(No Model.)

C. H. DAVIS.

BOTTLE STOPPER.

No. 554,389. Patented Feb. 11, 1896.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 2.

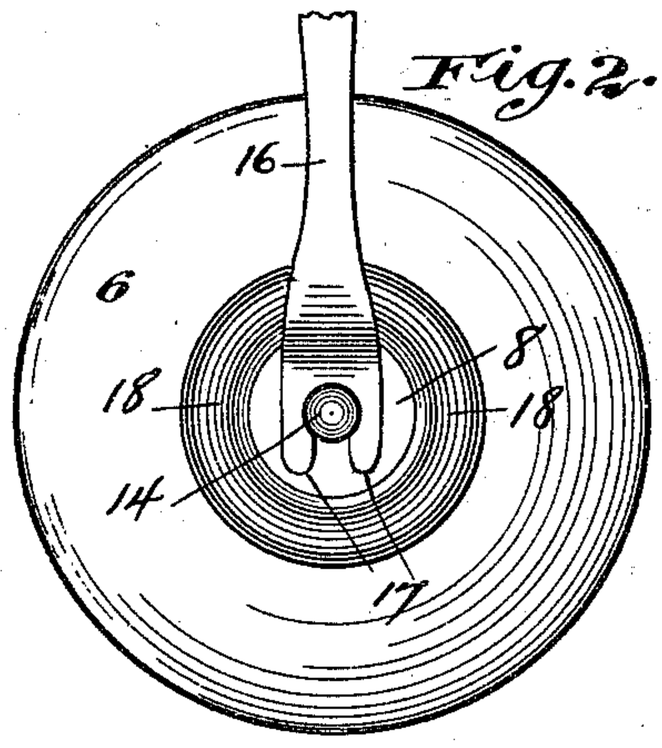
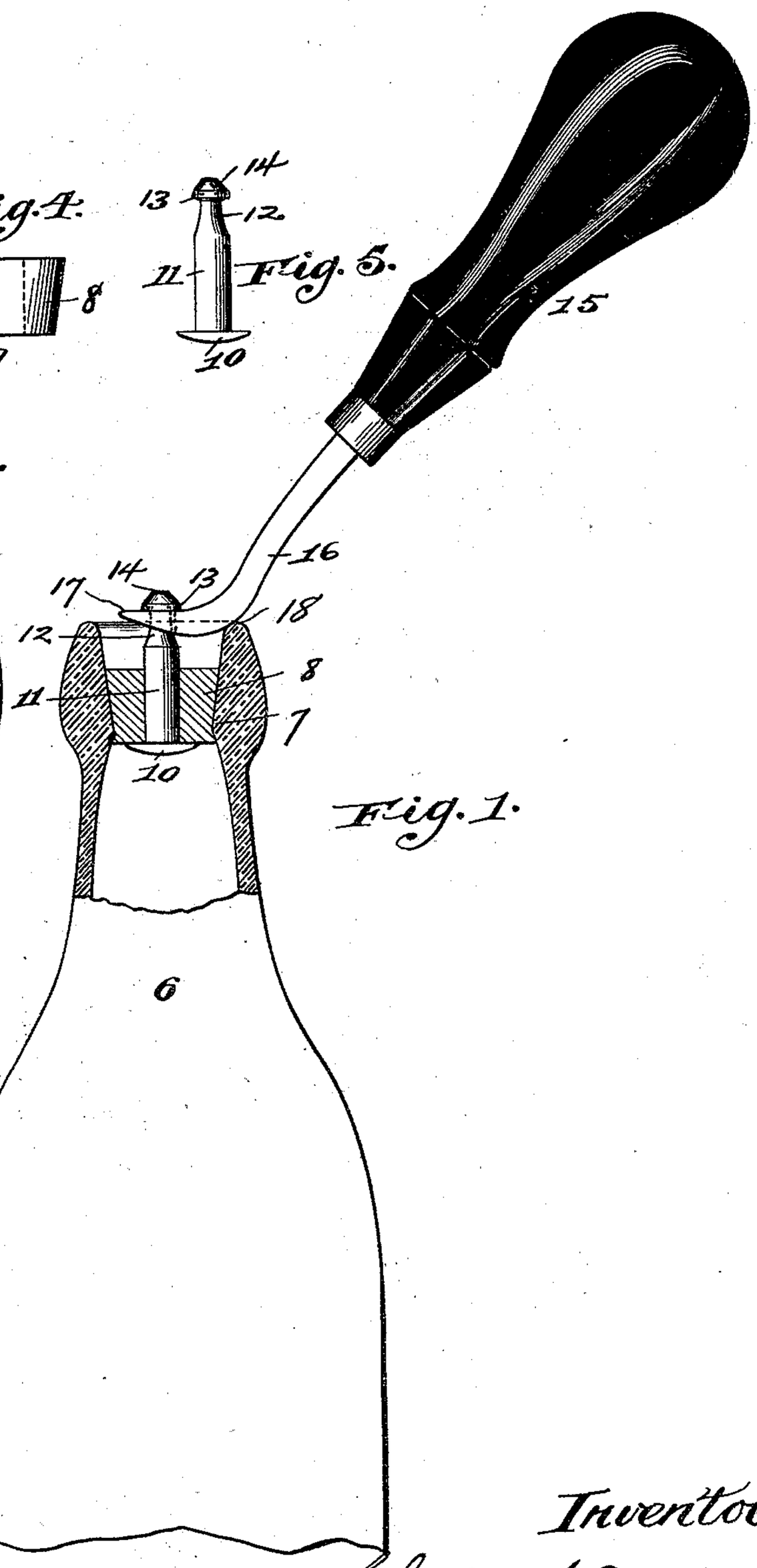


