July 3, 1934. H. V. KOJOLA 1,965,126

PROCESS AND APPARATUS FOR FILLING GAS CONTAINERS

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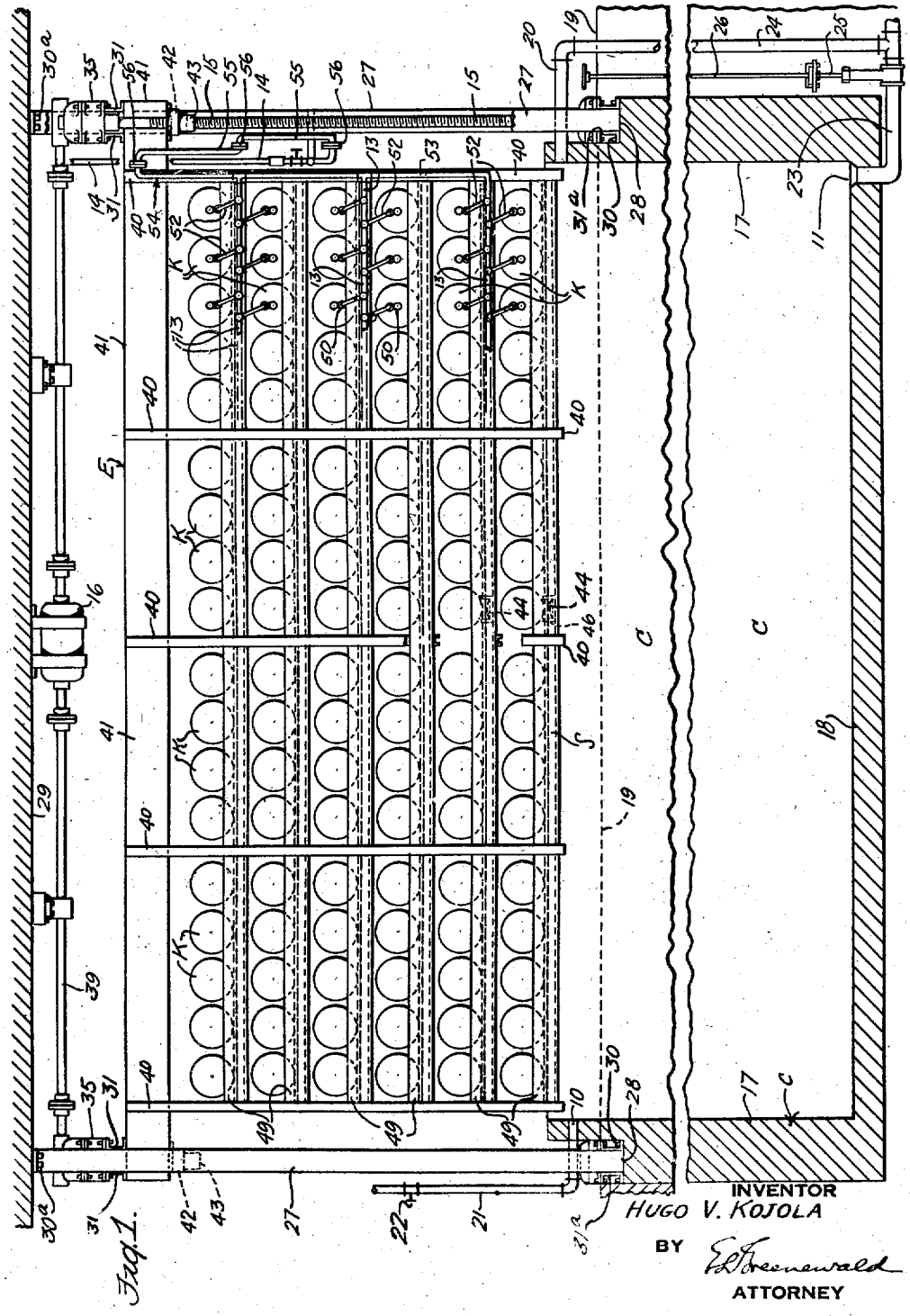


Fig. 1.

