

Aug. 7, 1956

E. W. SMITH

2,757,843

PRESSURIZED CONTAINERS AND METHOD OF FILLING THE SAME

Filed Oct. 18, 1952

2 Sheets-Sheet 1

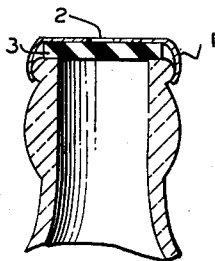


FIG. 1

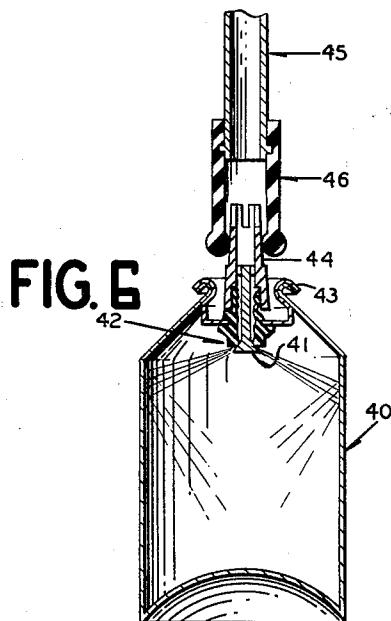


FIG. 5

FIG. 2

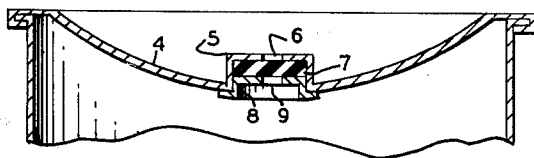
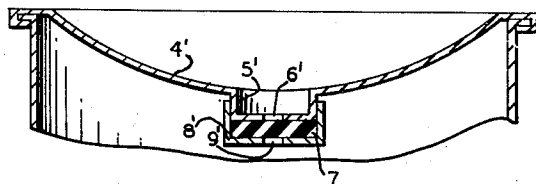


FIG. 2A



INVENTOR.
Edward W. Smith
BY
Ezekiel Wolf
his Attorney

Aug. 7, 1956

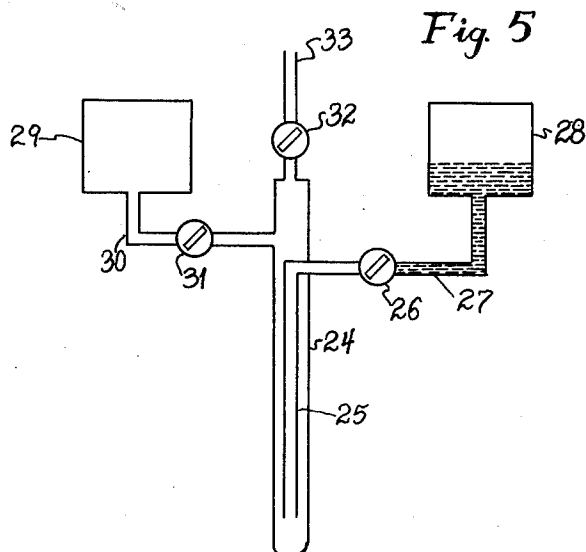
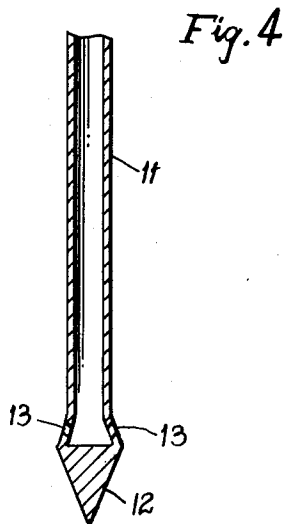
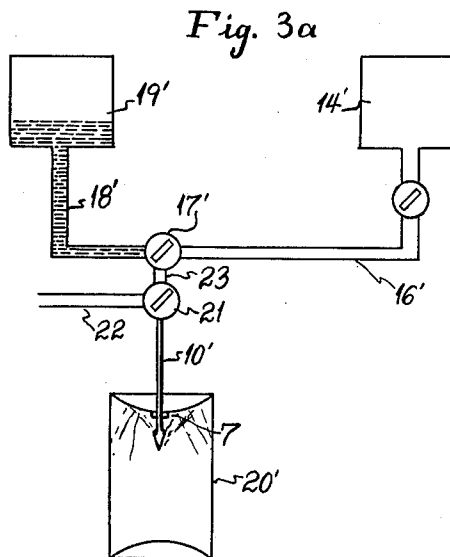
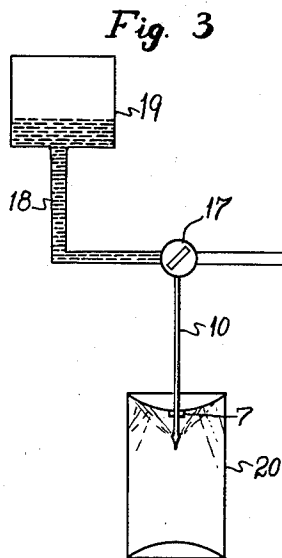
E. W. SMITH

