gravity. Thus between 7 and 8 the difference in fat is but .42%, and that of the lactometer degrees 10, while between 9 and 10 the difference in solids is but .32%, but the lactometer degrees 28 and the percentage of fat 1.26. Of course such differences are also attended by changes in the physical properties of the milk and can in most cases be recognized by experts.

A careful comparison of the data in the table presented will illustrate that the specific gravity alone is not an indication of the purity or composition of the milk. Lactometers ought to be restricted in their use. They are certainly useful in sorting milk, and under certain conditions sufficient to at once condemn milk absolutely. For a correct interpretation of the lactometer degrees in the examination of milk some other factors such as the percentage of total solid or fat are essential. A careful and proper use of the lactometer shows the *specific gravity* of the milk, but any inference beyond that depends largely upon the ability and experience of the operator.

ESTIMATION, BY TITRATION, OF DISSOLVED CARBON DIOXIDE IN WATER.

By Albert R. Leeds.

In the determination of the amount of lime requisite to precipitate the dissolved carbonates of lime and magnesia in natural waters, the discrepancy between the amount of carbonate remaining in solution after precipitation, and the calculated amount, is increased by failure to estimate and allow for the dissolved carbon dioxide present. This dissolved carbon dioxide interferes with the results obtained by the use of soap in the estimation of dissolved calcium carbonate. For this and many other reasons I have laid aside the use of the soap test in the examination of waters intended for use in boilers.

The estimation of the dissolved carbonates by means of decinormal acid with methyl orange as an indicator, affords a closer approximation, and in many cases the results thus obtained agree closely with those found by gravimetric analysis. But on using the amount of lime which is required to form a neutral carbonate, the further addition of lime to saturate the free carbonic acid is the more necessary, as the waters are richer in this constituent. For the past two years I have been using the following simple method. In the case of soft waters 500 c. c. are taken, a few drops of phenolphthalein solution is added and a decinormal solution of sodium carbonate is run in until a pink tinge is obtained. This occurs when the sodium salt is changed to the bicarbonate. With hard waters 100 c. c. are sufficient. The results agree very closely with those obtained by eudiometric analysis. Thus in the case of the Hoboken water, I obtained Dec. 1st, 1890, carbon dioxide 1.03 parts; oxygen, 8.55 parts; nitrogen, 18.07 parts per 100000. This determination required, of course, the additional expenditure of time to reduce the observed results to standard pressure and temperature. By the method above given, using ½ litre of water, the figure directly determined for carbon dioxide was 1.01 parts.

When 500 c. c. of the water are taken, the number of c. c. of the decinormal solution used, multiplied by 2.2, gives very approximately the number of c. c. of carbon dioxide dissolved in a litre of water. If 100 c. c. of water are employed, the same result is arrived at by multiplying by eleven. Too small an amount of the indicator should not be employed, but 10 drops of a strong solution added to 100 c. c. of the water will be found sufficient.