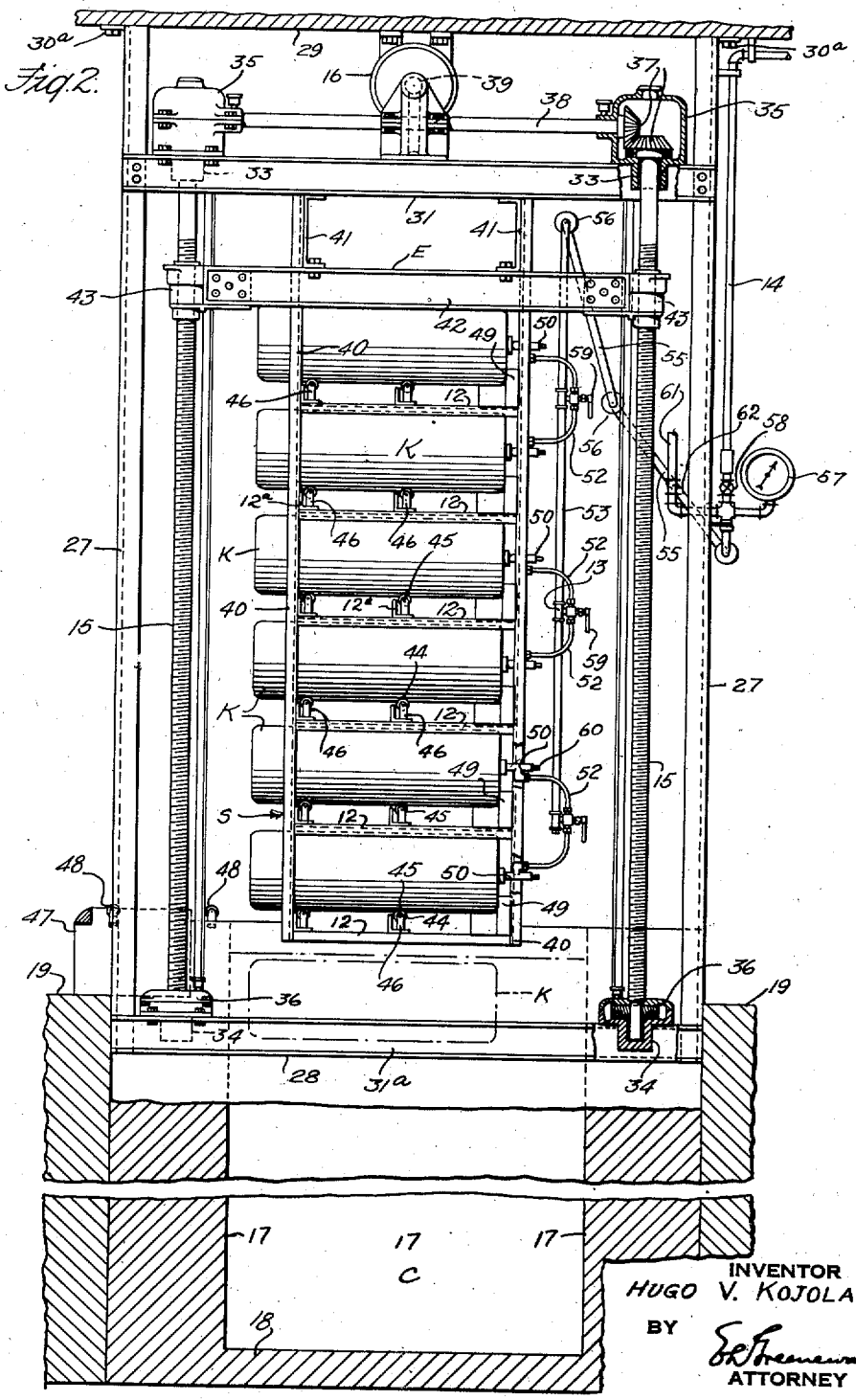
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Fig. 2.



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PROCESS AND APPARATUS FOR FILLING GAS CONTAINERS

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13 Claims. (Cl. 226—20)

This invention relates to a process of charging containers with gases; particularly to the charging of portable containers with unstable or combustible gases, such as acetylene, and to an apparatus or mechanism for use in carrying out the process.