2,757,843

PRESSURIZED CONTAINERS AND METHOD OF FILLING THE SAME

Filed Oct. 18, 1952

2 Sheets-Sheet 2



INVENTOR.
Edward W. Smith
BY
Ezekiel Wolf
his Attorney

1

2,757,843

PRESSURIZED CONTAINERS AND METHOD OF FILLING THE SAME

Edward W. Smith, Melrose Highlands, Mass.

Application October 18, 1952, Serial No. 315,590

16 Claims. (Cl. 226—69)

The present invention relates to pressurizing a variety of products by novel method and means such as packaging carbonated beverages and more particularly to equipment and procedures for simplifying such packaging and to the packaging of other liquids and fluids such as liquid waxes and polishes and liquid edible products.

In the usual method of preparing carbonated beverages, for instance, the beverage itself may be prepared from water, sugar, flavoring, etc., the water itself sometimes being deaerated preparatory thereto to remove dissolved air, and may then be charged with carbon dioxide in any of the usual ways such as spraying the liquid portion of the beverage into an atmosphere of carbon dioxide in an enclosed space to facilitate the solution of the carbon dioxide. It will be appreciated however, that since the carbon dioxide may be introduced into the liquid portion under atmospheric pressure condition and may then be transferred to the bottling and capping machines under atmospheric pressure it is usually necessary, if sufficient gas is to be introduced, to introduce the gas into the liquid at or near, 32 degrees Fahrenheit because of the greater solubility of the gas at this temperature. Consequently as a further aid in the carbonation process the liquid may be and usually is, refrigerated to a low temperature since under these conditions a maximum absorption of carbon dioxide takes place.

While still under refrigeration the charged beverage is then transferred to a bottling machine where the bottles are filled and capped.

In the above operations the necessity for handling the charged product under refrigeration because a substantial part of the cost of preparation which together with the necessity for bulky and expensive carbonating equipment makes the process an awkward one.

One of the purposes of the present invention is to eliminate the necessity for the usual type of carbonating equipment.

Another object of the invention is to eliminate the necessity for refrigeration of the liquid portion of the beverage during carbonation or during the time that the liquid is being charged with the gas.

Another object of the invention is to provide a method and means for carbonating the beverage in the container in which it is to be sold.

Still another object of the invention is to provide a method and means whereby the bottler does not need the elaborate and expensive can closing and capping machines usually required.

Still another object of the invention is to provide a package closure suitable for the accomplishment of the above purposes.

Still another object of the invention is to provide a method and means whereby the propellant gas used for the pressurized dispensing of various products need not be one which must be liquified before introducing it into the container.

The present invention is a continuation in part of my copending application Serial No. 236,151, filed July 11,

2

1951, now Patent No. 2,693,418 of November 2, 1954, and relates in part to the application of the means and methods for packaging liquids which are non-foamable upon being dispensed.

In the method of the present invention, containers for pressurized dispensing of such liquids as insecticides, etc., may be first filled with the desired liquid, capped under normal temperature conditions, and subsequently charged with the desired gas to the desired pressure, as will subsequently appear. Under modified methods, such containers may first be capped and then filled with the desired liquid and pressurized or the liquid and gas may be introduced simultaneously, or the gas may first be introduced and then the liquid.

The method of the present invention and the novel means by which this is accomplished will best be understood from the specification set forth below when taken in connection with the drawing, in which:

Figure 1 shows a bottle in fragmentary section capped in accordance with the present invention.

