PUBLISHED
APRIL 27, 1943.
BY A. P. C.

A. QUENTIN
SYSTEMS AND DEVICES FOR TEMPERING HOLLOW GLASS ARTICLES
Filed Jan. 19, 1940

Serial No.
314,727
5 Sheets-Sheet 1


Fig. 1

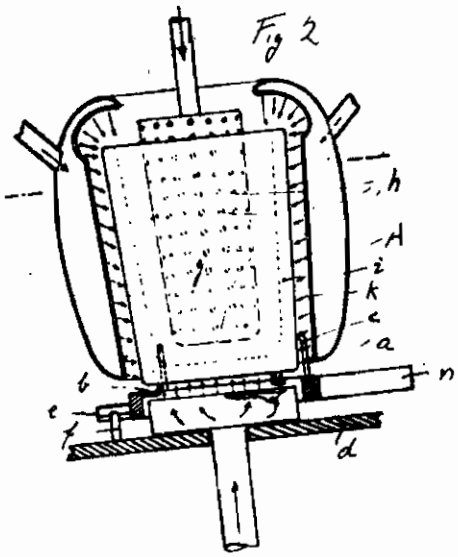

Fig. 2

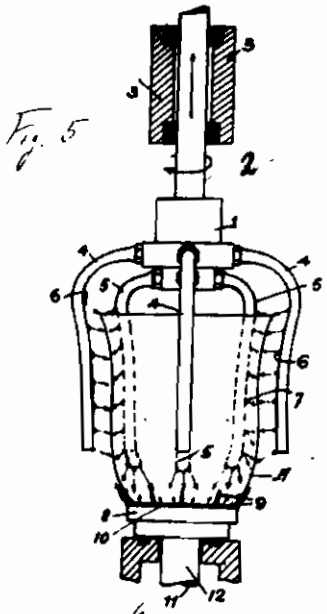

Fig. 5

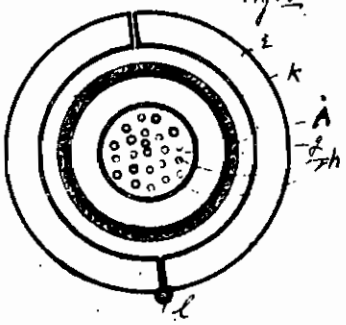

Fig. 3

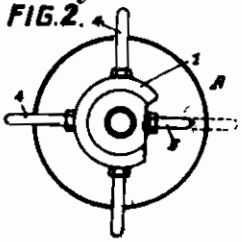

FIG. 2.

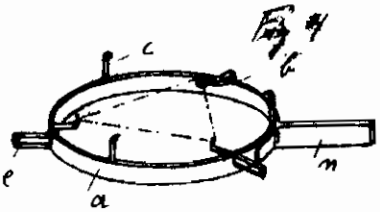

Fig. 4

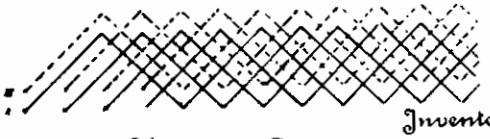
FIG. 4.