Certain gases such, for example, as acetylene cannot be stored at high pressures because they are unstable or explosive. These gases are accordingly stored in cylinders containing porous material as asbestos or charcoal, this porous material being held in place by cement or other suitable binder. The porous material contains an absorbent substance such as a solvent for the gas. A typical example is acetone which is employed as a solvent in connection with the storage of acetylene. In charging the storage containers it has heretofore been the practice to place them on storage racks and connect them to a gas supply through a suitable manifold. The gas is then introduced under pressure into the containers. During the charging operation it has been found necessary to spray the containers with water or other cooling medium in order to prevent the containers and the gas therein from becoming overheated.

One of the disadvantages of this method is that it requires a great amount of floor space and consumes a considerable amount of time. Also cooling the containers by spraying does not completely eliminate the fire hazard incident to the process. This hazard is principally due to high temperatures resulting from heat evolved in the absorption of the gas in the absorbing medium within the containers as well as from the heat due to the compression of the gas.

It is, therefore, an important object of this invention, to provide an improved process and improved apparatus for carrying out the process whereby containers may be filled with an unstable and inflammable gas with a material reduction in fire hazard, with a saving in floor space required in carrying out the process, and with a saving in time over processes heretofore known. Certain of these advantages are also present when the apparatus is used in connection with other kinds of gases.

In accordance with this invention, the process may consist in arranging a plurality of containers, preferably filled with an absorbent or solvent medium, such as indicated above, in superposed tiers so that they may be introduced into a cooling medium progressively as they are being connected to charging manifolds which, are connected through suitable conduits with a source of gas under pressure. In this way it is possible to maintain an uninterrupted flow of gas into the containers while these are being moved into and out of a cooling medium. After the containers of the last tier have been thus connected to a manifold and moved into the cooling medium, the containers are all allowed to remain in the cooling medium while the filling thereof is being completed and until the filled containers have all been cooled below the point at which there is danger of their contents becoming inflamed or exploded. The containers are then moved out of the cooling medium in reverse order from their introduction thereinto, disconnected from the manifold, and stored or transported to a place of use.

Suitable mechanism whereby the process may be effectively carried out may comprise a chamber, as a vat or other enclosure, which is suitably maintained at a low temperature by circulating a cooling medium, as water, therethrough and into which the containers mounted upon a suitable rack may be introduced by suitable means. The racks may be of a character to support a plurality of containers in superposed tiers and may be provided with manifold means adapted to be connected with containers supported thereon and flexibly connected to a source of gas supply so that the connection need not be broken in moving the racks and containers into and out of the enclosure.

The above and other objects and novel features of the invention will become more apparent from the following specifications taken in connection with the accompanying drawings, in which,

Fig. 1 is a view in side elevation of mechanism illustrating one embodiment of my invention comprising an apparatus for lowering gas containers into a vat and raising them therefrom; the vat being shown in longitudinal section; and

Fig. 2 is a view in end elevation of the elevating mechanism; the vat being shown in cross section.

The mechanism illustrated in the above figures comprises, in its principal features, a cooling chamber C, which may be in the nature of a tank or vat through which a suitable cooling medium may be circulated between inlet and outlet ports 10 and 11, and a support S for the containers, which support may be in the nature of a rack having a plurality of superposed shelves 12 for the support of the containers. Associated with the rack and vat, there is provided suitable means for flexibly connecting the containers with a source of gas supply so that in moving the

containers into the cooling chamber their connection with the source of gas supply may remain unbroken. This connection may be in the nature of a plurality of manifolds 13 connectable with the containers and flexibly connected to a conduit 14 leading from the source of gas supply (not shown). The racks are conveniently carried by suitable movable means, as an elevator E which may be raised and lowered in any convenient manner as by rotation of a plurality of screw shafts or columns 15 driven by power means, as an electric motor 16.

The cooling chamber or vat C may be of any suitable character into which the rack may be conveniently moved and, as shown, consists of a receptacle having walls 17 and a bottom 18 of concrete or other suitable material and adapted to be sunk into the ground or otherwise supported so that its upper edges will project a short distance above the level of the floor 19. The vat should be positioned at such a level, that proper drainage will be insured and a suitable overflow drain 20 should be provided near, but slightly below, its upper edge. A suitable conduit 21 leads the cooling fluid to the inlet 10 and is under control of a valve 22. The outlet 11 is connected with a drain pipe 23 with which the overflow also suitably connects, as through a pipe 24. Flow of fluid through the drain pipe may be under control of a valve 25 operable from the floor level through a rod 26.