Figure 2 and Figure 2a show variations of the structure shown in Figure 1.

Figures 3 and 3a illustrate schematically arrangements by means of which the present methods may be performed.

Figure 4 shows a detail of the present invention.

Figure 5 illustrates a further schematical arrangement by means of which the present methods may be performed and,

Figure 6 illustrates a method by means of which the present invention may be practiced using a typical aerosol package for foam-type products of current design.

Referring to Figure 1, where 1 represents a metal cap similar in most respects to those commonly used on bottled beverages except that in the center of this metal cap is a perforation 2 which, however, does not extend through the sealing material which may conveniently be of rubber or some similar material capable of being momentarily punctured by a hypodermic needle and yet reseal itself gas-tight after the needle has been removed. In this case the hole 2 may be made small, of the order of 1/4" or less for the ordinary pint or quart bottle or can and the sealing element 3 is made sufficiently thick so that when the hypodermic needle is removed, the sealing material will contract or be forced to fill the void formed by the needle. I have found that pressure of 75 to 100 pounds per square inch will be sustained in the bottle having such closures after the needle is withdrawn.

It will be clear that such a cap can be put in place and sealed by any of the conventional sealing machines used for this purpose without alteration.

In cases where the carbonated beverage is to be packaged in a tin container, such as in commonly used for beer, a somewhat different type of closure is used in the present invention which can best be understood by reference to Figures 2 and 2a.

Here, as will be noted, is shown one of the usual types of dished ends such as are used on at least one type of beer can. With particular reference to Figure 2, 4 represents a cross section of the dished end which has a substantially cylindrical elevated portion 5 formed in it during manufacture and an aperture 6 in the top of the elevated portion just mentioned. A mating cup-shaped element 8 with a matching perforation 9 is so constructed that it may be pressed into the elevated portion 5 of element 4 subsequent to the introduction of a rubber, or a similar self-sealing perforable material gasket 7. When such an end is sealed into a can in the usual manner, a container is provided into which fluid material may be introduced as will hereinafter be described in more detail.

Figure 2a shows an alternative construction which, under certain conditions may have advantages over the

3

construction shown in Figure 2. Referring to Figure 2a, 4' is as before the dished end of a can, 5' represents a cylindrically shaped depression in element 4' and is provided with a perforation 6'. As before, a matching cup-shaped cylindrical element 3' is so constructed as to provide a press fit to portion 5' of element 4' and it likewise has a matching perforation 9' concentric with perforation 6' when pressed into place with intervening gasket 7 forming a seal.

The method and means by which the advantages in the above described closures can best be utilized in accomplishing the purposes of the invention can best be understood from a reference to Figure 3, Figure 3a and Figure 4.

Referring to Figure 3, element 10 is, or may be, a special form of hypodermic needle shown in cross-section in Figure 4 and consists of a hollow tube 11 having at its end a perforating point 12. Immediately to the rear of point 12, are one or more perforations 13, disposed around the periphery so that when the liquid or gas is forced through the tube 11, it is thrown upward and outward through perforations 13.

Referring again to Figure 3, 14 represents a container for the gas to be used which for carbonated beverages, will usually be carbon dioxide, and 15 represents a reducing valve to regulate the pressure applied to the container to be filled and is interposed in line 16 leading from container 14 to a two-way valve 17 and then to needle 10. The other inlet to two-way valve 17 leads from this valve through line 18 to a container 19 containing the liquid portion of the beverage to be packaged. The method of filling is as follows:

A container 20 such as a can fitted with a cover such as was described above and illustrated in Figure 2 or 2a, is brought under needle 10 and the end of needle 10 is introduced into the container by perforating seal 7. Valve 17 may now be turned to connect the container 20 to the gas reservoir 14 via line 16 and container 20 may be pressurized with the desired gas to the desired pressure, say 75 pounds/sq. in. When this has been accomplished, valve 17 may be turned in the other direction, connecting needle 10 to the beverage reservoir 19 which may conveniently be pressurized to a somewhat higher pressure, say 100 lbs./sq. in.

Under these conditions the beverage will be forced into the container 20 by the differential pressure. In so doing, it is delivered in the form of a fine stream, or streams, which impinge on the upper walls and top of container 20, and if the differential pressure is sufficient, will be shattered into minute drops thereby presenting a large liquid surface to the gas already in the container, thus facilitating the absorption of the gas by the liquid portion of the beverage.