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Fig. 8

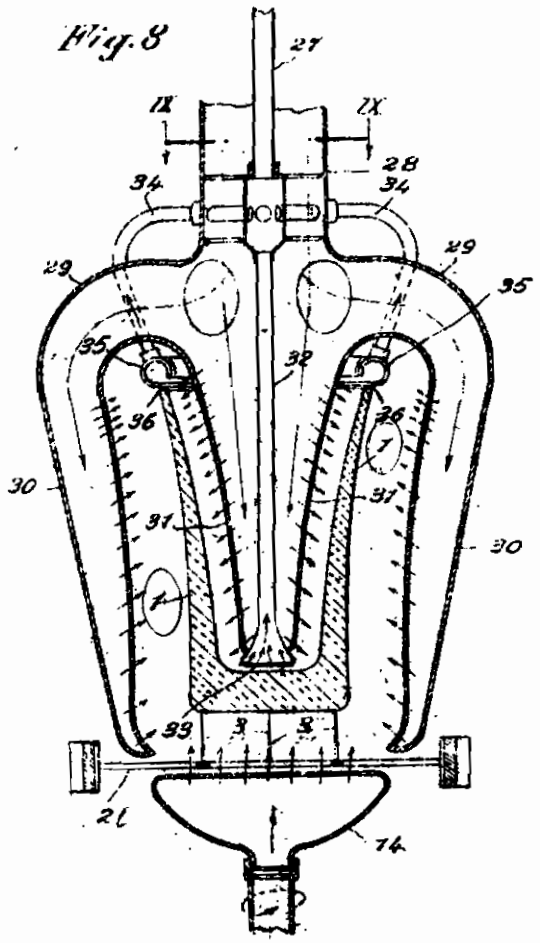

Fig. 9

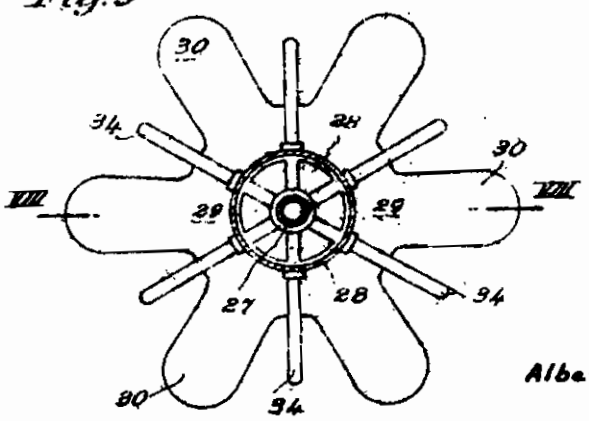

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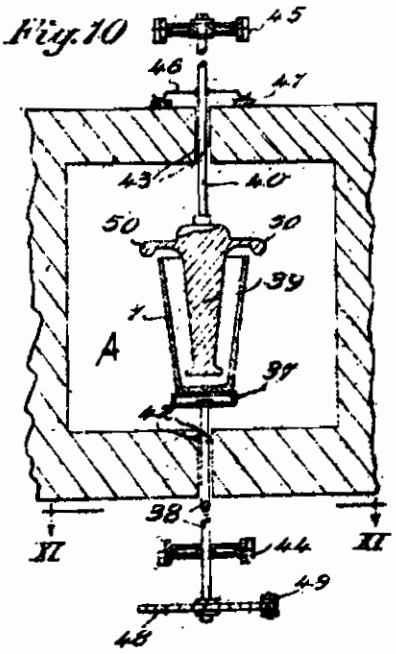
Fig. 10



