No. 789,810. PATENTED MAY 16, 1905.

A. J. KNIGHT.

CHEMICAL FIRE EXTINGUISHER.

APPLICATION FILED NOV. 25, 1904.

Fig. 1.

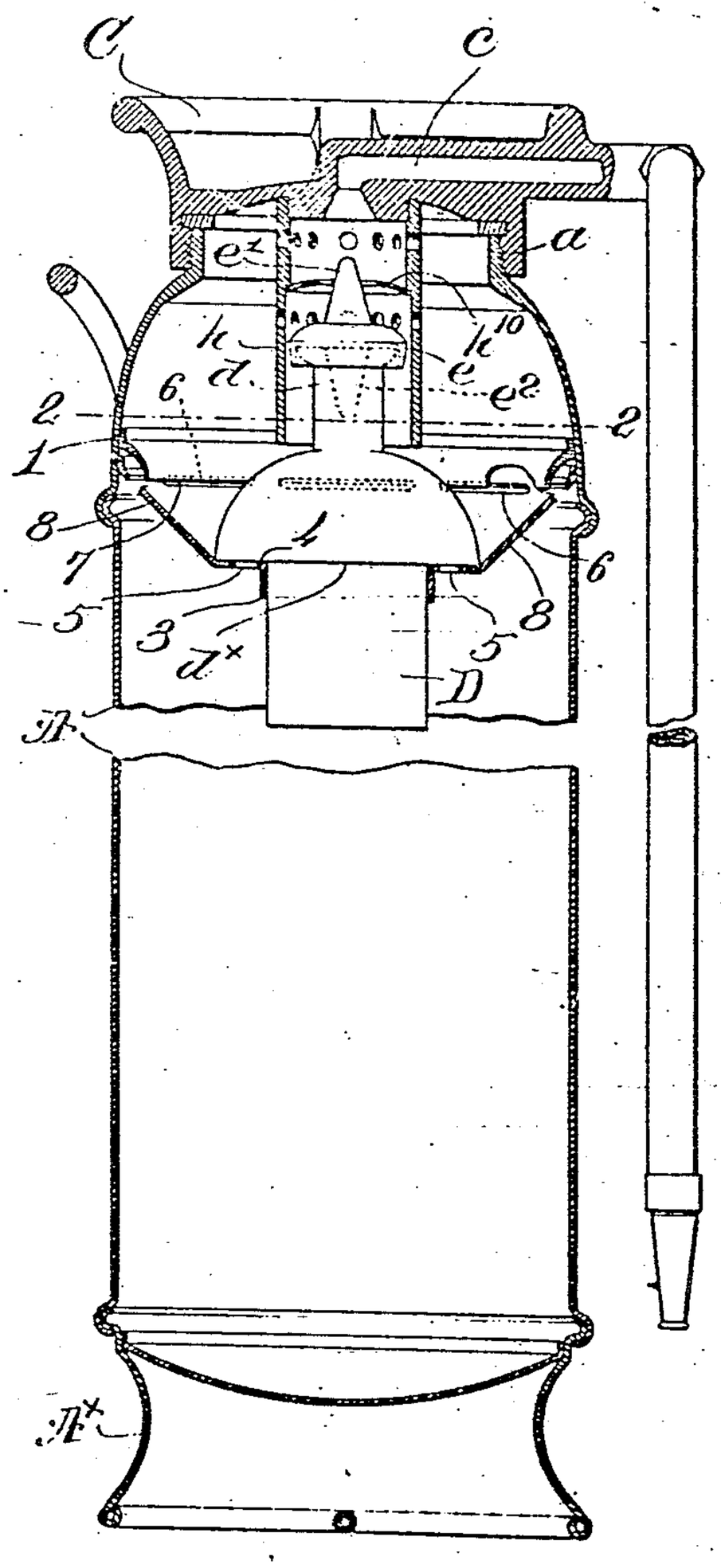


Fig. 2.

