This invention relates to a process for cleaning bottles and has for its object to secure this result in a novel and extremely effective manner.

One of the most ordinary methods of cleaning bottles is to subject the same to the action of one or more solutions and to numerous high-pressure rinsings and brushings, having for their object to remove dirt and sediment from the insides and outsides of the bottles; but these treatments have proved ineffective in the treatment of certain kinds of dirt and sediment. For instance, bottles used for grape juice have been subjected for long periods of time to a great many soaking and internal brushing, scrubbing and rinsing operations, but without effectually removing the sediment which has accumulated therein. In the practice of my invention, I am enabled to clean the bottles most effectually in a comparatively short time, and with the employment of but a comparatively small number of operations.

The process may be realized in and through any suitable apparatus, such, for instance, as the type shown in the patents granted to John R. Gruetter and myself on July 31, 1923, No. 1,468,763 and August 19, 1919, No. 1,313,706; hence no particular apparatus is illustrated herein.

In practicing my invention the bottles are preferably subjected, first, to an internal rinsing treatment with lukewarm water under a pressure of from eight to twenty-four pounds per square inch; that is to say, water having a temperature of about 110° F. This action is for the purpose of removing any loose sediment or dirt that is capable of being dislodged by water under pressure, as well as any material soluble in water.

The bottles are then subjected to a soaking operation with ordinary caustic solution. It is preferred to give them three such soakings in succession. The first soaking is in caustic soda solution of about two percent strength and having a temperature of about 110°-130° F.; the second soaking is in caustic soda solution of from four to eight percent strength and having a temperature of 150°-175° F.; while the third soaking is practically a repetition of the first soaking, with caustic soda solution of about two percent strength and having a temperature of about 130° F.

The rinsing with lukewarm water tends to soften certain kinds of sediment and preliminarily warm the bottles. The first soaking with the 3% caustic solution serves to remove material loosened but not removed from the bottles in the first rinsing operation; also to remove some of the crust and scum. It serves further to warm up the bottles prior to their treatment with the hot and strong caustic solution, thus preventing them from breaking under the high temperature of this second solution. The second treatment with the strong, hot, caustic solution serves to take out practically all of the residue that is capable of being removed by caustic without prolonged treatment. The third treatment with caustic solution will remove material which requires a long exposure to caustic solution and also serves to cool the bottles down sufficiently to enable them to receive the next treatment.

Following the caustic solution treatment, the bottles are rinsed with lukewarm water under a pressure of from eight to twenty-four pounds per square inch in order to remove the caustic solution therefrom, the temperature of the water being approximately 100° F.

After this rinsing operation, the bottles are subjected to an internal rinsing, with acid, under a pressure of from one to one and one-half pounds per square inch. The acid which is preferably employed is hydrochloric acid of from ten to thirty percent strength, the solution having a temperature of from 90° F. to 110° F. The bottles are preferably subjected to at least two such pressure internal-rinsings. Other acids may be employed, such, for instance, as citric acid and sulphuric acid.

Following the acid treatment, the bottles are subjected to several successive internal rinsings, using ordinary water from the city service mains. This rinsing is for the purpose of removing all of the acid from the interior of the bottles. After this treatment, the bottles may be rinsed externally and brushed, in accordance with ordinary practice.

While it is preferable to treat the bottles with the caustic solution before applying the acid solution thereto, it is possible to realize some of the advantages of my process by reversing these steps, i.e., by treating with the acid first and with the alkali later.

By the hereindescribed process, bottles...
which have hitherto been considered incapable of such cleaning as would enable their re-use, can be thoroughly and completely cleaned, and at a comparatively small expense.

Having thus described my invention, what I claim is:

1. The process of cleaning bottles by means of an apparatus which comprises operating the said apparatus in such manner that the bottles therein are subjected to the following operations in succession: (a) soaking the bottles in a caustic alkali solution; (b) rinsing the bottles with fresh lake-warm water to remove the caustic alkali therefrom; (c) rinsing the bottles internally with a mineral acid; (d) rinsing the bottles with water to remove the acid and sediment therefrom.

2. The process of cleaning bottles by means of an apparatus which comprises operating the said apparatus in such manner that the bottles therein are subjected to the following operations in succession: (a) soaking the bottles in a caustic alkali solution of about two percent strength and at a temperature of about 110°-130° F.; (b) soaking or subjecting the bottles to the action of a caustic alkali solution of four to eight percent strength and at a temperature of 150°-175° F.; (c) soaking or subjecting the bottles to the action of a caustic alkali solution of about two percent strength and at a temperature of about 130° F.; (d) removing the caustic alkali solution from the said bottles by means of fresh lake warm water; (e) subjecting the bottles thus treated to one or more internal rinsings with a mineral acid solution of from ten to thirty percent strength and at a temperature of from 90° F. to 110° F.; (f) removing with water the acid adhering to the bottles after the preceding step.

3. The process of cleaning bottles by means of an apparatus which comprises operating the said apparatus in such manner that the bottles therein are subjected to the following operations in succession: (a) soaking the bottles in a caustic alkali solution; (b) removing the caustic alkali solution from the said bottles by means of water; (c) subjecting the bottles thus treated to one or more internal rinsings with a solution of hydrochloric acid of from ten to thirty percent strength and at a temperature of from 90° F. to 110° F.; (d) removing with water the acid adhering to the bottles after the preceding step.

4. The process of cleaning bottles by means of an apparatus which comprises operating the said apparatus in such manner that the bottles therein are subjected to the following operations in succession: (a) subjecting the bottles to several successive treatments with heated caustic alkali solution varying in strength and temperature; (b) rinsing the bottles with fresh lake warm water to remove caustic alkali therefrom; (c) subjecting the bottles to one or more internal rinsings, with a mineral acid solution; (d) rinsing the bottles with water to remove the acid therefrom.

5. The process of cleaning bottles in a bottle-cleaning apparatus which consists in operating the said apparatus in such manner as to secure the performance thereby of the following actions in succession: (a) subjecting the bottles to several successive treatments with heated caustic alkali solution varying in strength and temperature; (b) removing the caustic alkali solution with fresh water at a temperature of about 90° F.; (c) treating the bottles with one or more internal pressure rinsings with a mineral acid solution of from ten to thirty percent strength and at a temperature of about 90° F. to 110° F.; (d) and removing with water the acid adhering to the bottles.

6. The process of cleaning bottles by means of an apparatus which comprises operating the said apparatus in such manner that the bottles therein are subjected to the following operations in succession: (a) soaking the bottles in a caustic alkali solution of about two percent strength and at a temperature of about 110°-130° F.; (b) soaking or subjecting the bottles to the action of a caustic alkali solution of four to eight percent strength and at a temperature of 150°-175° F.; (c) soaking or subjecting the bottles to the action of a caustic alkali solution of about two percent strength and at a temperature of about 130° F.; (d) removing the caustic alkali solution from the said bottles by means of fresh lake warm water; (e) subjecting the bottles thus treated to one or more internal rinsings with a mineral acid solution; (f) removing with water the acid adhering to the bottles after the preceding step.

7. The process of cleaning bottles in a bottle-cleaning apparatus which consists in operating the said apparatus in such manner as to secure the performance thereby of the following actions in succession: (a) subjecting the bottles to treatment with heated caustic alkali solution; (b) removing the caustic alkali solution with fresh water; (c) treating the bottles with one or more internal pressure rinsings with a mineral acid solution of from ten to thirty percent strength and at a temperature of about 90° F. to 110° F.; (d) and removing with water the acid adhering to the bottles.

In testimony whereof, I hereunto affix my signature.

CHARLES H. LOEW.