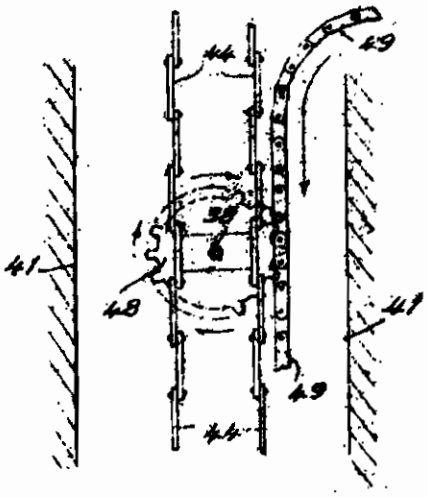


Fig. 11

Fig. 18

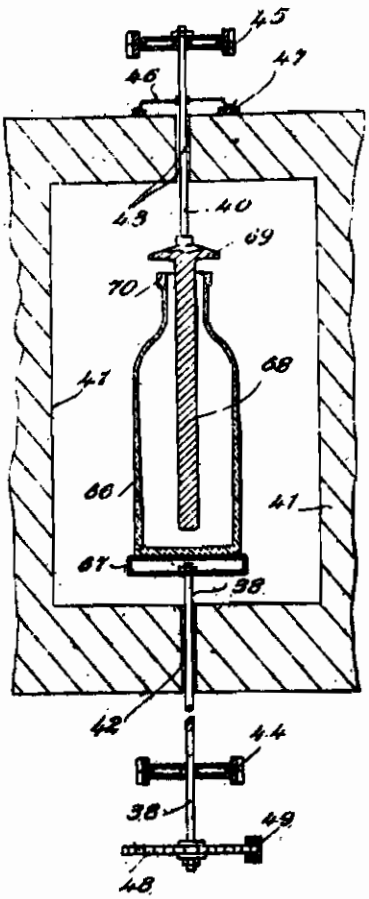


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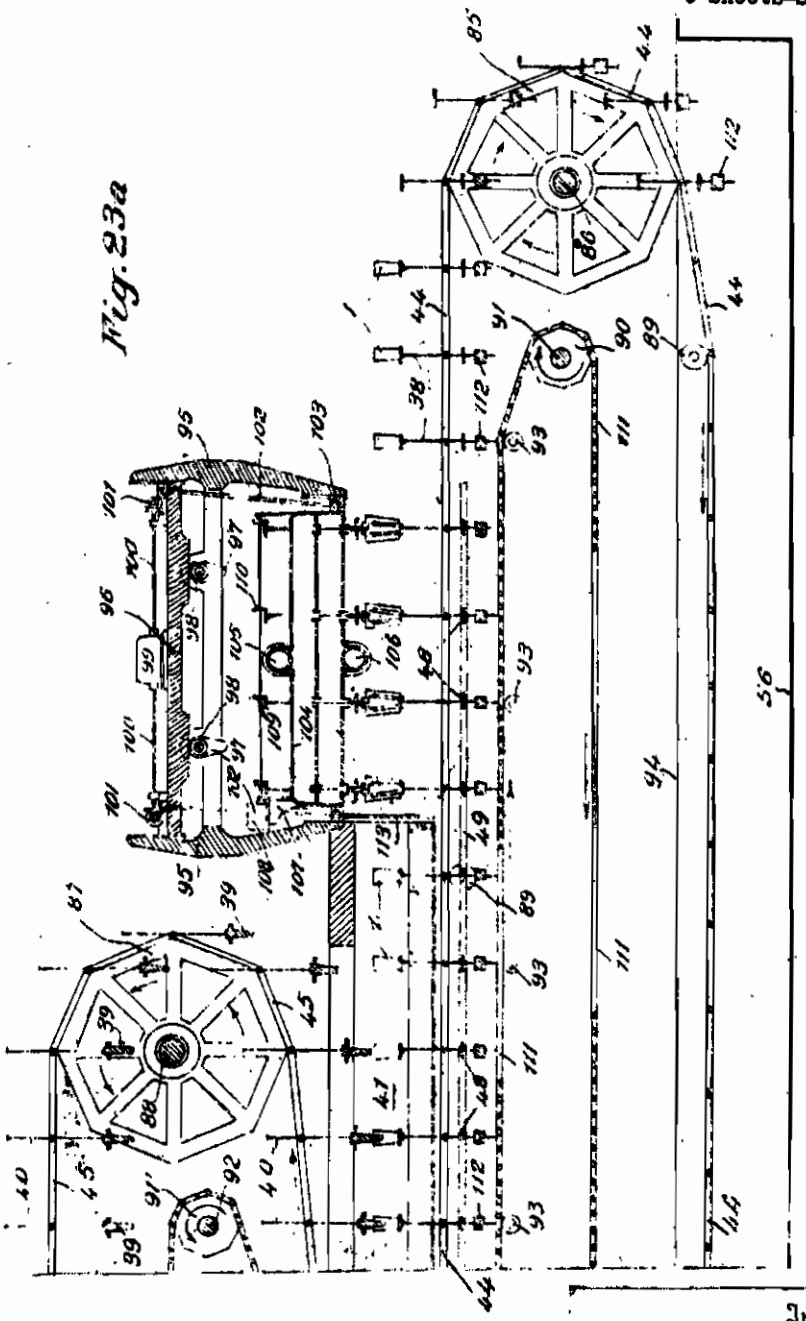
Fig. 23a



