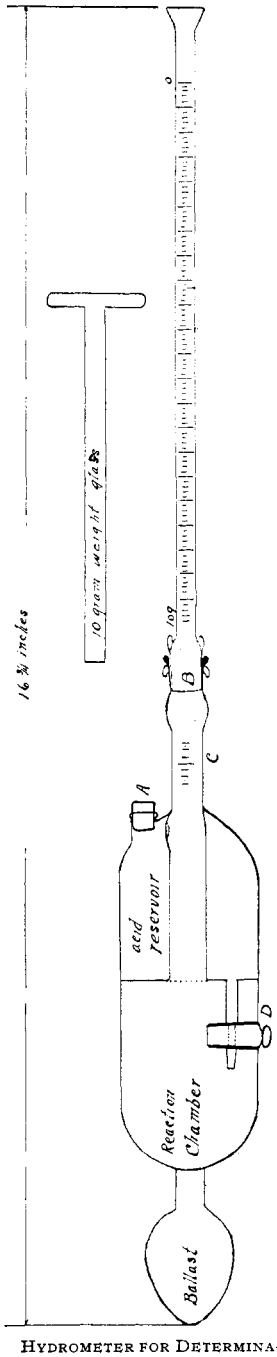
A Fahrenheit thermometer accompanies each instrument and is hung inside the floating cylinder. Its reading is taken before and after each determination to allow for any error due to change in temperature. To the figure for calcium carbonate equivalent add 0.5 for each degree rise, or subtract 0.5 for each degree fall in temperature between the two readings. This temperature change need seldom amount to more than a fraction of a degree.



HYDROMETER FOR DETERMINATION OF CARBONATES IN LIMESTONES AND OTHER MATERIALS

DEGREE OF ACCURACY

The following table of results illustrates what may be expected as to degree of accuracy. They represent all of the determinations made by one person, a boy without laboratory training and who has never studied chemistry. The standard method mentioned is by use of the Parr carbon apparatus.

CALCIUM CARBONATE EQUIVALENTS

Limestone No.	Author's Method	Standard Method
200	80.0	80.0
201	81.5	81.8
220	78.5	78.6
221	71.0	71.1
223	78.5	78.7
224	83.0	84.0
226	82.5	82.9
230	83.5	83.2
240	99.5	99.0
244	98.5	98.5
254	97.5	97.7
256	89.0	88.9
257	95.5	95.8
Calcite	99.5	..

SOME DETAILS

To those who care to examine the method critically it should be said that sources of error have been eliminated until the method is accurate to the degree that the graduated stem can easily be read: this means about 0.25 per cent. The limestone can be weighed to an accuracy of 0.02 g. The weight of CO_2 remaining in the apparatus tends to offset the loss due to moisture escaping with the gas, but the difference, together with any other possible sources of error, has been accounted for in the graduation of the reading stem.

This graduation was first determined theoretically and then tested by checking against pure calcite. Small corrections were found necessary and subsequent instruments have been so graduated that their readings need no correction save for change in temperature occurring during the progress of the determination.

Each outfit of this apparatus includes a glass cylinder for floating the hydrometer, a small Fahrenheit thermometer, 500 cc. of hydrochloric acid (sp. gr. 1.15), a 50 cc. graduate, a small dropping pipette and a scoop for convenience in transferring the sample. The manufacturer's price for a single outfit, it seems now, will be less than $10.00.

APPLICATION OF THE METHOD

For analyzing carbonates other than limestone and similar materials, this instrument is fitted with a graduated stem which reads percentage of carbon dioxide, an arrangement which greatly extends its use. It will be found especially suited to determining the comparative strengths of baking powders and considering speed and accuracy is more suitable than any other device now employed for that purpose.

The method is adapted for use in all chemical laboratories, college, experiment station, or commercial laboratories. However, it is devised for use outside of chemical laboratories, also. Limestone companies can employ it to check up on every carload of their goods, or to locate the stone in their quarry most suitable for grinding. County agricultural agents will use it to keep posted on the quality of limestone being sold in their territory and to determine the composition of local limestone deposits. Many an individual farmer or some member of his household will no doubt wish to own the apparatus.

NEW YORK AGRICULTURAL EXPERIMENT STATION
GENEVA, NEW YORK

CARBONATION STUDIES: I—A MECHANICAL STIRRER FOR CARBONATION DIRECT IN THE BOTTLE

By HARRISON E. PATTEN AND GERALD H. MAINS

Received March 23, 1917

In connection with an attempt to distinguish between naturally charged or bottle-fermented wines, and artificially carbonated wines, the need was felt for a machine which would enable one to carbonate direct in the bottle, and in a measure to control the purity of the carbon dioxide gas.

After extended experiments the machine described below was devised.[1]

A detachable stirring-head enables one to pass carbon dioxide (or other gas) through a side tube into the bottle containing liquid to be impregnated. This liquid is agitated by tines rotated by a shaft attached by pulley and belt to a motor. The complete assembly is shown in Fig. I.

DETAILS OF CONSTRUCTION

The stirring-head (Fig. II) consists of a stirrer with clock spring tines *A A*, and shaft *B* rotating in a shaft-chamber, *F*. The upper end of the stirrer-shaft *B* is fitted with a pulley, *H*, serving to connect it by belt to a source of power, and the shaft-chamber through which *B* runs is machined into a stuffing-box packed with oil-soaked lampwick which can be screwed tight to place by means of a hexed screw-collar, *Q*, thus rendering the joint between the shaft and shaft-chamber gas-tight. An opening below the stuffing-box joint leads into the side-tube *J*, so that there is free gas connection between the sleeve *C* and the

[1] See U. S. Patent 1,216,722.

