No. 897,923. PATENTED SEPT. 8, 1908.

J. ORTIZ.

PROCESS OF PRESERVING EXPLOSIVES.

APPLICATION FILED JULY 31, 1907.

2 SHEETS—SHEET 1.

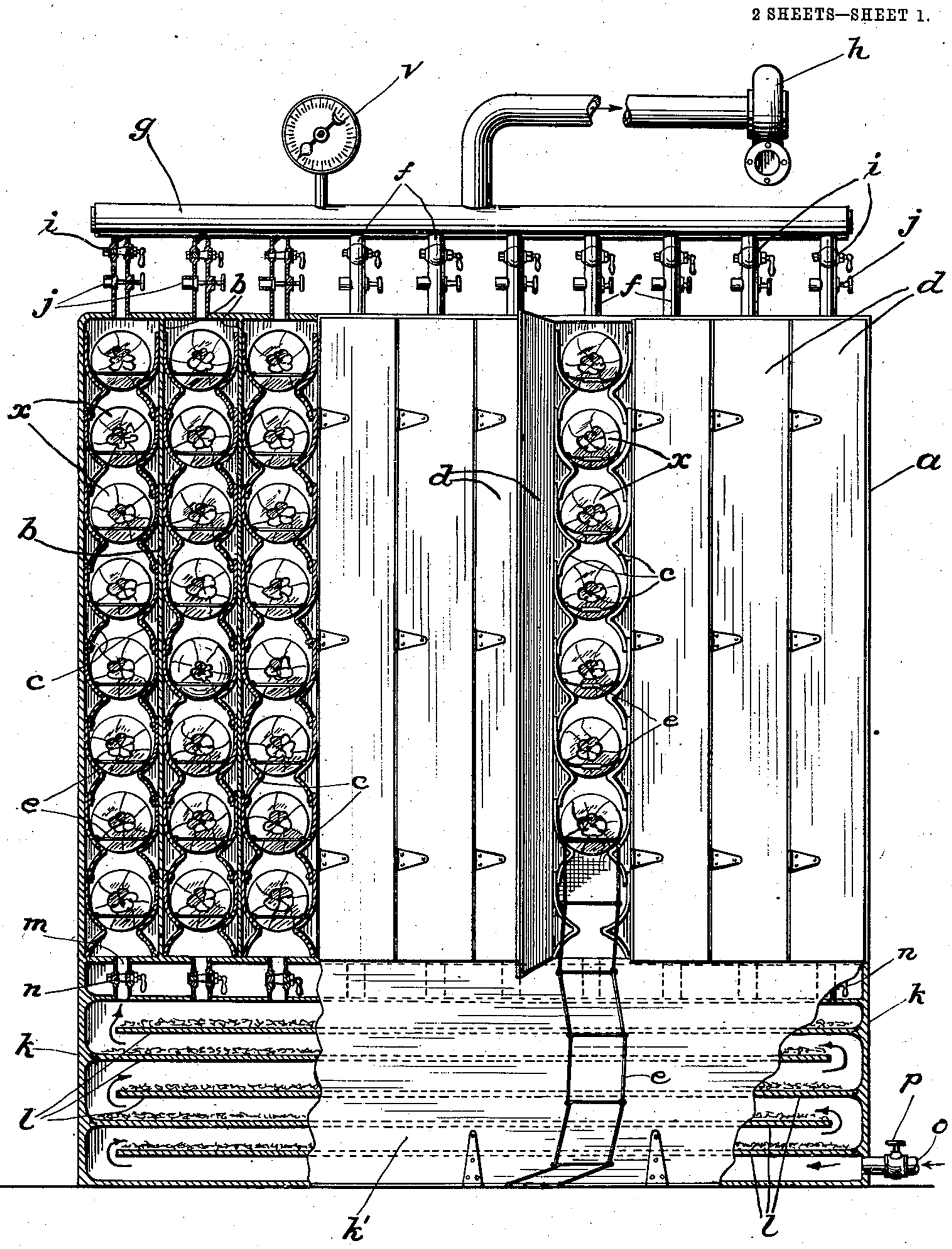

FIG. 1.

