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# UNITED STATES PATENT OFFICE.

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PROCESS OF PRODUCING SMOKE CLOUDS FROM MOVING AIRCRAFT.

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This invention relates to a process of spraying or sprinkling smoke-producing liquids from bodies moving with a high velocity and has more specific application to the sprinkling of smoke-producing liquids from aircraft, such as aeroplanes, dirigibles, etc.

Among the objects of this invention is the provision of a process whereby smoke-producing liquids may be dropped from aircraft, wherein the liquid reacts with one or more of the constituents of the air or atmosphere and generates a smoke screen as it falls. This is an improvement over the present means of generating smoke screens wherein the smoke material is dropped to the ground in containers or else is set out on the ground, and wherein the success of the operation of producing the screen is dependent on the rise of a smoke cloud.

A further object of this invention is the provision of a process which may be employed for laying screens of smoke from aeroplanes to protect the planes from anti-aircraft attack or to protect land fortifications, troops, or ships from enemy fire.

A still further object of this invention is the provision of a process for producing long and extensive fronts of smoke in an economic, safe and rapid manner.

Other, further and more specific objects of the invention will become readily apparent to persons skilled in the art from a consideration of the following description when taken in conjunction with the accompanying drawing.

When a liquid is dropped from an elevation at rest with respect to the air it will fall to the ground in the form of stable drops. If, however, the liquid be dropped from a body moving at high velocity, the liquid will immediately upon release become broken up into a mist and all of the liquid or a considerable portion thereof will be dispersed in the air and not reach the ground. By ejecting the liquid under pressure from an aeroplane or other moving aircraft so that the liquid leaves the plane at approximately the same velocity as the plane passes through the air but in a substantially opposite direction, the liquid will fall as if poured from an elevation at rest, and travels to the ground in substantially stable drops. The present invention makes

This invention is not limited to any class of smoke-producing liquids and may also be applied to solutions of solids in liquids. The success and effectiveness of the smoke screen is largely dependent on the chemical and physical properties of the liquid employed. We prefer to employ a smoke-producing liquid such as  $TiCl_4$ ,  $SnCl_4$ , oleum and chlorosulphonic acid. We may, however, use other mixtures or solutions, for example a solution of sulphur trioxide in chlorosulphonic acid. These smoke-producing materials are not stable in the air but react with one or more constituents of the air to form substantially stable products.

When these smoke-producing liquids are ejected under pressure from an aeroplane or other moving aircraft so that the liquid leaves the plane at approximately the same velocity as the plane passes through the air but in a substantially opposite direction, the liquid falls in the form of relatively stable drops and reacts with the constituents of the air to form a smoke screen. The effect produced is the generation of a falling smoke curtain, which reaches the ground in the form of a long, high screen. Dependent on the height at which the plane is travelling when the liquid is released, the smoke curtain may be made to hang in the air, or may be made to rest on the ground.

Reference is to be had to the accompanying drawings wherein we have illustrated, more or less diagrammatically, an apparatus which is suitable for carrying out our invention. Fig. 1 is a side elevation of an aeroplane equipped with the special apparatus for carrying out our invention. Fig. 2 is a detail view illustrating diagrammatically the parts of the apparatus.

The apparatus comprises a tank (1) for holding the liquid to be sprinkled. A pressure cylinder (2) containing compressed carbon dioxide or other suitable gas is connected to the tank (1) by the conduit (3) and the branching conduits (4) and (5). The conduit (6) connects with the conduit (5) and terminates at the back of the aeroplane in a nozzle (7). The tank (1) is fastened to the aeroplane by the straps or bands (8), and the cylinder (2) and the conduits are held in position by any suitable means.

The tank (1) is provided with a pressure gauge (9), and when handling corrosive sub-