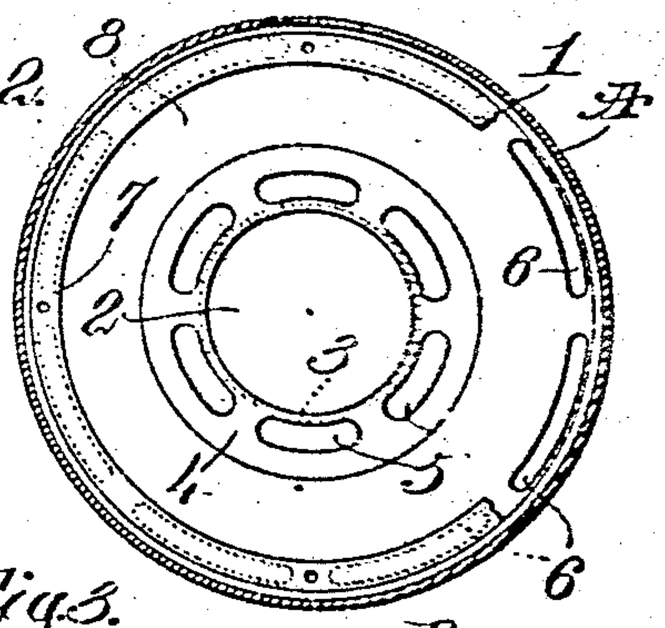


Fig. 3.

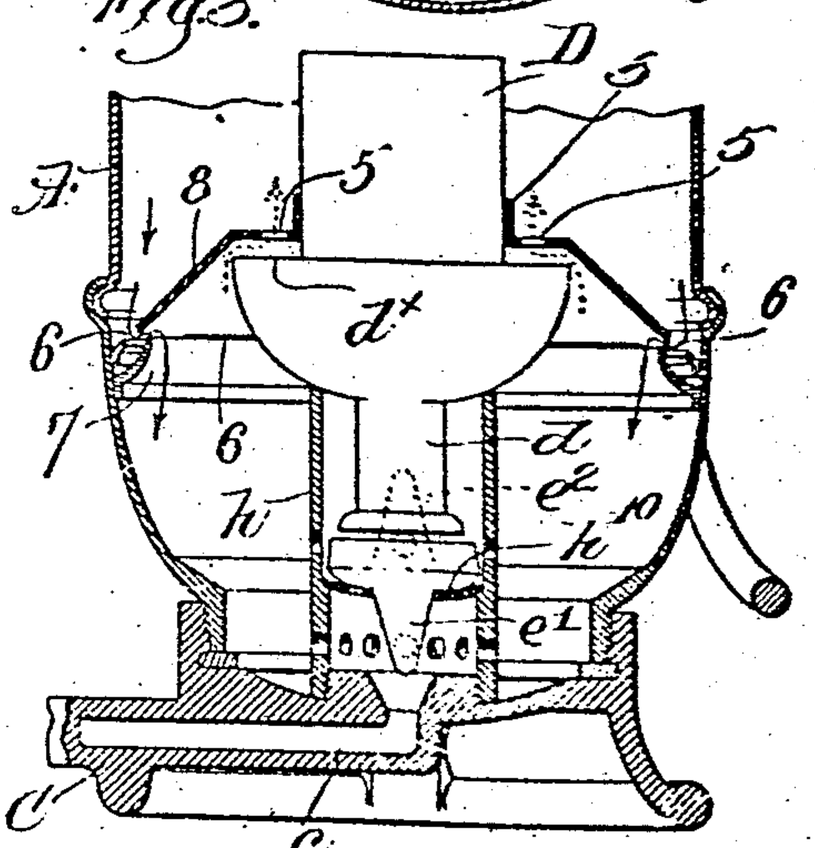
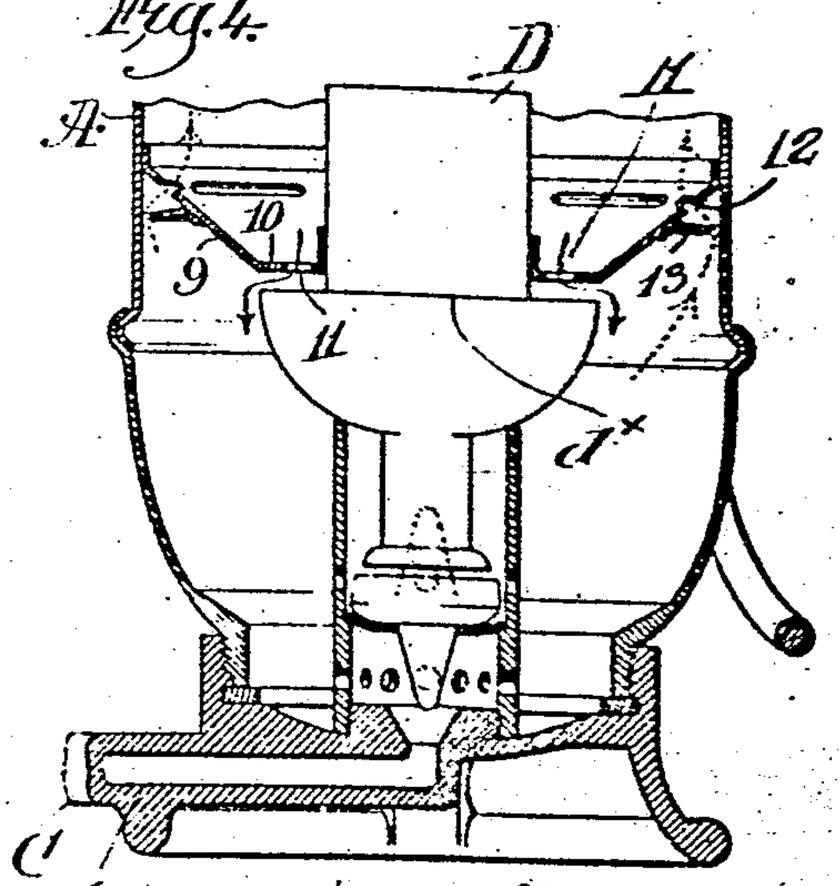


