Since the efficiency of the solution depends on the amount of arsenic it contains and probably not on its state of oxidation, the deterioration is thus only apparent. Yet if a solution several months old, as it is likely to be in a drug store, is examined by the official method it may cause unjust annoyance.

To determine the total arsenic present in Donovan's Solution, irrespective of its state of oxidation, the well-known Gooch-Browning method for determination of arsenic can be used to advantage. In this method all of the arsenic is first reduced to the arsenous condition by potassium iodide and sulphuric acid (= hydriodic acid) which is then titrated with standard iodine. The details of the method as applied to Solutions of Arsenous and Mercuric Iodide are as follows:

Transfer 25 mils of the solution, accurately weighed, into a 500 mil Erlenmeyer flask, add 4 mils concentrated sulphuric acid and 1 Gm. of potassium iodide, dilute to about 100 mils and gently boil until the volume is reduced to about 40 mils or until the solution is of a pale yellow color. Cool, dilute to about 200 mils with water, add a little starch solution and just discharge the blue color by the addition, drop by drop, of tenth-normal sodium thiosulphate. Add to the decolorized mixture 20 percent sodium hydroxide solution until it is slightly alkaline to litmus paper, then make at once slightly acid with diluted sulphuric acid, cool if necessary, then make again alkaline with sodium bicarbonate and titrate with tenth-normal iodine using starch as indicator.

Tested by this method after the last experiments recorded above, 20 mils of each of the solutions consumed 8.68 mils of tenth-normal iodine.

POWERS-WEIGHTMAN-ROSENGARTEN CO.,
PHILADELPHIA, PA.

INFLUENCE OF VISCOSITY ON THE EMULSIFICATION OF OILS.

BY CHARLES H. STOCKING.

The ease with which the emulsification of an oil may be brought about, and the permanence of the finished product depend upon a number of factors. With the view to establishing, if possible, a "viscosity rule" for manufacturing permanent emulsions from fixed oils the author selected a number of the more commonly used oils, made viscosity tests with an Engler Viscosimeter and then emulsified the oils by the Continental Method, producing emulsions varying in strength from 10 to 60 percent.

The classification of the oils according to their viscosity was determined by comparing the rate of outflow under definite conditions (same initial pressure and same temperature) with the rate of outflow of water from the viscosimeter. The quotient of the time of outflow of 200 mils of oil divided by the time of outflow of 200 mils of water at 20° C. is taken as the measure of the viscosity. This quotient is known as the Engler degree.

The following table shows the results of the tests on the oils selected:

VISCOSITY TABLE.

Liquid.	Time of Outflow.	Viscosity.
Water	54 seconds	1.
Paraffin Oil No. 1	3 minutes 16 seconds	3.63
Paraffin Oil No. 2	5 minutes 13.2 seconds	5.80
Linseed Oil	6 minutes 43.8 seconds	7.48
Cod Liver Oil	8 minutes 23.1 seconds	9.31
Oil Peach Kernel	9 minutes 17.8 seconds	10.33
Sesame Oil	9 minutes 31.6 seconds	10.58
Castor Oil	2 hours 10 minutes	144.44

The oils were emulsified in a mortar by the Continental Method. In all of the emulsions the 1, 2 and 4 rule was employed, using one part of finely powdered acacia with two parts of water and four parts of oil to produce the nucleus or primary emulsion. In every instance the acacia was placed in a perfectly dry mortar and triturated lightly with the oil. The water was then added and trituration continued until emulsification was complete. To produce the desired strength, the nucleus was simply diluted with water and no syrup or other flavoring agent was used. Great care was exercised in making the nucleus in order to insure complete emulsification of the oil before dilution, the diluent (water) being added very slowly and cautiously in every case. The samples were made up to 120 mils each, and were placed in bottles of uniform size and shape and allowed to stand for a period of ten days, at the end of which time they were graded according to quality. The bottles were placed in a row with the one containing the poorest emulsion first in line. Next to this was placed the second quality emulsion, and the others in like order until all the bottles were placed in the row in the order of separation at the end of the given period of time.

In tabulating the results of the emulsification test a number of interesting facts are revealed. The table includes a list of the sixteen emulsions that were made by the author, the viscosity number of each oil, the percentage strength of each emulsion, and the product which was obtained as a result of multiplying the viscosity number by the percent. This product is designated the "Constant."

TABLE OF EMULSIFICATION CONSTANTS.

Grade.	Oil.	Viscosity.	Percentage Strength of Emulsion.	Constant.
1	Paraffin No. 2	5.80	10	58.00
2	Linseed	*7.48*	10	*74.80*
3	Paraffin No. 1	3.63	25	90.75
4	Cod Liver	9.31	10	93.10
5	Peach Kernel	10.33	10	103.30
6	Sesame	10.58	10	105.80
7	Paraffin No. 2	5.80	25	145.00
8	Paraffin No. 1	3.63	50	181.50
9	Castor	144.44	10	*1444.40*
10	Cod Liver	9.31	20	186.20
11	Castor	144.40	20	*2888.80*
12	Paraffin No. 2	5.80	50	290.00
13	Cod Liver	9.31	33.33	310.33
14	Linseed	*7.48*	50	374.00
15	Cod Liver	9.31	60	558.60
16	Castor	144.44	30	*4333.20*

Emulsion number 1, a 10 percent emulsion, made from Paraffin Oil having a viscosity of 5.80, showed the greatest degree of separation and was the poorest emulsion of the lot. Emulsion number 2 was also a 10 percent emulsion but was made from an oil having a viscosity of *7.48*. This emulsion did not separate quite as much as number 1. Emulsion number 3 graded slightly better than number 2 and was made from an oil having a lower viscosity than either of the first 2 but contained a higher percentage of oil and therefore gave a larger figure in the column headed Constant.

It will be noted that the Constant becomes greater as the quality of the emulsions approaches the ideal. The only emulsion which does not fit into the table, and which may be said to be the exception which "proves the rule," is the one made from Castor Oil which has such an abnormally high viscosity.

All of the emulsions that were made showed improvement in quality as the Constant became larger. Emulsions numbers 4 and 5 are of the same strength but the viscosity of the oil used in number 5 is greater than the viscosity of the oil in number 4, therefore the Constant is greater, and the experiment proved that emulsion number 5 was a better emulsion than number 4.

Emulsions number 13 and number 15 were made from oils having the same viscosity, but vary in strength. Number 15 was a much better emulsion than number 13, and it will be noted that the Constant for number 15 is greater than for number 13.

Further experimentation showed that the adjustment of the percentage with oils of different viscosities to produce Constants that were equal, resulted in emulsions practically identical in quality.

Knowing the viscosity of any oil and the Constant occurring from the successful emulsification of any possible percentage of the oil, the percentage of any other oil necessary to produce an emulsion of similar quality may be determined by dividing the Constant belonging to the oil in the given emulsion by the viscosity of the oil to be emulsified.

For example, having a 20 percent emulsion of Cod Liver Oil with a viscosity of 9.31 and desiring to make an emulsion of Sesame Oil of similar appearance and quality, the percentage of Sesame Oil necessary may be determined by dividing the Constant (186.20) of the 20 percent Cod Liver Oil emulsion by the viscosity of the Sesame Oil (10.58).

$$186.20 \div 10.58 = 17.5.$$

Therefore a 17.5 percent emulsion of Sesame Oil having a viscosity of 10.58 is practically the equivalent in quality to a 20 percent emulsion of Cod Liver Oil having a viscosity of 9.31.

Therefore, under similar conditions of manufacture, emulsions that are similar in quality may be produced from oils of different viscosities if care is exercized in maintaining an equality in the Constants.