The vat may serve as a foundation for certain supporting structure for the elevator E and this supporting structure may comprise pairs of upright structural members 27 at opposite ends of the vat which rest upon a ledge 28 at the upper edge thereof. The members 27 may be connected near the top and bottom ends thereof by cross members 31 and 31*a* in the nature of angle irons and may be suitably secured to the ceiling 29 by bolts 30*a*. The cross members 31*a* also serve to connect the uprights to the vat. To this end, the cross members 31*a* are preferably two in number so arranged as to embrace the lower ends of the uprights 27 and rest on the ledge 28 to which they are secured by bolts 30.

The cross members 31, 31*a* serve as supports for elevating means for the rack S which may be, as indicated above, in the nature of upright screw columns 15, preferably four in number, which are mounted at their upper and lower ends in bearings 33 and 34. The bearings may be of an antifriction variety, as shown, and are preferably mounted in protective housings 35 and 36. The upper housings 35 also serve to house miter gears 37 forming the drive connection between suitable shafts 38 and the screw columns 15. Shafts 38 are driven by the electric motor 16, referred to above, through shafts 39 which are in driving connection with shafts 38 through worm drives 39*a* at the ends of shaft 39.

The rack S may comprise, as stated above, a plurality of spaced horizontal shelves 12 which are supported by members 40 depending from overhead members 41, which are preferably structural members such as angle beams, and which are, in turn, supported on suitable beams 42. These beams have at their ends heads 43 provided with threaded bores which engage the screw columns 15. By this arrangement it is apparent that the rack may be lowered into, and raised out of the vat by proper control of the power by which the screw columns are driven.

The shelves are of any convenient number, preferably, however, of an even number for a purpose which will presently appear, and these shelves are provided with a plurality of sets of antifriction means, as dollies 44. The dollies of each set are arranged in pairs at spaced intervals transversely of the shelves and supported thereon by angle irons 12*a* extending lengthwise of the shelves and constituting a part thereof. The dollies are preferably of frusto-conical shape, the smaller bases of each pair of which lie in opposition to each other to provide a trough-like support for the container supported thereon, thereby preventing them from being dislodged laterally therefrom. The dollies are rotatably mounted on pins 45 supported by brackets 46 secured to the shelves. The containers K are preferably loaded onto the dollies from the left or rear side of the shelves as viewed in Fig. 2 and, to facilitate the placing of the containers in position, a stationary rack 47 is provided a little above floor level. This rack has sets of dollies 48 thereon, which are also arranged in spaced pairs. The sets of dollies on the stationary rack correspond in number and lie in opposition to the sets of dollies on the shelves when the shelves are brought to the level of the stationary rack. The shelves are preferably provided on the right side of the rack with stop members 49 in the nature of vertical flanges, against which the ends of the containers may abut when loaded onto the rack. The flanges serve to limit the extent to which the containers may be moved transversely of the shelves and to position the inlets 50 of all of the containers on the rack in a single vertical plane.

When the containers are so positioned on the shelves of the rack, they may be connected through their inlets 50 with the manifolds 13. There is preferably one manifold to every two shelves and the manifold is disposed between two tiers of containers, so that the manifold may be connected to the containers of both tiers by suitable leads 52, which may be of flexible metallic tubing. The manifolds are all connected at one end with a common vertically extending pipe 53 which is connected with the pipe 14, leading from the source of gas supply, by suitable means whereby, during the movement of the rack into and out of the cooling chamber the connection between the containers and the source of gas supply need not be broken. I have found the flexible connection shown at 54 to be satisfactory for this purpose.

The flexible connection 54 may be of any suitable character and, as shown, comprises a plurality of links 55 in the nature of lengths of tubing hinged together and to the pipes 14 and 53 by suitable couplings 56 so as to have rotary movement relative to each other, while maintaining an uninterrupted passage between the pipe 14 and the vertical pipe 53. There may be any convenient number of these links and preferably there are at least two, as shown, in order that there may be provided sufficient flexibility and length to permit the rack to travel the entire length of its path without strain on the connection and without too great a length of each link.