Fig. 4.



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No. 789,810. Patented May 16, 1905.

UNITED STATES PATENT OFFICE.

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CHEMICAL FIRE-EXTINGUISHER.

SPECIFICATION forming part of Letters Patent No. 789,810, dated May 16, 1905.

Application filed November 25, 1904. Serial No. 234,144.

To all whom it may concern:

Be it known that I, ALFRED J. KNIGHT, a citizen of the United States, and a resident of Melrose, county of Middlesex, State of Massachusetts, have invented an Improvement in Chemical Fire-Extinguishers, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

In United States Patent No. 752,399, granted to me February 16, 1904, I have shown a chemical fire-extinguisher provided with means to prevent splashing or slopping of the liquid in the main receiver or canister upon the mouth of the acid-receptacle contained therein. To that end a transverse diaphragm is shown in said patent as secured to the walls of the canister below its filling-opening, the diaphragm having a central circular opening to receive the lower part of the acid-receptacle, which is conveniently a bottle having an annular shoulder to normally rest upon the diaphragm and cover a series of feed-apertures therein. A gravity closure or stopper is provided for the acid-bottle with means to guide it in its movement. In operation the reversal of the canister causes the bottle to move longitudinally far enough to permit the unclosing of the feed-apertures in the diaphragm while the gravity-closure opens the mouth of the bottle for the discharge of its acid contents in order that the solution in the canister may be mixed therewith and generate carbonic-acid gas in well-known manner. In actual practice I have found that the operation of such extinguisher is not as rapid, smooth, and continuous as it should be for the highest efficiency, and in the course of my researches to discover the cause I have found that the action apparently is as follows: When the extinguisher is inverted and the feed-apertures in the diaphragm are uncovered, some of the solution rushes therethrough and mixes with the acid and carbonic-acid gas is generated at considerable pressure. Thereupon the gas acts against the solution, it being understood that the gas is below and the body of the solution above the diaphragm, the pressure of the gas being sufficient to more or less completely hold back the solution from passing through the feed-apertures. A substantial equilibrium is thus apparently established between the liquid and gaseous contents of the canister separated by the diaphragm, and the proper circulation of the contents of the canister is impeded and may be stopped altogether. Consequently the extinguishing-stream thrown from the nozzle is apt to be irregular and not of the high degree of efficiency desired in such apparatus.

In accordance with my present invention I have so constructed and arranged certain portions of the extinguisher of the type referred to that any tendency of the gaseous and liquid contents of the extinguisher to establish a condition of equilibrium is prevented, and as a consequence a free and rapid circulation of such contents is maintained throughout the operation of the extinguisher.

The various novel features of my invention will be fully described in the subjoined specification and particularly pointed out in the following claims.

Figure 1 is a vertical section, broken out between its top and bottom, of a fire-extinguisher embodying one form of my invention, the acid-receptacle and its closure or stopper being shown in elevation. Fig. 2 is a transverse section on the line 2 2, Fig. 1, looking down, omitting the acid-receptacle, and with the annular guard partly broken out, showing the diaphragm in plan view. Fig. 3 is a view similar to Fig. 1, but showing the extinguisher inverted, as it would be when in use; and Fig. 4 is a sectional view of a modified form of the extinguisher inverted.

The main receiver or canister A, adapted to rest in upright position upon its base A^x, Fig. 1, when not in use, the flange *a*, surrounding the filling-opening and threaded to receive the cap C, the latter having an outlet *c* for the receiver, the perforated holder *h*, depending from the cap and having within it a centrally-open stop-plate h^{10}, the gravity

stopper or closure *c*, having oppositely-extended projections c' c^2, the former projecting into the holder and the latter into the neck *d* of the acid-receptacle D, and the annular shoulder d^x on the latter may be and are all substantially as in my patent referred to and operate as therein set forth.