When the container has been filled to the desired level needle 10 is withdrawn and the container is then ready for shipment.

It will be noted that by the above procedure, a number of advantages are made available to the bottler. First, a large and expensive piece of equipment such as is usually necessary for carbonating the beverage is eliminated; second, the necessity for refrigeration to obtain the absorption of the desired amount of gas is eliminated; third, a capping machine, another expensive piece of equipment from the bottler's point of view is eliminated, since he may use already capped containers, and, fourth, the equipment for introducing the gas and liquid portions of the beverage into the container becomes very simple and inexpensive.

The above procedure described the steps to be followed in connection with filling a can according to the present invention, and it will be obvious that bottles fitted with a closure such as is shown in Figure 1 may be filled in the same way.

While the above described procedure will be sufficient in most cases it may sometimes happen that the bottler wishes to eliminate from the beverage even the small amount

4

of air normally present in the container before it is filled and which, of course, would be partially absorbed into the beverage during the above described method of filling.

An alternative procedure and equipment such as is illustrated in Figure 3a may then be employed where dissolved air is objectionable.

Referring to Figure 3a, 14' and 19' are respectively the gas and beverage reservoirs, 15' a reducing valve, and 17' a two-way valve with a closed position, and 10' and 20' the needle and container to be filled respectively. In the present instance the procedure would be as follows.

Two-way valve 17' would be moved to its closed position and valve 15' adjusted to deliver the desired pressure of gas, say 75 lbs./sq. in., to the container. In this case the outlet of valve 17' passes through line 23 to one inlet of another two-way valve 21, the other inlet of which is connected via line 22 to a vacuum pump (not shown) and the outlet of which is connected to needle 10' as before. With valve 17' set in its closed position valve 21 is turned to connect needle 10' to line 22 and the vacuum pump which will then exhaust container 20' of air to the desired amount. Valve 21 is then turned to connect needle 20' to line 23, valve 17' is turned to connect line 16' to the gas reservoir after which the remaining steps in completing the filling of the container are as before.

While the procedures indicated up to this point have suggested that the container should be filled by first pressurizing the container with the desired gas and then introducing the liquid portion in such a way as to present a large surface of the liquid to the gas to facilitate gas absorption it may sometimes be found convenient to introduce the gas and liquid phases simultaneously by the method and means illustrated in Figure 5.

Referring to this figure, the needle employed, consists of an outer tube 24, concentric with and surrounding an inner tube 25, somewhat shorter than outer tube 24, as shown. The inner tube 25 is connected through valve 26 and line 27 to the liquid reservoir 28, which may be somewhat pressurized as before. The gas reservoir 29 is connected through line 30 and valve 31 to the space between the inner tube 25 and the outer tube 24.

In filling a container, the atomizer needle just described is introduced into the container through the perforable self-sealing closure previously described, with valve 31 and valve 26 in the closed position. Valve 32, interposed in line 33 between the interior of tube 24 and the vacuum pump (not shown) may then be opened connecting the interior of the container with the vacuum pump. After the desired degree of evacuation has been attained, valve 32 is closed and valves 26 and 31 opened simultaneously to the amount necessary in each case to atomize the liquid into the container with the gas so that the completion of the filling operation, the requisite amount of each has been introduced into the container. Valves 31 and 26 are then closed, the atomizing needle, withdrawn, and the process may then be repeated with the next container to be filled.

It will be obvious that if dissolved air in the finished product is not considered to be of any consequence, valve 32 may be left closed or even eliminated entirely.

Although in most cases it will be found preferable to use the needle and perforable seal, described hereinbefore, it is possible to practice the present invention in some cases at least without them as is illustrated in Figure 6. In this figure, 40 represents a cross-section of a typical aerosol package, such as is now on the market and extensively used for foam-type products. Such packages commonly have a valve 41, seating against a rubber element 42 firmly secured to a cap 43 pressed into position on the top of the container. Nozzle 44 is solidly secured to valve 41 so that when nozzle 44 is pressed downward, or tilted sideways, the valve 41 is displaced on its seat allowing some of the contents to escape.