There may be provided, in the conduits leading from the source of gas supply to the containers, suitable gauge means 57 for measuring the pressure of the gas in the cylinders K and, when the desired pressure has been reached, a valve 58 in the supply pipe 14 and valves 59 controlling flow of gas through the leads 52 may be closed. The valves 60 of the cylinders or containers K, may be closed, whereupon, the containers may be dis-

connected from the leads and removed from the rack. These operations may be performed as the rack is raised from the vat and of course after the cylinders have been cooled below the danger point. A blow back line 61 may be included in the supply conduit, as shown, which leads back to the low pressure side of the source of gas supply. After valve 58 in supply line 14 and valves 59 controlling flow of gas through leads 52 are closed, valve 62 in blow back line may be opened to drain the gas under pressure in manifolds 13, pipe 53, and flexible connection 54, to the low pressure part of the source of gas supply. This is done in order that there will be no sudden rush of gas from the manifold into the next lot of empty cylinders that may be placed on the rack, on opening valves 59. Valve 62 is kept closed during charging.

In operation, the containers are loaded onto the shelves from the left as each shelf of the rack is lowered to the level of the stationary rack in the manner as indicated above. Before passing below the stationary rack, the containers on a shelf are connected to the associated manifold and gas is allowed to flow into the containers. The containers on each succeeding shelf are in this manner connected to their respective manifold, and, the last tier of tanks having thus been connected to its manifold, the rack is completely submerged in the liquid of the vat and kept therein until cooled to the desired temperature, after which, the rack may be raised, the containers disconnected from the manifolds and removed from the rack.

It should be clearly understood that any other suitable cooling medium besides water may be used and that, in place of a vat, any suitable cooling enclosure may be provided into which the rack may be moved either horizontally or vertically. However, a vat, into which the rack is lowered, is to be preferred on account of the economy in floor space and because the cooling medium does not have to be withdrawn when the rack is removed as would be the case if the rack were removed from a side or end. Water serves as a suitable cooling medium on account of its universal availability and inexpensiveness and because of its fluidity at usual temperatures.

While I have disclosed my method and apparatus in conjunction with the charging of the cylinders containing combustible or explosive gases, it is to be noted that I may use this invention in conjunction with the filling of containers with gases which are not combustible but which require cooling after they are filled. While I have shown the containers as cylinders the apparatus is not limited. Moreover, the apparatus is useful even in installations in which cooling is not required since it permits of the placing of the containers on a rack without excessive lifting.

I claim:

1. The process of charging containers with fluid which comprises attaching containers to a branched source of supply, establishing communication between said containers and the source of supply; concomitantly moving said containers into a cooling medium and attaching additional containers to said branched source of supply; maintaining the containers within the cooling medium until the fluid within the containers has reached the desired temperature; removing said containers from the cooling medium and concomitantly closing said containers and disconnecting them from the source of supply.

2. Method of charging containers with fluid which comprises placing a tier of containers on a rack; connecting said containers to a source of supply; lowering said containers into a cooling medium while permitting the fluid to flow into the containers; loading another tier of containers onto said rack and continuing the operation until all the containers have been connected or the rack is full; maintaining the containers in the cooling medium until the desired temperature has been reached; removing the rack from the cooling medium and closing and disconnecting the containers.

3. The process of filling containers with gas which comprises, flexibly attaching the containers placed in superposed relation to each other to a source of gas supply; and moving the containers into a cooling medium while permitting the gas to flow into the containers; cooling the containers to prevent them from becoming overheated; and disconnecting the containers from the source of gas supply.

4. The process of filling containers with gas which comprises, flexibly connecting a plurality of containers in superposed relation to each other with a source of gas supply, moving the containers into a chamber; circulating cooling fluid through the chamber while allowing gas to flow into the containers; cooling the containers to a temperature below that of explosion or dissociation of the gas; removing the containers from the chamber; and disconnecting them from the source of gas supply.

5. The process of filling containers with unstable or inflammable gas which consists in mounting the containers in superposed tiers; connecting the containers to a source of gas supply so that the connection need not be broken in moving the containers from one locality to another; moving the containers so connected into a cooling chamber and cooling them below the temperature of dissociation of the gas with which they are being filled; removing the containers from the cooling chamber; and disconnecting them from the source of gas supply.

6. The process of filling containers with unstable or inflammable gas which consists in connecting a plurality of superposed containers with a source of gas supply so that in moving the containers into a cooling vat the connection may remain unbroken; moving the containers so connected into a liquid containing vat and circulating liquid at low temperature through the vat so as to maintain the containers submerged while being filled with gas; and removing the containers from the vat after being completely filled; closing the inlets thereto and disconnecting the containers from the source of gas supply.