WITNESSES:
Robt R Ritchel
M. M. Hamilton

INVENTOR
Julien Ortiz
BY
Harding & Harding
ATTORNEYS.

No. 897,923. PATENTED SEPT. 8, 1908.

J. ORTIZ.

PROCESS OF PRESERVING EXPLOSIVES.

APPLICATION FILED JULY 31, 1907.

2 SHEETS—SHEET 2.

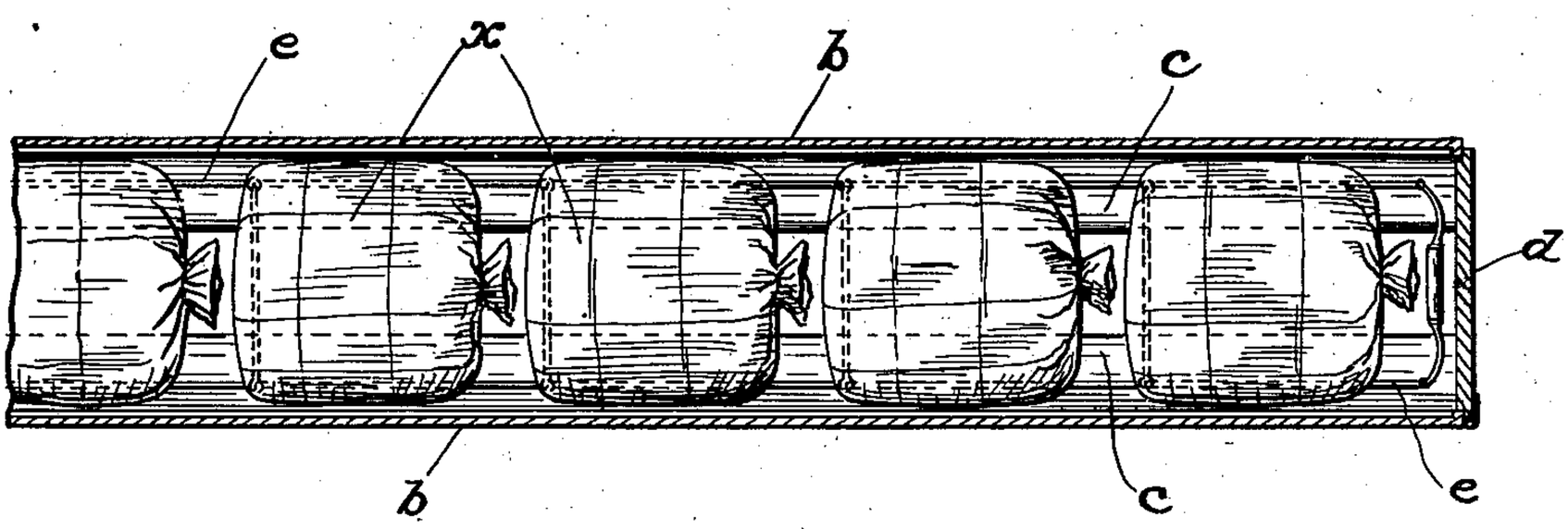

FIG. 2.