Fig. 1.



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UNITED STATES PATENT OFFICE.

CLIFTON H. DAVIS, OF CHICAGO, ILLINOIS, ASSIGNOR OF THREE-FOURTHS TO ARCHIBALD McNEILL, OF SAME PLACE, AND GUSTAV HAUSMANN AND LEON A. RENAUD, OF FORT WORTH, TEXAS.

BOTTLE-STOPPER.

SPECIFICATION forming part of Letters Patent No. 554,389, dated February 11, 1896.

Application filed October 8, 1895. Serial No. 564,988. (No model.)

To all whom it may concern:

Be it known that I, CLIFTON H. DAVIS, of Chicago, Illinois, have invented certain new and useful Improvements in Bottle-Stoppers, of which the following is a specification.

This invention relates to that class of bottle-stoppers which are employed for sealing bottles containing liquids which exert a considerable pressure, tending to force the stopper out, such as bottled beer and other beverages heavily charged with carbonic-acid gas.

It is the purpose of this invention to provide a bottle-stopper which shall not require any wire, cap or clamp for holding it and which shall by reason of its form and of the materials of which it is composed afford a tight joint or seal under all circumstances.

One object of my invention is to provide a stopper which will fit any ordinary beer-bottle and which does not require any modification or special provision in the construction of the bottle itself.

A feature of my invention consists in the peculiar construction of the lifting-pin and in its manner of application to the rubber body.

According to the common practice of bottling beer, and particularly beer which is intended for export, the bottles are filled with the liquid, highly charged with carbonic-acid gas. The stoppers are then applied, and after the sealing is effected the bottles are placed in a vat and subjected to a liquid and steam bath, the temperature of the bottles and the contained liquid being raised, usually, to 148° or over. This increase of temperature generates a considerable additional pressure within the bottle, so that a stopper which is effective to withstand the pressure due to the carbonic-acid gas is entirely insufficient to withstand the added pressure produced by this processing.

Heretofore it has been common to apply wires, clamps or other means for confining the stoppers previous to subjecting them to this heating operation. With my improved bottle-stopper nothing of the kind is required and the goods may be processed or heated without the employment of any such extraneous securing means.

My improved bottle-stopper is composed of a soft-rubber body of slightly conical form and having a central vertical opening through which a lifting-pin is inserted from the bottom upwardly, said pin having a shank and head extending above the top of the body and furnishing means whereby the stopper may be extracted by the employment of a suitable implement. The body of the stopper is moistened before being inserted, and this moistening may be effected by simply dipping the stopper in water, when it may be readily driven into the bottle-neck.

