

1,426,338.

Patented Aug. 15, 1922.

Fig. 1.

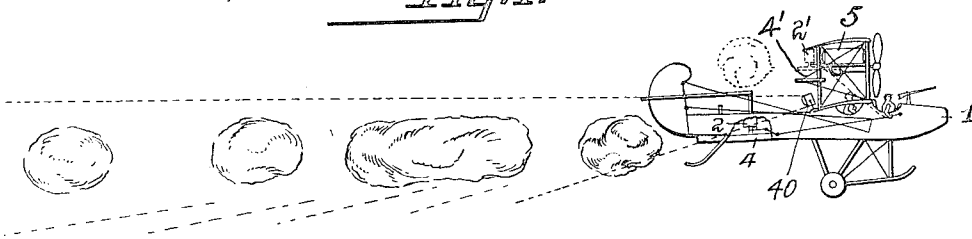


Fig. 2.

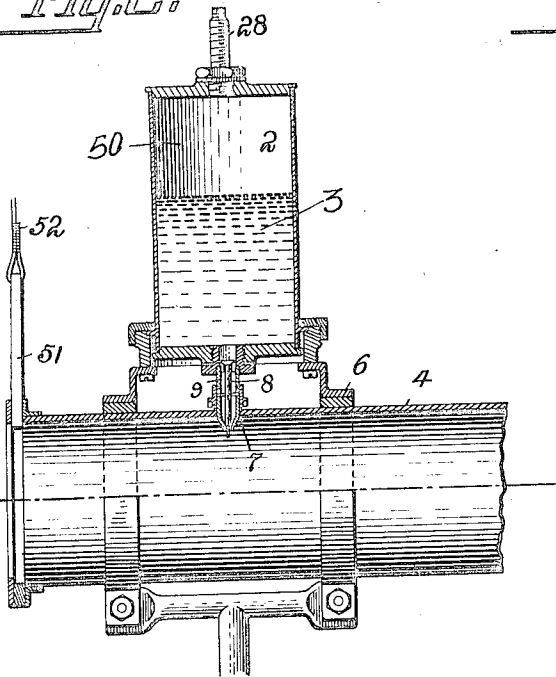


Fig. 5.

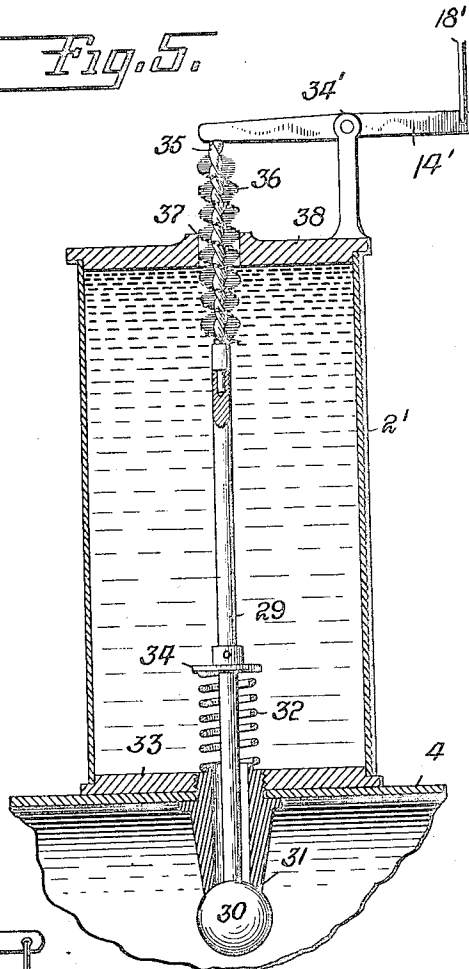


Fig. 3.

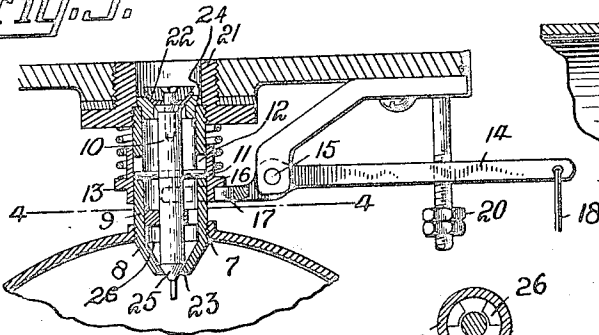


Fig. 4.