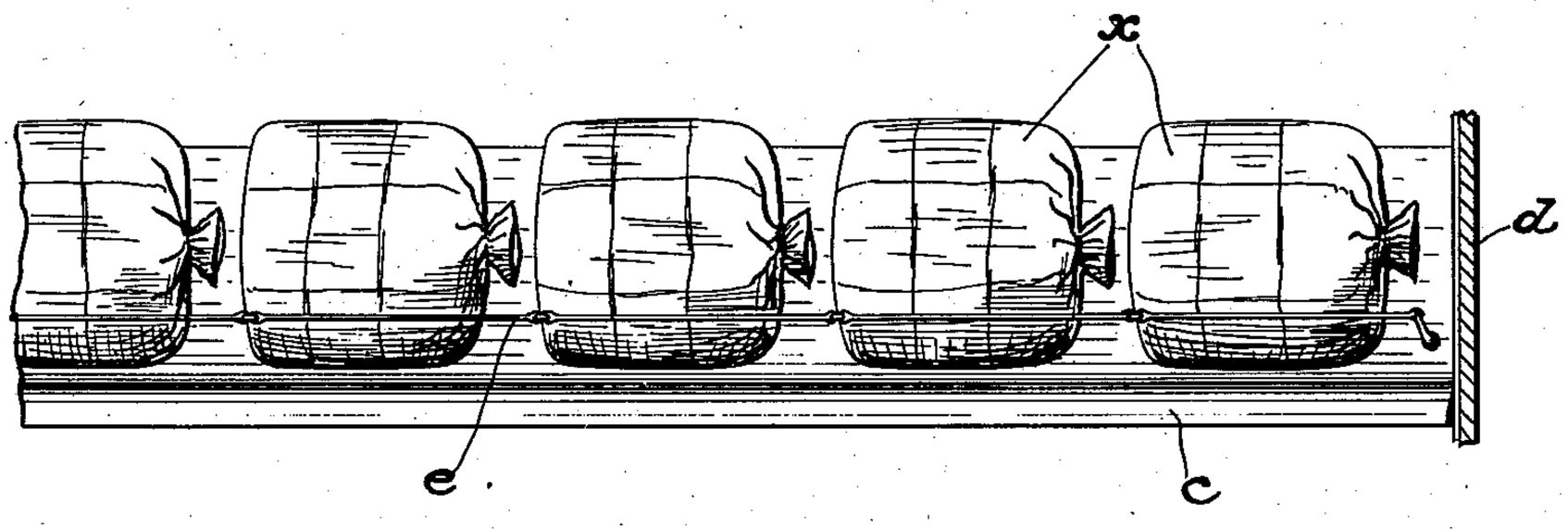

FIG. 3.

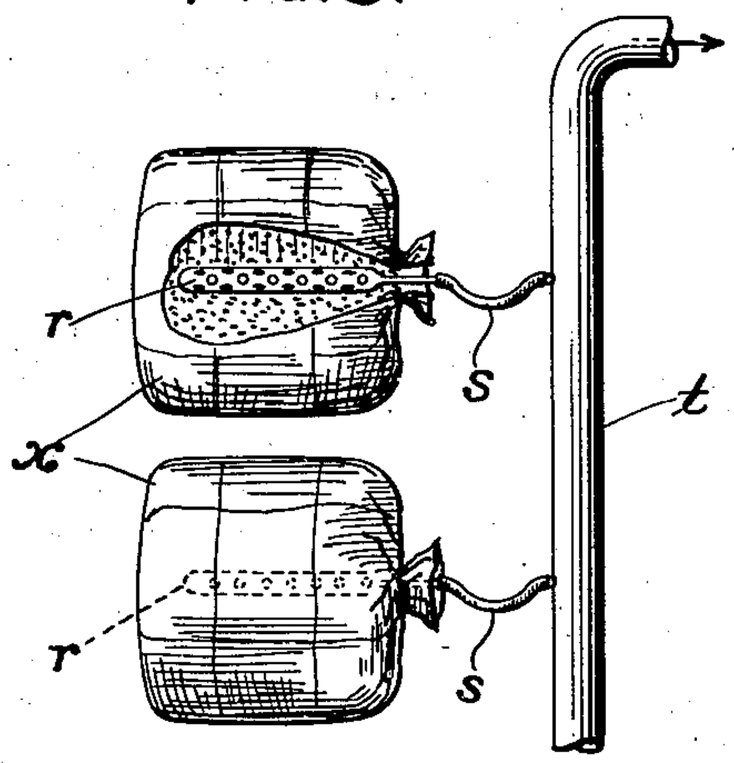

FIG. 4.

WITNESSES:

Robt. R. Kitchel.

M. M. Hamilton

INVENTOR

Julien Ortiz

BY

Harding & Harding

ATTORNEYS.

UNITED STATES PATENT OFFICE.

JULIEN ORTIZ, OF GREENVILLE, DELAWARE, ASSIGNOR TO THE E. I. DU PONT DE NEMOURS POWDER COMPANY, OF WILMINGTON, DELAWARE, A CORPORATION OF NEW JERSEY.