The material employed in making the stopper is what is known commercially as "pure soft rubber." Such rubber is not, of course, really pure, nor need it be for the purposes of this invention. The term is used to designate rubber which has a high degree of compressibility and which is practically homogeneous, in contradistinction to a body composed of rubber and textile fabric in layers. These bottle-necks have an interior enlargement below the mouth of the opening, and which is called the "choke." The stopper is driven down in application until its lower end passes to and preferably beyond this enlargement or choke. When in position the top of the stopper is considerably below the mouth of the bottle-neck and the upper end of the lifting-pin projects into the plane or slightly above the plane of the opening. When the bottles are placed in the liquid bath with the stoppers inserted therein in the moist condition, the heat of the bath will rapidly raise the temperature of the bottle-neck, and this will operate to completely dry the surface of the stopper in contact with the neck of the bottle. When the stopper is thus dried its frictional power is very greatly increased, so that it is adequate to sustain the additional pressure generated within the bottle by the raising of the temperature of the liquid contents.

The stopper under all circumstances, and even when moistened to facilitate its insertion in the bottle-neck, offers sufficient frictional resistance to withstand the ordinary pressure of the liquid contents, but when it is thoroughly dried by the treatment in the

bath its holding power is very greatly increased, so that it is adequate to withstand the additional pressure.

The moistening of a stopper of the specified material and form, before insertion in the neck of the bottle, produces an action or effect which is believed to be wholly new, and which for the purposes of this invention is of great importance. The stopper, as already stated, is made of pure, or substantially pure, rubber—that is to say, of a highly elastic material. When inserted into the neck of the bottle with its surfaces dry, it is found that it cannot be driven, with the maximum permissible force, far enough into the bottle-neck to hold its place against the internal pressure. The reason for this is that the dry surface of the stopper clings tightly to the neck of the bottle, while the elasticity of the rubber permits it to yield to the force of the blow applied to drive it in, the only effect of increasing the force of the blow being to stretch the rubber still further. Moisture, however, acts as a lubricant, so that with very slight force the stopper can be driven in until its top is considerably below the mouth of the bottle.

When moistened the described stopper can, with moderate pressure, be inserted into the neck of a bottle more than a quarter of an inch farther than is possible, with maximum force, when the stopper and bottle-neck are dry. When so applied, no internal pressure which the bottle itself can stand will expel the stopper. It will be observed that to produce this result the stopper should be of pure homogeneous rubber, since rubber compounds, made of waste and impure rubber, both lack the necessary elasticity and also usually have incorporated in them fibrous material which absorbs and retains moisture. Furthermore, the stopper should have a considerable area of contact with the bottle-neck, being in the form of a plug rather than a disk, as now commonly used with bottles having a special lodgment or groove in the neck. The height or length of axis of the body or plug should not, however, be greater and preferably is slightly less than its shortest diameter, since any increase of height beyond this diameter renders the removal of the stopper more difficult, the motion in removal being practically one of rotation, or in the arc of a circle.

In the accompanying drawings, Figure 1 is an elevation, partly in vertical section, showing the stopper applied to a bottle and the uncorking implement in position. Fig. 2 is a partial plan view of the same. Fig. 3 is a side elevation of the stopper. Fig. 4 is a side elevation of the body of the stopper with the pin removed, and Fig. 5 shows the pin.

In the drawings, 6 represents an ordinary beer-bottle, the neck of which is shown in section in Fig. 1, and the perimeter of said neck having what is technically called a "choke"—that is, an enlargement or swell 7 in the inner surface of the neck below the mouth of the opening, and the bore of the neck being inclined each way from said choke. The neck, therefore, presents in cross-section two cone frustums with their smaller ends joined.

The stopper has its body portion composed of soft rubber, and is marked 8. In form it is slightly conical and its height is slightly greater than its shortest diameter. It is provided with a central opening, (shown at 9, Fig. 4,) and through this central opening a lifting-pin is thrust. Said lifting-pin is shown in Fig. 5.

The lifting-pin is preferably made from a steel wire or rod of uniform diameter, one end of the rod being upset, as at 10, to provide a retaining-disk to prevent the withdrawal of the pin through the opening in the body. The body of the pin 11 is greater in length than the rubber body 8, and in its upper end a peripheral groove 12 is turned to provide a shoulder 13 and head 14. The circumference of this shoulder is the same as the body 11, and therefore the pin may be inserted upwardly through the aperture in the rubber body. Said head furnishes means whereby the stopper can be withdrawn by the application of an implement, such as shown in Figs. 1 and 2 of the drawings, said instrument having a suitable handle, as at 15, and a shank 16, terminating in claws 17, with an aperture between the claws adapted to embrace the reduced portion or neck beneath the shoulder 13. The heel of the claw is somewhat thickened and is of such shape as to engage the upper edge of the bottle-neck, which is slightly rounded, as shown at 18, and furnishes a rolling fulcrum over which the leverage is exerted to remove the stopper.

