size of the bars in the burettes is thus regulated for each carboy of acid.

A few details only remain to be described. The board D D is supported at any desired height by pins (iron bolts) which fit into holes bored at a downward angle into the frame G G—the pins being movable to new holes through the slots s s in the board.

The siphon F is supported by a bracket or cleat projecting from the wall; not shown in the cut.

Finally, two small pieces of the sheet lead are so placed on top of tube A and close to the two siphons as to exclude the outer air from the acid.

Working the apparatus. First the leaden siphon F must be started and the receptacle A B C be filled. To do this, lower the board D D until the pipe A is nearly to the level of the base of the carboy. Remove the siphon from its place, invert, fill it with acid, close both ends with rubber stoppers—having previously fastened a stout copper wire three feet long to the stopper which is to go into the carboy; return siphon to place, by use of the wire pull out stopper attached thereto, then remove the other and *quickly* raise the board and its attachments high enough to prevent overflow when the acid "finds its level." Then gradually lower it until trial shows that the glass siphon c can be filled. To fill this siphon apply strong and sudden suction to one of the rubber tubes, turning the cock if necessary to establish the proper connection. The entering acid should displace all air; no bubbles should remain.

This being done the level of the acid in the carboy is thereafter known by its height in the tubes b b, and thus also it is known when the board D D must be lowered "a peg" as the level sinks by use.*

Charges of acid can now be drawn by merely turning the cock through an angle of 90 degrees, back and forth; each turn fills one burette and empties the other—the acid being delivered into a test bottle placed beneath. In reality, the test bottle, instead of standing directly on the wooden shelf, stands upon a small leaden tray with a false bottom having an orifice just where the bottle stands, somewhat smaller than

the base of the bottle. This is to catch drippings, which are very small in amount.

To avoid risk of damage from accidental leakage it is best every day, after testing is over, to blow the acid back through the glass siphon as completely as possible. And in refilling it for another day's work always *blow* through the rubber tube a moment *just the instant before applying suction*, in order to force all the residual acid into the siphon and thus avoid the possibility of drawing any into the mouth.