The change in the relative position of the acid-receptacle and its closure *c* when the canister is inverted for use is clearly shown in Figs. 3 and 4.

Below the filling-opening I secure to the walls of the canister a thin metallic diaphragm substantially frusto-conical in shape and having its edge bent to form a flange 1, which is soldered to the canister, the concave side of the diaphragm being uppermost. (See Fig. 1.) A circular opening 2 is made in the diaphragm at its center large enough to loosely receive the receptacle D, the diaphragm being bent adjacent the opening to present a depending flange 3 and an annular flat seat 4, the latter having apertures 5 therein. (See Figs. 1 and 2.) The shoulder d^x of the acid-receptacle normally rests upon the seat and closes the apertures 5, so that the liquid in the canister cannot be splashed or slopped up onto the neck or mouth of the acid-receptacle. Near its periphery I form elongated openings 6, which in this form of my invention permit the passage of the liquid through the diaphragm when the extinguisher is in use. An annular splash-guard 7 is secured to the canister just above the diaphragm and overhanging the openings 6, as clearly shown in Figs. 1 and 2, so that there is no danger of the liquid being thrown therethrough onto the acid-receptacle when the extinguisher is agitated or hurriedly moved around from place to place. If the liquid is ejected through the openings, it will hit the guard 7 and be deflected onto the top of the diaphragm and trickle down its inclined portion 8 and finally under the shoulder d^x back to the lower part of the canister. Small drainage-openings 9 are made in the splash-guard to permit the complete escape of all liquid from the canister when desired; but said drainage-openings are located between two adjacent openings 6 of the diaphragm, so that the function of the guard is not modified. When the extinguisher is inverted for use, as in Fig. 3, the receptacle D drops until its breast bears against the end of the holder *h*, the shoulder d^x then uncovering the apertures 5, the closure *c* at the same time moving down to open the mouth of the said receptacle, and the acid fed out mingles with some of the liquid, which passes through the diaphragm to the then lower part of the canister. Gas is instantly generated, and it rises in and fills the space below the diaphragm, the pressure rising rapidly. The gas seeks an outlet at the highest point of the diaphragm, and consequently rushes through the apertures 5, while the liquid above the diaphragm passes through the openings 6 (which are at a lower level than the apertures 5) to fill the space left by the escaping gas. This operation continues as long as there is any liquid remaining and gas is being generated, a constant free and rapid circulation of the gaseous and liquid contents of the canister being maintained so long as the extinguisher is in operation. The flow of the gas and liquid in opposite directions is indicated in Fig. 3 by dotted and full line arrows, respectively. So far as I am prepared to state it, the action described is due to the fact that the lighter gas seeks the highest point of the diaphragm for escape, and this is found at the apertures 5, while the additional weight of the column of water above the openings 6 is sufficient to overcome any back pressure of the gas at such points. The rush of the gas along the inclined portion 8 of the diaphragm also appears to have some effect in inducing the flow of the liquid through the openings 6. This theory of operation appears to me to be the most reasonable and is probably correct; but at all events in actual practice an arrangement by which the gas is conducted through the diaphragm at a higher point than the openings for the passage of the liquid absolutely prevents the establishment of a condition of equilibrium between the gaseous and liquid contents of the extinguisher.

In the modification shown in Fig. 4 the diaphragm 9 is frusto-conical, as before; but it is reversed in position in the canister, so that the centrally-located seat 10, having apertures 11, is at a lower point than the periphery of the diaphragm when the extinguisher is inverted. Openings 12 in the diaphragm, at or near its periphery, are normally overhung and shielded by an annular splash-guard 13, which is shown as mounted on the normally upper side of the diaphragm. When the extinguisher is not in operation, the guard prevents any liquid which may be thrown through the openings 12 from impinging upon the mouth of the acid-receptacle. Upon inversion of the extinguisher for use, as shown in Fig. 4, the shoulder d^x of the acid-receptacle D drops away from the seat 10, uncovering the apertures 11, and the generated gas is conducted through the diaphragm at the highest point (which is in this arrangement at its periphery) by means of the openings 12. The liquid passes down through the apertures 11, and a free and rapid circulation of the gaseous and liquid contents of the canister is thereby maintained. The dotted arrows in Fig. 4 indicate the course of the gas and the solid arrows the course of the liquid.

My invention is not restricted to the precise construction and arrangement herein shown and described, as the same may be varied or modified in different particulars without departing from the spirit and scope of my invention.