7. Mechanism of the class described for use in filling containers with combustible gas under pressure comprising in combination, a cooling chamber; a rack; means for moving the rack into the cooling chamber; means for connecting the containers to a source of gas supply; and means for maintaining the connection unbroken while permitting movement of the rack.

8. Mechanism of the class described for use in filling containers with a combustible gas comprising, in combination, a rack made up of a plurality of superposed shelves adapted to support gas containers; a cooling chamber; means for moving the rack into and out of the cooling chamber; and means for flexibly connecting containers on the rack with a source of gas supply.

9. A machine of the class described for filling containers with a combustible gas which com-

prises, in combination, a rack for supporting a plurality of containers in superposed relation to each other; a cooling chamber; means for moving the rack into the cooling chamber; means for circulating cooling fluid through the chamber; and flexible means for connecting the containers with a source of gas supply.

10. A machine for use in filling containers with gas comprising a rack for supporting the containers and a cooling chamber; the rack being movable into and out of the cooling chamber; and means for connecting the containers supported by the rack with a source of gas supply and for maintaining the connection during the movement of the rack into and out of the cooling chamber; and antifriction means on the rack to facilitate loading of the containers thereupon.

11. Apparatus for use in filling containers with fluid comprising a vertically movable rack for supporting the containers; said rack being provided with horizontal shelves; a branched connection having means adapted for engagement with said containers when they are in place on the shelves; loading means for use in placing the containers on a shelf when the rack is in a given position; and means for moving said rack vertically whereby different shelves are brought into position opposite said loading means.

12. Apparatus for use in filling containers with fluid comprising in combination a cooling chamber; a support for the containers movable into and out of said cooling chamber; and means constructed and arranged to maintain unbroken connection between the containers and a source of fluid supply during the movement of the support into and out of the cooling chamber.

13. Apparatus for use in filling containers with fluid comprising in combination a rack having a plurality of superposed shelves for supporting the containers; a cooling chamber; said rack being movable into and out of said chamber; means for connecting the containers with a source of fluid supply so constructed and arranged as to maintain the connection unbroken during such movement of the rack.

HUGO V. KOJOLA.

CERTIFICATE OF CORRECTION.

Patent No. 1,965,126. **July 3, 1934.**

HUGO V. KOJOLA.

It is hereby certified that the name of the assignee in the above numbered patent was erroneously written and printed as "The Presto-O-Lite Company, Inc." whereas said name should have been written and printed as The Prest-O-Lite Company, Inc., as shown by the records of assignments in this office; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 7th day of August, A. D. 1934.

Leslie Frazer

(Seal) Acting Commissioner of Patents.

prises, in combination, a rack for supporting a plurality of containers in superposed relation to each other; a cooling chamber; means for moving the rack into the cooling chamber; means for circulating cooling fluid through the chamber; and flexible means for connecting the containers with a source of gas supply.

10. A machine for use in filling containers with gas comprising a rack for supporting the containers and a cooling chamber; the rack being movable into and out of the cooling chamber; and means for connecting the containers supported by the rack with a source of gas supply and for maintaining the connection during the movement of the rack into and out of the cooling chamber; and antifriction means on the rack to facilitate loading of the containers thereupon.

11. Apparatus for use in filling containers with fluid comprising a vertically movable rack for supporting the containers; said rack being provided with horizontal shelves; a branched connection having means adapted for engagement with said containers when they are in place on the shelves; loading means for use in placing the containers on a shelf when the rack is in a given position; and means for moving said rack vertically whereby different shelves are brought into position opposite said loading means.

12. Apparatus for use in filling containers with fluid comprising in combination a cooling chamber; a support for the containers movable into and out of said cooling chamber; and means constructed and arranged to maintain unbroken connection between the containers and a source of fluid supply during the movement of the support into and out of the cooling chamber.

13. Apparatus for use in filling containers with fluid comprising in combination a rack having a plurality of superposed shelves for supporting the containers; a cooling chamber; said rack being movable into and out of said chamber; means for connecting the containers with a source of fluid supply so constructed and arranged as to maintain the connection unbroken during such movement of the rack.

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