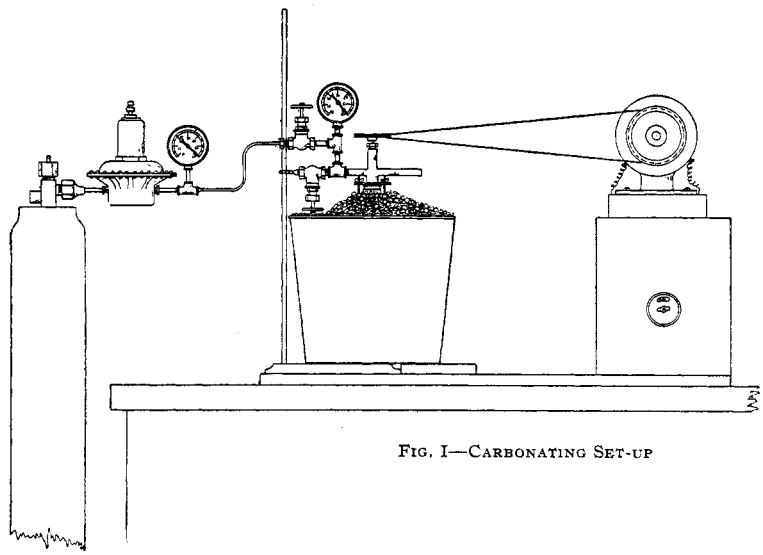


FIG. I—CARBONATING SET-UP

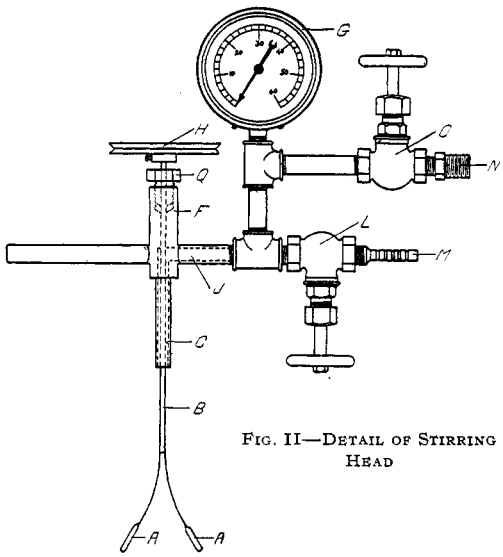


FIG. II—DETAIL OF STIRRING HEAD

stirrer-shaft. This gas inlet through J is connected with a pressure gauge, G, and also with a union, N, serving to connect with a source of compressed carbon dioxide gas. The globe-valve O controls the admission of gas.

A continuation of J through control-valve L leads to exit tube M, where gas may be withdrawn as desired.

OPERATION

The apparatus used for impregnating with carbon dioxide consists of a carbon dioxide cylinder, pressure-reducing valve, the stirring apparatus described above, a champagne bottle, and a small motor, as shown in Fig. I.

First, the liquid is placed in the bottle, and chilled, if desired.

Attachment of the stirring-head to the bottle is made as follows: Holding the tines AA together they are passed through the central hole of a slotted plate, which then slides on up over sleeve C, and is held firmly in place by a one-hole rubber stopper which serves as a heavy gasket closing air-tight the mouth of the bottle when the standard-clamp screws are brought up into the slots of the plate (120° apart) and screwed tight to place as shown in Fig. I. The bottle with attached stirring-head is packed in ice and the pail is placed in position, the bottle being held securely by a clamp. (Upward thrust of the pulley due to gas pressure in the bottle is prevented by a glass rod which acts as a top-bearing.) A flexible pipe from the carbon dioxide cylinder is connected with the union N, and a belt run from the pulley-wheel H of the stirring-head to the motor. Gas is turned on by opening the cylinder-valve and the globe-valve O, the motor started and carbonation continued as long as desired for the experiment. During the process of carbonation, the collar Q is turned back sufficiently to allow free rotation of the shaft B. This entails a slight gas leak, but the source of pressure being practically infinite by comparison, the operation of the machine is not affected.

If a high degree of purity of carbon dioxide in the finished liquid is desired, control-valve O should be closed, valve L opened and gas allowed to run out of exit tube M. The valve L is then closed, valve O opened, and carbonation resumed. This "blow-off" of top gas from the bottle sweeps out foreign gases, especially nitrogen and oxygen collected above the liquid and should be repeated several times to secure the best carbonation.

As soon as the carbonation process is finished, the collar Q is screwed down tight and the valve O closed.

In practice we have found that with the packing used in the stuffing-box and valves we are able to hold a pressure of 75 lbs. per sq. in. for several weeks.

DEPARTMENT OF AGRICULTURE
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A SAMPLING PRESS[1]

By W. BLAIR CLARK[2]

Received March 16, 1917

Any device used in the preparation of samples for the ordinary run of analytical work should meet each of the following conditions as completely as possible: it should reduce all the constituents of the substance under investigation to particles of approximately equal size, and these particles should be fine enough to be acted upon promptly by whatever solvents or extractive liquids are to be used subsequently; in the process of reduction no part of the sample should be lost by spurting or otherwise; a minimum of the sample should be retained in the mechanism, and it should be possible to remove this minimum without contamination and in such a manner that, if desired, it may be added to the main bulk of the sample; the apparatus should be capable of rapid operation; and, finally, it should be easily taken apart for cleaning.

It is believed that the press here described fulfills these requirements quite satisfactorily as applied to the sampling of roots, tubers, melons, and such fruits as are easily separated from the seeds and skins, especially when the last mentioned are of the tough, thick sort.

[1] Published by permission of the Secretary of Agriculture.

[2] Biochemist, Office of Cotton, Truck and Forage Crop Disease Investigations.