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Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is —

1. A portable fire-extinguisher comprising a canister having an outlet, a diaphragm separating the canister into two portions and having a central opening, an acid-receptacle extended partly through the opening and normally supported by the diaphragm, said diaphragm having passage-ways for the passage of the liquid and the gaseous contents of the extinguisher, the egress-openings of such passage-ways being in different horizontal planes when the extinguisher is in use.

2. A portable fire-extinguisher comprising a canister having an outlet, a diaphragm below it having a central opening and apertures for the passage of the liquid contents of the canister when inverted, an acid-receptacle extended partly through the opening of and normally supported by the diaphragm, a movable closure for such receptacle, means to prevent splashing or slopping of the liquid through the diaphragm when the canister is upright, and means to conduct the generated gases through the diaphragm at a higher point than the said apertures when the canister is inverted, whereby free and rapid circulation of the gaseous and liquid contents of the canister is maintained.

3. A portable fire-extinguisher comprising a canister having an outlet, a diaphragm below it having apertures for the passage of the liquid contents of the canister when inverted, an acid-receptacle normally supported by the diaphragm, a gravity-closure for such receptacle, means to prevent splashing of the liquid through the diaphragm when the canister is upright, and means operative when the extinguisher is in use to conduct gases generated therein through the diaphragm at a higher point than the said apertures, whereby free circulation of the fluid contents of the canister is maintained.

4. A portable fire-extinguisher comprising a canister having an outlet, a diaphragm below it having a central opening and an annular seat, an acid-receptacle extended partly through said opening and having a shoulder to rest upon said seat, a gravity-closure for the acid-receptacle, said diaphragm having passage-ways for the liquid and gaseous contents of the extinguisher, the egress-openings of such passage-ways being in different horizontal planes when the extinguisher is in use to prevent the establishment of a condition of equilibrium between the liquid and gaseous contents.

5. A portable fire-extinguisher comprising a canister having an outlet, a concave diaphragm below it having a central opening and a surrounding, apertured seat, an acid-receptacle extended partly through the opening and having an annular shoulder to normally rest upon the seat and close the apertures therein, a gravity-closure for said receptacle, and vent-openings in the diaphragm near its periphery, reversal of the extinguisher for use causing the shoulder of the acid-receptacle to open the adjacent apertures for the passage of the generated gas, the liquid contents of the canister passing oppositely through the peripheral openings in the diaphragm, whereby free and rapid circulation of the contents of the extinguisher is facilitated and maintained.

6. A portable fire-extinguisher comprising a canister having an outlet, a concave diaphragm below it having a central opening and a surrounding, apertured seat, an acid-receptacle extended partly through the opening and having an annular shoulder to normally rest upon the seat and close the apertures therein, a gravity-closure for said receptacle, vent-openings in the diaphragm near its periphery, and an annular shield above said openings, to prevent the liquid in the canister from splashing through the openings and onto the acid-receptacle.

7. A portable fire-extinguisher comprising a canister having an outlet and a filling-opening at one end, a diaphragm below it having a central opening and a surrounding, apertured flat seat, the diaphragm sloping from the canister-walls to the seat and having vent-openings near its periphery, an overhanging splash-guard for the openings, a cap to close the filling-opening, an acid-receptacle adapted to extend partly through the central opening and having an annular shoulder to normally rest upon the seat and close the apertures therein, a gravity-closure for the receptacle, and means to limit the discharge-opening between the closure and the mouth of the receptacle when the extinguisher is inverted, the shoulder at such time opening the seat-apertures and permitting the generated gas to pass therethrough while the vent-openings at a lower level permit the liquid to pass and thereby establish free and rapid circulation of the fluid contents of the canister.

8. A portable fire-extinguisher comprising a canister having an outlet, an inverted frusto-conical diaphragm in the canister below the outlet, having a central opening and a surrounding, flat and apertured seat, openings in the diaphragm near its periphery, a splash-guard overhanging said openings, an acid-receptacle having an annular shoulder to normally rest upon the seat and close the apertures, a gravity-closure for said receptacle, and means to permit the receptacle to move a limited distance and withdraw the shoulder from the seat and thereby open the apertures when the extinguisher is inverted for use.

9. A portable fire-extinguisher comprising a canister having an outlet, a frusto-conical diaphragm in the canister below the outlet and having a central opening and apertures

for the passage of the liquid contents of the canister when inverted, an acid-receptacle extending partly through the opening and normally supported by the diaphragm, a movable closure for the diaphragm, means to normally prevent splashing of the liquid through said apertures and upon the receptacle, and means operative when the extinguisher is inverted to conduct the gases generated therein through the diaphragm at a higher point than the said apertures.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALFRED J. KNIGHT.

Witnesses:

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MARGARET A. DUNN.