5

When the downward or sideways pressure is removed, the somewhat corrugated portion of element 42, acting like a spring, returns the valve to its seat. Such a container without alteration may be filled by the methods of the present invention as follows. Instead of the needle 10, 10', or 24', as shown in Figures 3, 3a, and 5 respectively, a tube 45 is substituted having an end 46, made of rubber or other suitable material, which may be pressed down on the tapered end of nozzle 44, sufficient pressure being used to slightly depress valve 41 away from its seat on element 42. After this has been done, the procedure may be as in Figure 3, where gas to the proper amount is first forced into the container by turning valve 17 in the proper direction, after which valve 17 may be turned in the other direction to force liquid into the now gassed container.

It will be noted that when this occurs, the liquid is forced into the container in a thin stream, which strikes against the walls of the container in addition thereby presenting a large surface of the liquid to the gas and therefore facilitates rapid absorption of the gas in the liquid.

While the above description has been concerned in a considerable measure with the application of the method to the bottling or canning of charged beverages, it will be appreciated that the advantage of the process applies with equal force to the packaging of other types of products which are commonly dispensed under pressure. For example, in the packaging of such products as insecticides, polishing waxes, shaving cream, etc., which are frequently dispensed under pressure, it is common practice to introduce the product to be dispensed into an uncapped can. An easily liquified gas such as trichloromonofluoromethane, commonly called "Freon" may be refrigerated to the liquid form and then flowed into the container immediately before capping. The propellant then returns to the gaseous state at room temperature and the package is ready for use.

While such propellants are rather expensive, they do have the advantage that, assuming that sufficient refrigeration is available to liquify them, they can be used with currently available canning equipment. On the other hand, it is not always an easy matter to arrange the correct formulation of propellant to give the desired pressures and yet be compatible with the product to be dispensed. Using the methods and means of the present invention, not only is the necessity for complicated and expensive refrigerating equipment avoided, but they make available, a wide variety of inexpensive gases, even air, from which to choose the one best suited to the product without reference to whether or not they can be readily liquified.

Having now described my invention, I claim:

1. A closure for a container adapted to hold liquids charged with gases providing a pressure substantially above atmospheric pressure comprising a perforable self sealing diaphragm, two rigid perforated members one on each side of the diaphragm, said diaphragm confined wholly within opposite surfaces of the rigid members and in surface contact with said diaphragm, said members having aligned perforations, means retaining said rigid perforated members with said diaphragm inbetween as a closure for said container whereby the diaphragm becomes part of the closure of the container.

2. A closure for a container adapted to contain liquids charged with gases under a pressure above atmospheric pressure, comprising a rigid perforated member closing said container, a perforable self sealing diaphragm member covering said perforated member and in face contact therewith, a rigid capping member extending over said self sealing diaphragm and holding the diaphragm firmly on said container forming a seal for said opening, said diaphragm confined wholly within opposite surfaces of the rigid members, said cap member having a small hole

6

therethrough directly over the diaphragm and otherwise contacting the diaphragm substantially over its whole surface, whereby said self sealing diaphragm may be punctured through said hole for providing the pressure within said container and for preventing the escape of said pressure by the self sealing of said diaphragm after the puncturing element has been withdrawn.

3. A method of filling, with a liquid, a previously sealed container having a seal providing a self-sealing element, which consists in puncturing said seal with a hollow needle, injecting gas therein under pressure above atmosphere through said needle, stopping the flow of gas and then flowing the liquid into the container through said needle and withdrawing the needle whereby the self sealing element will seal the needle hole and prevents the escape of pressure.

4. A method of filling, with a liquid, a container having a valve providing a self-sealing element adapted to be punctured and then sealed which consists in puncturing said seal, and introducing gas through said puncture under pressure, then introducing the liquid into the container in a thin stream through said valve and permitting said valve to close again whereby the valve prevents the escape of pressure.

5. A method of filling a container adapted for pressurized dispensing having a valve providing a self sealing element adapted to be punctured and then sealed which consists in puncturing said self sealing element of the valve, and forcing gas into the container through said valve to the desired pressure, then forcing the liquid through said valve in a thin stream at a higher pressure than the gas pressure built up in the container, until the desired quantity of liquid has been introduced, and withdrawing said higher pressure whereby said valve prevents the escape of the pressure.

