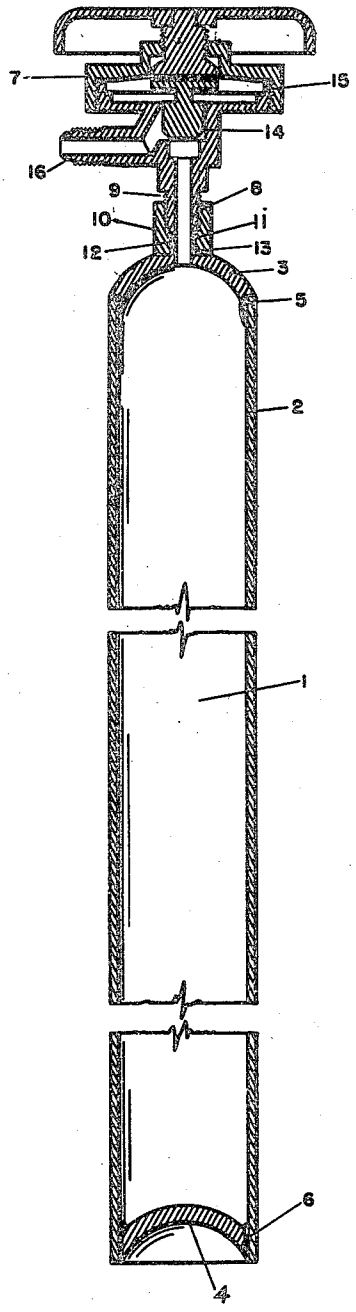
April 29, 1947. H. F. PRIEST ET AL 2,419,915

APPARATUS FOR THE STORAGE OF FLUORINE

Filed Jan. 22, 1943



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Patented Apr. 29, 1947

2,419,915

UNITED STATES PATENT OFFICE

2,419,915

APPARATUS FOR THE STORAGE OF FLUORINE

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Application January 22, 1943, Serial No. 473,249

3 Claims. (Cl. 220—64)

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This invention relates to the improvements in apparatus for the storage of elementary fluorine and more specifically to a tank for the storage of fluorine under pressure.

The usual practice has been to set up an electrolysis cell at the place where it has been desired to produce and utilize the fluorine. The installation and operation of such an apparatus involves considerable expense, takes up a rather large amount of space, and the handling thereof is difficult due to the extremely reactive and poisonous nature of fluorine.

One object of our present invention is to provide a receptacle which upon introduction of fluorine forms a protective coating which is unreactive with fluorine, so that fluorine can be safely handled and stored under pressure. Another object is to provide a container which can be easily transported from place to place and used at different places whenever desired. Other objects will be apparent to those skilled in the art.

The extreme activity of the fluorine gas, its ability to react on the elements to form fluorine compounds, and particularly its ability to decompose almost all compounds, have prevented the development of a suitable means for the storage thereof. The present invention has overcome such difficulty in providing an apparatus in which it may be indefinitely stored without reaction of the fluorine with the material of which the apparatus is composed.

It is essential to the invention not only that the tank be made of copper, nickel, or a copper-nickel alloy with a copper content above 60 percent, or some other compound equally effective to form protective coatings preventing decomposition and destruction of the container and the wasting of the fluorine, but that all sealing compounds be made of similar materials.

The single figure drawing is a semi-diagrammatic view, in sectional elevation, of the fluorine storage receptacle in its simplest form.

Referring to the drawing, there is shown a cylindrical tank 1 which has wall 2, with bottom 4 and head 3 both hermetically sealed, welded, or otherwise tightly secured, over the ends of the cylinder, as indicated at 5 and 6. The tank, as well as all parts and seals as above stated, must be made of a material which forms the protective coating and prevents further reaction of fluorine with the containing surface of the tank.

The threads 8 of seat 9 are threaded into neck 10 which is soldered or welded to head 3. To insure proper sealing of the valve, the end 11 of seat 9 compresses copper gasket 12 which rests against collar 13 of head 3. Seat 9 may be soldered to neck 10 to be sure of a proper seal. The plunger 14, diaphragm 15 and nozzle 16, as well as all other parts of the valve must be made of copper, nickel, an alloy of copper with copper content in excess of 60 percent, or some other material which is not appreciably corroded or decomposed by the fluorine. The nozzle 16 is fitted to connect to any source where fluorine is being prepared.

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Flourine gas is admitted to the evacuated copper cylinder through nozzle 16 of valve 7 from any source of supply, either directly or through a buffer system. If a buffer system is used, it may be set up so that the fluorine generator is connected to a copper dry ice trap and a liquid nitrogen trap where the gas is condensed in the presence of helium to prevent condensation of air in the liquid nitrogen. In such case, the liquid fluorine is evaporated in the copper cylinder from the copper trap which would be connected to the nozzle.

After the fluorine is transferred to the evacuated copper cylinder 1, there may be a slight decrease in the initial pressure of the fluorine due to reaction with the copper walls of the cylinder. However, after a short time, there is no further decrease indicating that a protective coating of copper fluoride has formed on the subjacent interior surface of the copper tank which is immune to further action of fluorine and prevents any further reaction of the fluorine with the walls of the tank.

Pressures on copper cylinders up to 200 lbs. per square inch have been used. Nickel tanks have likewise proved equally effective for equivalent pressures. Storage at greater pressures has been achieved by reenforcing the copper or nickel cylinders in steel casings. Steel cylinders lined with copper or nickel can also be used for storage under high pressure.

Whereas a nickel diaphragm valve has been mentioned, it is not intended to limit the invention to that particular type of valve, but any copper, nickel, or copper alloy valve suitable for the purpose may be used. Any workable system of passing the fluorine to the tank or cylinder for storage under pressure may be employed.

These cylinders have proven particularly convenient and advantageous to ready use as a source of fluorine in the fluorinating of hydrocarbons and the preparation of fluorides of uranium. It will be understood that variations may

be made in the apparatus described without departing from the scope of the present invention; for example, the tank or receptacle may have any number of varied forms or shapes, may be different sizes, the walls may be of any suitable thickness, or the tank may be made in sections with various types of control valves or traps, so the invention is not to be limited to any particular arrangement or design, but only to the following claims.

We claim:

1. A fluorine gas storage vessel including a storage space defined by a metal of the group consisting of nickel, copper and an alloy of nickel and copper containing in excess of 60 per cent copper, and a continuous adherent coating on the inner surface of said metal composed of a stable fluoride of said metal, said metal fluoride coating being impenetrable and non-reactive to fluorine gas.

2. A fluorine gas storage vessel including a storage space defined by a continuous surface composed of nickel, and a continuous adherent coating on said inner nickel surface composed of a stable fluoride of said nickel, said nickel fluoride coating being impenetrable and non-reactive to fluorine gas.

3. A fluorine gas storage vessel including a storage space defined by a continuous surface

composed of copper, and a continuous adherent coating on said inner copper surface composed of a stable fluoride of said copper, said copper fluoride coating being impenetrable and non-reactive to fluorine gas.

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