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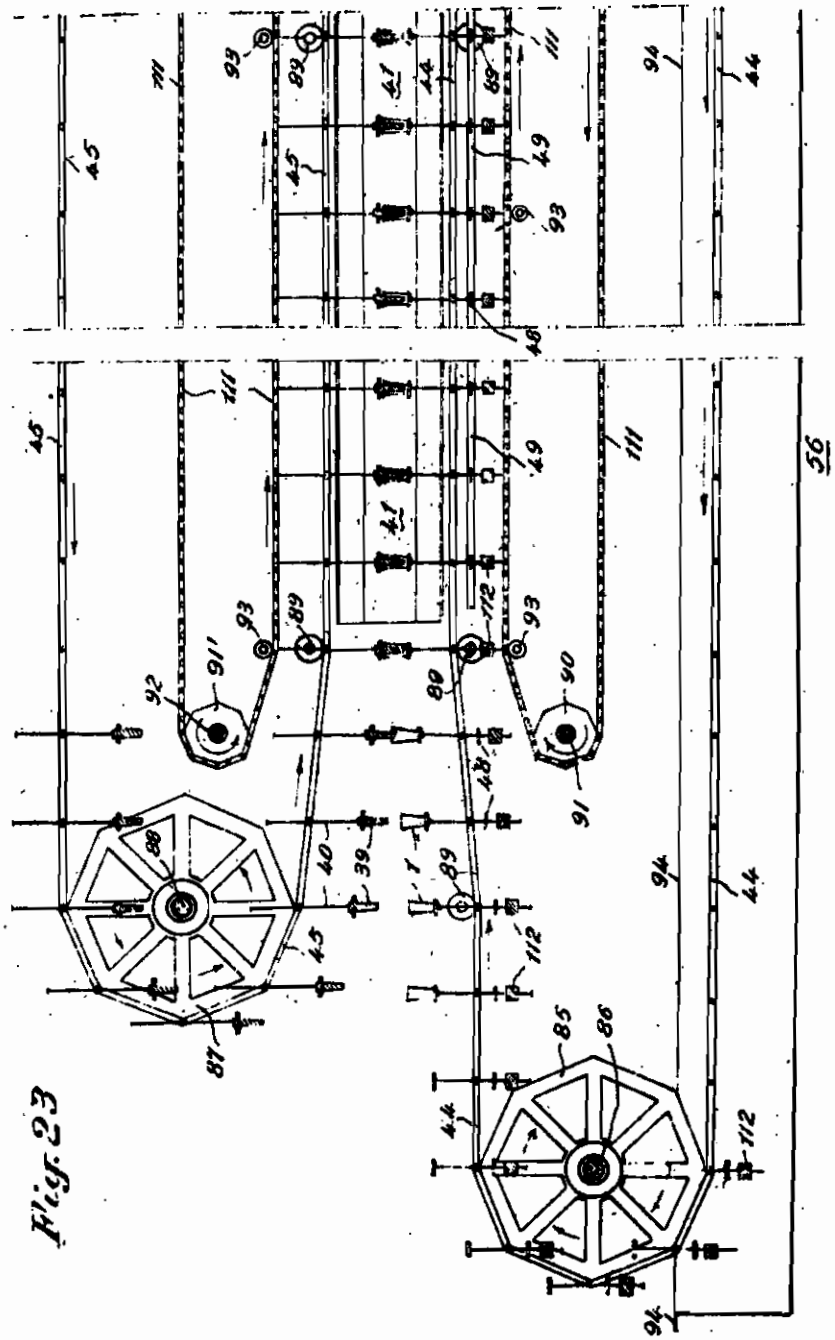

Fig. 23

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Published Apr. 27, 1943

Serial No. 314,727

ALIEN PROPERTY CUSTODIAN

SYSTEMS AND DEVICES FOR TEMPERING HOLLOW GLASS ARTICLES

Alberto Quentin, Milan, Italy; vested in the Alien Property Custodian

Application filed January 19, 1940

This invention refers to improvements in the tempering of hollow glass articles, with a sudden cooling of said articles by blowing jets of air or other fluid against the surfaces of same.