By reference to Fig. 1 it will be seen that the body of the stopper is forced down until its lower end passes the enlargement or choke 7, and it is shown as expanded outwardly, thus pressing against the inclined surfaces of the bottle-neck below the choke. For ordinary use and except when it is designed to withstand very great pressure it will not be necessary to force the stopper below the choke or narrowest portion of the bottle-neck. By making the body slightly tapering or inclined its sides adhere closely and tightly to the similarly-shaped surfaces of the bottle-neck, therefore furnishing an extended bearing-surface and being much more efficient than a stopper having a cylindrical body. In fact, it has been demonstrated by experiment that if the stopper shown be applied in an inverted position and the large end be forced past the choke it will not hold so effectively as when applied in the proper position, as indicated in the drawings. The resistance of the internal pressure tending to dislodge the stopper is due of course to the friction of the sides of the stopper of the soft-rubber body upon the interior surfaces of the neck, and as friction is in proportion to the area of the surfaces in contact rather than in proportion to the ex-

pansive force or elasticity of the material the shape of the stopper becomes highly important, and a stopper of the form shown in the drawings has the necessary frictional surface to withstand the expelling pressure of the confined liquid.

It will be observed that when the stopper is in position the withdrawing-stem is protected by the bottle-neck and projects so slightly that it does not render the bottles inconvenient to pack or handle, nor sufficiently to make the stopper liable to be accidentally withdrawn.

It will be understood that the body being composed of pure soft rubber is very highly elastic, but its elastic qualities are not at all impaired by the passage of the lifting-pin through the aperture in its center. The pin is simply forced into position and the rubber body is simply seated upon it, but is not affixed thereto in any manner, nor is the rubber body confined or compressed between any rigid disks or metal substances, nor is any non-elastic or less elastic material incorporated therewith, as in the bottle-stoppers now in common use.

While pure rubber is an expensive material compared with cork or with a compound stopper having a fabric incorporated therewith, still pure rubber is practically indestructible for this use, and as the stopper requires no extraneous fastening devices and is adapted to all ordinary bottles and adequate to maintain a perfect seal under all circumstances my improved stopper is more economical in use than any other with which I am acquainted.

While I prefer to construct my improved stopper in the forms herein shown and described, still slight variations may be made therefrom.

I claim—

1. A bottle-stopper having a body composed of substantially pure soft rubber of slightly conical form tapering downwardly with a central aperture and a lifting-pin passing through such aperture and having a disk or enlargement on its lower end to prevent its separation upwardly and having its extremity projected above the upper surface of the stopper and provided with a head whereby it may be withdrawn, substantially as described.

2. A bottle-stopper having a body portion composed of substantially pure homogeneous soft rubber of tapering form, its height being slightly less than its shortest diameter, combined with a lifting-pin passing through a central aperture in said stopper and provided with an enlargement at its lower end and with a head at its upper end, substantially as described.

3. The combination with a bottle having in its neck a contracted portion or choke, of a stopper therefor, said stopper comprising a substantially pure soft-rubber body having a central opening and a lifting-pin passing through said opening and having a disk to prevent its withdrawal therefrom and a head to facilitate the removal of the stopper and the body of the stopper being less in height than the distance from the mouth of the bottle-neck to the contracted portion whereby the stopper may be inserted so that its lower end shall pass below the contracted portion while the pin projects into the plane of the mouth in a position convenient for withdrawal, substantially as described.

4. A bottle-stopper comprising a substantially pure soft-rubber body and having a central vertical aperture, and a lifting-pin of greater length than said aperture and adapted to be inserted therethrough from the bottom upwardly, said pin having a disk or enlargement upon its lower end and a groove in its extended portion whereby to provide a head having a peripheral bearing flange or shoulder of a diameter not exceeding that of the body of the pin, substantially as described.

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