6. A method of filling a bottle or the like with charged liquids which consists in first capping the bottle with a seal providing a self sealing rubber-like element puncturing said seal with a hollow needle, forcing the charging gas into the bottle through the passage in the needle to a substantial pressure, then forcing the liquid through the needle at a higher pressure than the gas pressure built up in the bottle, then withdrawing the needle whereby the self sealing element will seal the bottle and retain the pressure therein.

7. A method of filling a bottle or the like with charged liquids which consists in first capping the bottle with a seal providing a self sealing rubber-like element, puncturing said seal with a hollow needle, forcing the charging gas into the bottle through the passage in the needle to a substantial pressure, then forcing the liquid through the needle at a higher pressure in a thin stream whereby drops of liquid are exposed to the gas under pressure built up in the bottle, then withdrawing the needle whereby the self sealing element will seal the bottle and retain the pressure therein.

8. A method of filling a bottle or the like with charged liquids which consists in first capping the bottle with a seal providing a self sealing rubber-like element, puncturing said seal with a hollow needle, forcing the liquid into the bottle through the passage in the needle, then forcing the charging gas through the needle to build up the gas in the liquid to a substantial pressure and then withdrawing the needle whereby the self sealing element will seal the bottle and retain the pressure therein.

9. A method of filling a bottle or the like with charged liquids which consists in first capping the bottle with a seal providing a self sealing rubber-like element, puncturing said seal with a hollow needle, forcing the charging gas into the bottle through the passage in the needle to a pressure of about 75 lbs. per square inch, then forcing the liquid through the needle at a pressure about 25 lbs. per square inch higher than the gas pressure built up in the bottle, then withdrawing the needle whereby the self seal-

7

ing element will seal the bottle and retain the pressure therein.

10. A closure for a bottle with a top lip and rim having carbonated liquids therein, comprising a cap having a metallic top with a small perforation therethrough, a rubber-like sealing disc under said metallic top in contact therewith, said metallic top having downwardly extending flanges gripping the top lip of the bottle and sealing the rubber-like sealing disc at the top rim of the bottle.

11. A closure for a bottle with a top lip and rim having carbonated liquids therein, comprising a cap having a metallic top with a small perforation therethrough, a rubber-like sealing disc under said metallic top in contact therewith, said perforation having a diameter not substantially larger than the thickness of said rubber-like sealing disc, said metallic top having downwardly extending flanges gripping the top lip of the bottle and sealing the rubber-like sealing disc at the top rim of the bottle.

12. A closure for a can having a dished top member with an outwardly projecting inverted cup-like member having a perforation in the inverted bottom of the cup-like member, a rubber-like sealing diaphragm in face contact with the inner face of the inverted bottom of the cup-like member sealing over said perforation, a mating member having a perforation aligned with the first perforation having a forced fit on the inner surface of the cup-like member and pressing said diaphragm against the inner face of said inverted bottom of the cup-like member for completing the sealing of the can.

13. A closure for a can having a dished top member with an inwardly projecting cup-like member having a perforation through the bottom of said cup, a rubber-like sealing diaphragm in face contact with the bottom of the cup covering said perforation, a cup mating member having a force fit with said cup and exerting pressure on said diaphragm to provide a seal, said mating member having a perforation aligned with the perforation in said cup.

8

14. A method of filling with a liquid, a container having a valve providing a self sealing element which consists in first forcing gas through said valve at pressure above atmospheric forcing the liquid in a thin stream through said valve and causing said valve to close again when the flow of liquid is removed, said valve acting to prevent the release of pressure from within the container.

15. A method of filling a container adapted for pressure dispensing having a valve providing a self sealing element which consists in first forcing gas into the container under pressure through said valve to a desired pressure then forcing the liquid through said valve in a thin stream at a higher pressure than the desired gas pressure established in the container until the desired quantity of liquid has been introduced and stopping the flow of liquid.

16. A method of filling a pressurized container which comprises simultaneously forcing a gas and liquid into the container through an opening formed by puncturing a self sealing rubber-like valve element until the desired quantity of gas and liquid are present in the container, then stopping the forcing of the gas and liquid into the container and permitting the valve to seal itself and prevent the escape of the pressure within.

References Cited in the file of this patent

UNITED STATES PATENTS

1,336,719	Baulig	Apr. 13, 1920
1,509,916	Waite	Sept. 30, 1924
1,967,439	Heineman	July 24, 1934
2,400,955	Samel	May 28, 1946
2,613,023	Reich	Oct. 7, 1952