The invention generally refers to all kind glass of articles for any use, for inst. drink glasses, bottles, vases, tubes, globes, and other recipients, as bombs, having walls of any thickness and of variable thickness.

Particularly the invention refers to articles having relatively thin walls.

The above said kinds of glass articles have been tempered up to day, preferably by immersing them, immediately after they have been extracted from the forms and when they have still a high temperature, in an oil or melted salt bath. This tempering system diminishes the brilliancy of the glass. Further, articles having relatively thin walls may not be tempered with this system. If the walls of the articles are not uniformly thick, then the tempering by immersion is not uniform and this prejudices the elasticity and the resistance of the tempered article.

All these drawbacks become eliminated by the improvements in the tempering system and devices according to this invention.

A first feature of the invention consisting in the fact that the article to be tempered becomes previously slowly heated in a manner to bring all its parts to a temperature adapted for a good tempering. In a particular manner, an article having walls of variable thickness will be heated proportional to its different thicknesses so that a perfect uniformity of temperature of all parts of the object is obtained.

According to another feature of the invention, articles having particularly relatively thin walls, become tempered very rapidly, for inst. within 5–10 seconds, with high pressure jets of air or other fluid, for inst. 7–8 atm. issued by nozzles placed at a little distance, 3–5 mm, form the walls of the article.

According to another feature of the invention the inner faces of an object become tempered in a different manner than the outer faces of same. Precisely the inner faces, for inst., of a drink glass, become tempered more rapidly than the outer faces of same, so that the so-called "core", which is formed between the suddenly cooled outer layers of the walls, will be displaced towards the interior of the object. An object which is tempered in this manner will be more resistant at the outer faces, against which the shocks are more frequent, than at the inner faces.

Since in order to obtain a good tempering effect the object must be heated to a temperature which is near the mollifying point of the glass, it is provided, according to another feature of this invention, to keep still the object during tempering, so that it may not become deformed and it is further provided, according to this invention to move the blowing elements so as to obtain the rapid and uniform distribution of the jets over the whole internal and external surface of the object being tempered.

It is, however, possible to keep still also the blowing elements and in this case the latter are distributed over the whole inner and outer surfaces of the object to be tempered.

In some cases where the shape of the object does not allow the blowing elements of being thus distributed as to follow perfectly said shape, for inst. in the case of bottles, the inner blowing elements only may be moved, and may blow with a pressure different from that of the outer blowing elements, in order to compensate the greater distance of the nozzles, and their less number, with respect of the outer elements.

These and other features particularly that referring to the devices for carrying out the invention, will be better understood from the following description of some examples of these devices, which are shown in the annexed drawings:

Fig. 1 is a longitudinal middle section of a drink glass, in which the different layers created by the tempering process are shown, in which the inner layer, or so-called "core", is displaced towards the interior of the glass.

Fig. 2 shows a first type of a tempering device according to this invention, in which both the inner and outer blowing elements are stationary; and whereby the outer element is of the type like an openable form;

Fig. 3 is the plant view of same;

Fig. 4 shows a supporting ring for the object during tempering;

Fig. 5 shows a second type of tempering device, according to this invention, in which both the inner and outer blowing elements become moved, either with a simple rotating movement, or with a combined rotating and alternated axial movement;

Fig. 6 is the corresponding plant view;

Fig. 7 shows the path described by each jet blown by the elements according to Fig. 5;

Fig. 8 shows still another tempering device according to this invention;

Fig. 9 is the corresponding plant view;

Figs. 10 and 11 show a type of a heating chamber with a heating element for a drink glass;

Fig. 12 shows a similar heating chamber with a heating element for a bottle;

Figs. 13 and 13*a* show, schematically, a complete machine for heating and tempering continuously;

Fig. 1 is intended to show, how the inner layer or so-called "core" which becomes formed the outer layers of the glass wall which have been suddenly cooled, is displaced towards the interior of the object. This displacement of the core has been obtained by a more rapid tempering of the inner faces of the object, with respect of its outer faces, with the purpose of rendering the outer faces more resisting than the inner faces.