PROCESS OF PRESERVING EXPLOSIVES.

No. 897,923. Specification of Letters Patent. Patented Sept. 8, 1908.

Application filed July 31, 1907. Serial No. 386,343.

To all whom it may concern:

Be it known that I, JULIEN ORTIZ, a citizen of the Republic of France, residing at Greenville, county of Newcastle, and State of Delaware, have invented a new and useful Improvement in Processes of Preserving Explosives, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

It is well known that explosives, particularly smokeless powder explosives, containing a base of a large percentage of nitro-cellulose, are more or less unstable. Efforts have been made, with only comparative success, to render such explosives relatively stable. Substances, commonly called stabilizers, have been added to the explosive to absorb the acid fumes as they are formed. The air in the powder magazine has been renewed by means of ventilators. Water has been caused to circulate along the walls of the magazine. Refrigerating apparatus has been applied under the floor of the magazines, and air has been forced into the magazine which, in relaxing, lowered the temperature. Notwithstanding these expedients, there have occurred spontaneous explosions, with frightful results.

The remedies that have been applied seem to have proceeded on the assumption that the avoidance of high temperature is the only important condition required for the prevention of deterioration. It is, of course, true that variations in temperature and a sustained high temperature, produce deterioration, but hygrometric variations are an even more effective cause of deterioration, humidity accelerating the formation of acid fumes in a pronounced degree.

The object of my invention is to obviate, or at least substantially retard or minimize, the formation of acid fumes and to absorb any acid fumes that may be generated. This I accomplish by exhausting the air in contact with the explosives and displacing it with air that has been thoroughly dried, and then rarefying that air in turn so as to produce as near as practically possible an absolute vacuum and maintaining that vacuum. The rarefaction of the air, by removing both the air and contained moisture, lowers both the temperature and humidity and besides withdraws any acid fumes that may have been generated. The successive introduction of dry air and rarefaction of the air may be repeated from time to time, the addition of dry air causing the fumes evolved by the powder and held stagnant in the cells to be diluted, by which their subsequent removal by the application of the vacuum is facilitated. Besides, the introduced dry air (which has lost its moisture in contact with Ph_7O_5), being in need of moisture, when it contacts with the powder and permeates its cells, takes from it the moisture previously lost and prevents in the powder the formation of HNO_3 which requires the presence of H_2O to be formed.

The drawings show a practical way of carrying out my improved process as applied to a powder magazine, either on land or water.

While the invention will doubtless be of most useful application to magazines on war-vessels, as accidents in the navy have been relatively far more numerous and disastrous than accidents on land, it is adapted for application to all situations as well as to all methods of packing and storing powder, whether in bulk, in bags, or in shells or cartridges.

In the drawings: Figure 1 is front elevation, partly in section, of a powder magazine and appurtenant mechanism adapted for the carrying out of my improved process. Fig. 2 is an enlarged plan view of part of a horizontal row of powder bags in one of the upright compartments. Fig. 3 is a side elevation of same. Fig. 4 is a detail view of a modified construction.

The magazine *a* is divided by vertical partitions *b* into a series of upright independent compartments. To the walls of the partitions *b* are secured shelves *c*, allowing the bags *x* to be stored in tiers and the several tiers to be independently supported.

d are the hinged doors, one to each upright compartment.

e are chains, one to each tier of bags, composed of links hinged together, each link being of the length of a bag and of somewhat less width than the diameter of a bag, so that the bag can rest therein. When the door of a compartment is opened, the outermost bag of a tier may be removed by hand. To gain access to the next bag, the chain is pulled for-

ward, advancing the series of bags a distance equal to the length of one bag and bringing the second bag of the series into position to be removed.

Through the top of the magazine and communicating with the respective compartments, is a series of pipes *f* communicating with a pipe *g* connecting with a vacuum pump *h*.

v is a vacuum gage on pipe *g*.

In each pipe *f* is a valve *i* for opening and closing communication between each magazine and the pump. In the wall of each pipe *f* is an orifice controlled by a valve *j* by means of which outside air may be admitted to any particular compartment, as, for instance, when it is desired to gain access thereto for the purpose of removing the bags.