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VISUAL SIGNALING MEANS.

1,426,338.

Specification of Letters Patent. Patented Aug. 15, 1922.

Application filed July 9, 1917. Serial No. 179,587.

To all whom it may concern:

Be it known that I, ELMER A. SPERRY, a citizen of the United States of America, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Visual Signaling Means, of which the following is a specification.

This invention relates to visual or optical means especially adapted for moving vehicles such as aeroplanes or other aircraft, the main object of the invention being to improve upon the present signaling means so that clearer visual signals may be produced and with less apparatus and less weight than heretofore.

My invention is so designed as not to interfere with any other signaling means which might be employed, such as radio or other signals, and at the same time to be visible from great distances and to persist for some time.

Referring to the drawings in which what I now consider to be the preferred forms of my invention are shown:

Fig. 1 is a small diagrammatic view of an aeroplane shown in the act of producing visual signaling according to my invention.

Fig. 2 is a view of one form of my invention being a section through the exhaust pipe of the engine and through the container which I propose to mount adjacent thereto.

Fig. 3 is an enlarged detail thereof showing the actuating means.

Fig. 4 is a section on line 4—4, Fig. 3.

Fig. 5 is an enlarged sectional view of another form of the invention.

To carry out my invention, I propose to make use of a continuous stream of hot, moist exhaust gases to produce visual signals in the form of puffs or clouds of "smoke," fumes or condensed vapors which remain visible for some time.

As my invention is applied, for example, to an aeroplane, I may provide the craft with a container 2, designed to contain a substance 3 adapted when introduced into a moisture containing gas or atmosphere to produce fumes or clouds of "smoke." For use in this connection, I find it best to employ an anhydrous substance, preferably in liquid form, which possesses very marked hygroscopic properties or avidity for moisture, so

that when a small portion of it is introduced into a gas containing water vapor or moisture in any form, it immediately absorbs the moisture and forms minute solid particles which appear as fumes or a cloud which is very persistent. For this purpose I have found stannic tetra-chloride useful, (SnCl_4) which, upon being exposed to moisture takes up water to form $\text{SnCl}_4 \cdot 4\text{H}_2\text{O}$. This in its anhydrous form is a liquid, but if a small portion of said liquid is sprayed into a gas or air containing moisture a white cloud is produced which is visible from a long distance. Another substance which might be used for this purpose is titanium tetra-chloride (TiCl_4). The said container may be placed adjacent to or in the path of moist air such as the exhaust of hydrocarbon or gas engine. Preferably said container is mounted on the exhaust pipe 4 of the engine 5 and is shown in Fig. 2 as strapped thereto by metallic strap 6. While the exhaust pipe in Fig. 1 is shown as near the bottom and rear of the boat-like body of the vehicle, it may of course be placed directly behind the engine and propeller as shown at 4' or in both locations. When the exhaust and tank 2' are located behind the propeller, a different character of cloud is produced so that in signaling both containers and exhaust pipes may be employed in alternation or together. To assist in accomplishing this purpose, a closure 51 operated by wire 52 may be employed for each pipe. An opening 7 is provided in the wall of the exhaust pipe in which is inserted a connection extending between the tank 2 and the exhaust pipe. A manually or otherwise operated valve 8 is placed in the said connection. Preferably the said valve extends in whole or part into the exhaust pipe so that the heat from the exhaust maintains the valve and adjacent parts at sufficient temperature to prevent the hydrated chloride from precipitating on and in the valve and clogging it up.

The valve as a whole is shown as threaded into an opening 7 in the exhaust pipe and comprises an outer casing 9 and a valve stem 10, the stem being longitudinally movable within the casing. The said stem is shown as provided with a cross pin 11, which extends through slot 12 in the casing and is secured at its outer end to a slidable sleeve 13. Said

sleeve serves to close the said opening 12 and is provided with a flange or collar 16. A lever 14 pivoted at 15 may be provided to actuate said stem by engaging the collar 16 on sleeve 13, the end of the lever being forked at 17 so as to engage the collar on opposite sides. A wire or the like 18 is shown as secured to the free end of said lever and extends preferably to adjacent the operator's seat so that he may operate the signal readily. An adjustable stop 20 may be provided for the lever if desired.