Figures 2 and 3 show a first type of tempering device, for tempering a drink glass.

The glass A is supported by a supporting ring *a*, having radial projections *b* and is held by vertical projections *c* of said ring. The ring *a* is collocated on a fixed plan *d* of the device, by means of externally extending projections *e* and pins *f* provided on said fixed plan, which serve to keep centrated the supporting ring *a* with respect of the blowing elements.

The inner blowing element is consisting of a cylindrical element *g* provided with holes *h*; the outer blowing element *i* has form of an open cylinder, which surrounds the object to be tempered, and which is provided with holes *k*. It is consisting of two parts which are hinged together at *l* so that it may be easily opened and closed.

A third blowing element *m* is arranged on the fixed table *d*, beneath the supporting ring *a*.

As will be clearly seen from the figures, the form and the arrangement of the three blowing elements is such as to blow jets of air, or other fluid, against the whole inner and outer surface of the object to be tempered and as the holes, through which the jets are blown, may be arranged sufficiently close to one another, practically the whole surface of the object will be invested by the air.

The various blowing elements may be connected all with the same compressed air source or ventilator, in order that the pressure of the jets is the same, or they may be controlled so as to blow air or fiuld under different or variable pressure, if different thicknesses are to be tempered, or if, owing to the shape of the object the distance of some points of the object from the blowing holes is different, or if for the above specified reason, or for any other reason, one or two blowers should blow with a different pressure and/or for a different period of time with respect of the other or the others.

The supporting ring *a* bears a further projection *n* which may serve to hold and transport it from the heating chamber to the tempering device, which transport may effected either by hand or mechanically, for inst. in a machine for continuous heating and tempering.

These different tempering can also be obtained by varying the number of the blowing holes or by varying their diameter.

The radial projections *b* which serve to support the object to be tempered, may be connected together by metallic wires, and a net of wires may be foreseen so as to leave decorative or inscriptive incisions in the bottom of the object.

The tempering device according to Fig. 4 is essentially consisting of a hollow shaft **2**, mounted in special supports **3**, allowing it to rotate and to move axially. The shaft **2** bears a body **1**, from which are departing arms **4** and **5**, some of which extend in the interior and the other at the exterior of the object to be tempered. Said arms are provided with blowing holes **6** and **7** along their sides towards the faces of the object A and they are shaped so as to follow the shape of the object A. The glass A is supported on a supporting ring **8**, the surface of which is consisting of a net of thin wires and which presents perimetral upward projections **9** to hold the glass A. A hollow disc **12** is provided with holes **10** and is communicating with shaft **11**.

Shafts **2** and **11** are connected to the compressed air source or to the ventilator.

By means of adapted driving and transmission means, the shaft **2** is rotated and alternately axially moved, so that the jets issued by holes **6** and **7** describe paths, as shown by Fig. 7.

Figs. 9 and 9 show still another tempering device according to this invention.

27 is a sucking tube placed in the interior of the blowing element **28**. The latter presents a distributing body **29**, from which elements **30** are extending downwardly, which are provided with blowing holes directed against the outer faces of the object to be tempered, and an element **31**, which is provided with holes directed against the inner faces of the object.

As will be seen from Fig. 8, the blowing holes are more close to one another at the upper part of the object **1**, where this has thinner walls, than at the under part where it has thicker walls and where, therefore, a less efficacious tempering is required.

The bottom of the object **1** becomes tempered by jets blown through holes of element **14**.

The glass A is supported by needles **21** placed on a fixed frame of the device.

The tube **32** is connected to tube **27**, and with its head **33** sucks the air issued by the internal blowing holes.

In order to obtain an efficacious tempering especially on the border **36** of the glass, a sucking ring **35** is placed near it, which is also connected to tube **27**, through pipes **34**.

Figures 10, 11 illustrate a type of heating device, according to this invention.