Beneath the magazine proper is a drying chamber *k*, which has independent communication with the several compartments by means of pipes *m* controlled by valves *n*. In the drying compartment are shelves *l*, upon which may be spread phosphorous anhydrid or other moisture absorbing substance.

o is a pipe communicating with the lower part of the drying chamber and provided with the valve *p*. The shelves *l* are made removable so that the phosphorous anhydrid may be readily replenished when exhausted. They are also preferably staggered so as to compel the air entering through the pipe *o*, to pass back and forth in a circuitous path before entering the powder compartments. The drying chamber is provided with a door *k'* hinged at its bottom.

After the powder is stored in the magazine, the apparatus is operated as follows: The valves *i* in pipes *f*, the valves *n* in pipes *m*, and the valve *p* in pipe *o*, are opened, and the valves *j* in pipes *f* closed. The vacuum pump is then operated causing the air in the magazine to be withdrawn and outside air to enter the drying chamber and pass therefrom through the powder compartments in multiple. The relatively humid air in the magazine is thus displaced by air that has been thoroughly dried by its passage through the drying chamber, and any acid fumes that have been formed are likewise withdrawn. The valves *n* in pipes *m* are now closed, and the continued action of the pump rarefies the air in the several powder compartments and also withdraws any moisture or evaporable substance that may be in the compartments or in suspension in the powder. When the desired degree of rarefaction has been obtained, the valves *i* in pipe *f* are closed. The conditions are now such that the powder will be preserved almost indefinitely, the important conditions of reduced temperature and much reduced humidity substantially preventing the disintegration of the explosive. It is obvious, however, that safety dictates a renewed application from time to time of the vacuum pump as well as occasional tests at such time of the gases extracted in such operation. It may also be advisable, after a time, to again introduce dry air into the powder compartments for the purpose of diluting any fumes that may have been evolved by the explosive and held stagnant in its cells, which fumes will thus be more completely removed than if the vacuum pump were applied without previous introduction of dry air.

The particular construction and arrangement shown for carrying out my improved process are illustrative only, as it is obvious that the same may be modified in many particulars without departing from my invention, and also that different situations will require more or less variation in mode of application of the invention. For example, in Fig. 4, there is shown an arrangement for exhausting the air in contact with the explosive in which a separate perforated tube *r* is inserted into each powder bag *x*, the tube *r* being connected, directly, or by means of a flexible or other hose *s*, with the tube *t* communicating with the air-exhaust.

The invention may of course be applied to powder kept in metallic cartridge cases apart from the shells and to powder kept in cartridge cases in which the projectile is fixed.

Having now fully described my invention, what I claim and desire to protect by Letters Patent is:

1. The process of storing explosives to retard their spontaneous decomposition which consists in inclosing a quantity of the explosive in an air tight compartment, rarefying the air in the compartment in contact with the explosive and displacing the withdrawn air with a body of anhydrous air, and then rarefying the body of anhydrous air.

2. The process of storing explosives to retard their spontaneous decomposition which consists in inclosing a quantity of the explosive in an air tight compartment, drying a body of air, withdrawing air in contact with the explosive and displacing the air so withdrawn by air so dried, shutting off access of dried air to the explosive, and rarefying the body of air in the compartment in contact with the explosive.

3. The process of storing explosives to retard their spontaneous decomposition which consists in independently storing fractional parts of the entire quantity, rarefying the air in contact with each fractional part, drying a body of air not in contact with the explosive, and independently introducing the air so dried into contact with the several fractional parts.

4. The process of storing explosives to retard their spontaneous decomposition which consists in independently storing fractional parts of the entire quantity, drying a body of air not in contact with the explosive, and in-

dependently withdrawing air in contact with each fractional part and independently introducing air so dried into contact with the several fractional parts, and then rarefying the anhydrous air in contact with each fractional part.

In testimony of which invention, I have hereunto set my hand, at Wilmington, Del., on this 19th day of July, 1907.

JULIEN ORTIZ.

Witnesses:
IRVING EYER,
CHARLES E. ARNOLD.