Member 9 is shown as threaded into a nipple 21 which in turn is threaded into the bottom of casing 2. Valve stem 10 is shown as provided with an upper valve 22 and lower valve 25, which engage on seats 24 and 23 respectively. Guide blocks 26 may be provided for the lower part of the valve, if desired. The lower valve is provided to break up deposits of solid hydrate which may be found.

According to this form of the invention, the stannic chloride is preferably maintained under pressure within the tank 2, a connection 28 being shown for a pump to compress the air 50 within the tank.

In the form of the invention shown in Fig. 5, the tank 2' is shown as provided with a modified form of valve and valve operating device. According to this form the valve stem 29 extends through the casing 2' and is provided adjacent its lower end with a ball 30, which acts as the valve proper. Said ball is normally maintained against seat 31 by a spring 32 located preferably inside of the casing and bearing against the bottom of the casing 33 and a collar 34 pinned or otherwise secured on the valve stem 29.

The lever 14' used to operate the valve is shown in this instance as pivoted to a bracket 34' on the stop 38 of the casing. Said lever normally bears near one end against an extension 35 of the valve stem 29 while flexible member 18' is secured adjacent the opposite end. Extension 35 of said stem is shown as provided with bristles or the like 36 designed to keep the opening 37 in the top 38 of the tank clean and free of stannic chloride. It will readily be seen that as rod 35 is moved up and down the bristles will remove all deposit on the walls of opening 37.

In order to send signals according to my invention, all that the operator need do is to pull on connection 18 in a predetermined manner. He may thus readily transmit both dots and dashes, dependent upon the length of time with which he holds the valve open and also he may readily vary the rapidity of sending the signals. Any signal code such as the Morse or International code may be employed. As the valve is opened, a small portion of liquid in tank 2 or 2' will flow down into the exhaust pipe where it will be immediately broken up into a spray and will

practically instantaneously absorb the moisture in the passing gases, forming a large cloud of fumes. By closing one or the other of closures 51, the character of the clouds may be varied.

One marked advantage of my signaling means is that the signals remain visible for some time, since the puffs remain in the air for some time. If, therefore, the aeroplane should happen to be observed behind a passing object so that with the ordinary signaling means the signals would be lost, the observer, when my invention is used, may read the puffs when they emerge from behind the obstacle. Also, my signals may be used at night, since they are white, and the puffs are readily visible when illuminated as by a small light 40 adapted for the purpose located for instance on the wing tip to secure a side illumination on the puff or by a searchlight either on land or on some other part of vantage on the aeroplane.

In accordance with the provisions of the patent statutes, I have herein described the principle of operation of my invention, together with the apparatus, which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative and that the invention can be carried out by other means. Also, while it is designed to use the various features and elements in the combination and relations described, some of these may be altered and others omitted without interfering with the more general results outlined, and the invention extends to such use.

Having described my invention, what I desire to secure by Letters Patent is:

1. In a signaling means for aircraft, the combination with the exhaust pipe of the engine, of a container for a hydroscopic, cloud-producing substance mounted adjacent thereto, a valve opening out of said container into said pipe, a stem therefor running through said container, and a brush or the like on said stem for cleaning the walls of the container adjacent thereto.

2. In a signaling means for aircraft, the combination with the exhaust pipe of the engine, of an opening through the wall thereof, a movable closure for said opening, means for opening said closure to admit a cloud-producing substance into the exhaust, said closure being sufficiently close to the exhaust to utilize the heat thereof to keep it substantially free of deposits of the hydrate.

3. In a signaling means for motor-propelled aircraft, a motor exhaust pipe, a container adjacent said pipe adapted to contain a signaling substance, a valve connection between said container and said pipe, means for actuating said valve, said valve being so disposed with respect to said pipe as to

utilize the exhaust heat therein to prevent clogging of said valve.

4. In a signaling means for aircraft, the combination with the exhaust pipe of the engine, of a container for a cloud-producing substance mounted adjacent thereto, a valve opening out of said container into said exhaust, said valve being sufficiently close to

the exhaust to utilize the heat thereof to keep it substantially free of deposits, an opening 10 for admitting air into said container, and means for preventing clogging of said opening.

In testimony whereof I have affixed my signature.

ELMER A. SPERRY.