The glass A is hold by a support **37** mounted on shaft **38**. In the interior of the glass, the heating element **39** is arranged which is preferably of the type heated by an electric resistance and which is hold by shaft **40**. **41** are the walls of the heating chamber, made of refractory material, which presents slits **42** and **43**, through and along which the shafts **38** and **40** may be moved with a synchron movement. This movement is transmitted to said shafts by means of chains **44** and **45**, with which the shafts **38** and **40** are engaged respectively.

Shaft **40** bears two contact springs **46** slding, during the movement, upon contact guides **47** through which the current is led to the heating element **39**.

Shaft **38** bears a toothed wheel **48** engages with chain **49** so as to impart the shaft **38** a slow rotating movement in order to assure uniform heating of the glass A.

The heating element **39** presents an upper annular expansion **50** surrounding the upper border of the glass A. This expansion can also be executed to extend downward so as to surround the whole outer face of glass A.

Fig. 12 shows a heating chamber with a heating element **68** adapted for heating a bottle. The bottle **66** is supported by support **67** which receives a transporting movement from chain **44**

and a slow rotating movement from wheel **48**, as described.

The heating element has an annular expansion **89** which serves to heat the top **70** of the bottle, which is normally thicker than the other walls.

Figures 13, 13*a* show an example of a complete machine for heating and tempering continuously.

The chain **44** which serves to transport the objects to be tempered, is mounted on poligonal wheels **85**, which are rotated about their axis **86**. The length of each sector of wheels **85** corresponds to the length of each element of chain **44**. At the pivot points of the chain elements there are fixed the shafts **38** supporting the objects to be tempered.

A chain **45** running on wheels **87**, mounted on axis **88** bears and transports likewise the heating elements **39**. Chain **44** is guided by rollers **89**. Similar guiding rollers **89** are provided for chain **45**. The elements of both chains **44** and **45** have the same length.

Chains **111** arranged inside the chains **44** and **45** and serve to maintain the exact vertical position of the shafts bearing the objects to be tempered and the heating elements respectively. Said chains **111** are running over poligonal wheels **90** mounted on axis **91**, respectively **91'** and **92**. Of course, chains **44**, **45** and **111** must be moved with synchronism so as to assure exact position of the objects to be tempered with respect of the heating elements. The shafts supporting the objects are provided with counterweights **112** serving to assure the vertical position of said shafts, the ends of which are engaged with chain **111**.

It is clear that with such an arrangement, a continuous heating may be obtained by transporting the objects through a heating chamber as already described. **94** indicates the pavement of the room where the machine is placed.

The device for tempering continuously is illustrated in the right part **23***a* of the figure. On the frame **95**, preferably made of refractory material, is slidable mounted a plan **98** to which an alternating movement is imparted by means of excenters **97**, mounted on axis **98**, the actuating mechanism of which is not shown. On plan **98** an electric motor **99** is placed, which through shafts **100** and gears **101** actuates a rod **102**, terminating on a guide element **103**, on which a box **104** is mounted.

The highness of the movement imparted to plane **98** by excenters **97** is such as to raise the blowing elements completely above the objects to be tempered.

If for inst. the tempering device allows four objects be tempered simultaneously, then the wheels **85** must moved so as to bring this number of shafts **38** at a time beneath the tempering device.

The movement imparted to box **104**, by rods **102** has the purpose of uniforming the tempering effect. Box **104** is divided into two parts; the upper part is connect to pipe **105**, for inst. for sucking, and the under part is connected to pipe **108** feeding the compressed air or fluid to be blown. The blowing and sucking elements are connected to the respective parts of the box so as to allow rotation of the elements. This rotating movement is given by motor **106**, mounted on a support **107**, through a shaft **109** and gears **110**.

The left side of frame **95** terminates close to the extremity of the heating chamber. This extremity is closed by a door **113** connected to the box **104**.

The manner of working of this machine is clear and needs not particularly to be described.

After having tempered by blowing air or fluid the object can also be thrown in a liquid bath to complete the tempering.

In particular cases, as for inst. in case of bombs, it may be provided to temper the bomb only along predetermined lines or zones, in order to obtain determined lines or zones of resistance and other zones or lines of fracture, which effects may easily be obtained by controlling accordingly the blowing or sucking elements.

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