

1,128,697.

Fig. 2

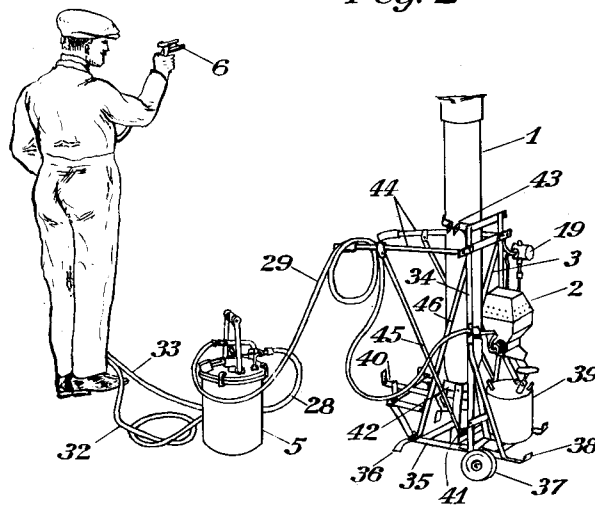
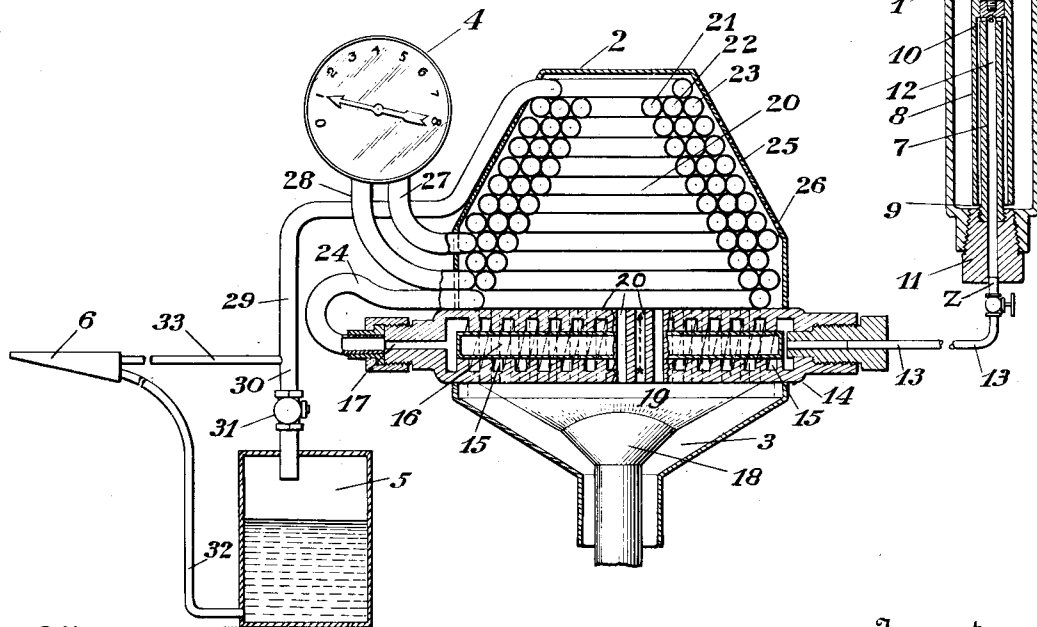


Fig. 1



HB. Langnet.
C. Seppi

Fortunato Levy

By his Attorney
Lawrence Langner

UNITED STATES PATENT OFFICE.

FORTUNATO LEVY, OF PARIS, FRANCE.

METHOD OF ATOMIZING LIQUID COMPOSITIONS SUCH AS PAINT.

1,128,697.

Specification of Letters Patent.

Patented Feb. 16, 1915.

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To all whom it may concern:

Be it known that I, FORTUNATO LEVY, subject of the Sultan of Turkey, and resident of Paris, France, have invented certain new and useful Improvements in the Method of Atomizing Liquid Compositions Such as Paint, of which the following is a specification.

This invention relates to a method of spraying or atomizing liquids or liquid compositions, and more particularly to a method of and apparatus for spraying liquids upon surfaces or objects to be coated with a liquid composition such as paint, although it is, of course, to be understood that the apparatus is applicable in other relations.

One of the objects of the present invention is to provide a simple and practical method of applying liquid compositions such as paints to surfaces or articles to be coated in a smooth uniform manner at a minimum amount of expense and trouble.

A further object is to provide a method which shall be capable of use under all conditions where such spraying or coating is carried out.

A further object is to provide a method of atomizing such liquid compositions by the use of a pressure medium which shall have no action upon the liquid composition other than to atomize it.

Other objects will be in part obvious from the annexed drawings and in part indicated in connection therewith in the following description of this invention.

To enable others skilled in the art fully to comprehend the underlying features thereof drawings by way of illustration have been annexed as a part of this disclosure, and in such drawings, like characters of reference denote corresponding parts throughout all the views, of which:—

Figure 1 is a view, partly diagrammatic, showing the various operative elements of the system. Fig. 2 is a perspective view of the complete installation showing the same in operation.

In applying liquid compositions such as paints to surfaces to be coated therewith, it has been the custom to use compressed air as the motive medium. However, the application of apparatus for spraying paints by means of compressed air is limited in scope, owing to a number of difficulties which arise in the use of such ap-

paratus. Primarily, lack of portability operates to prevent the general use of such apparatus because, in order to furnish the supply of compressed air, it is the general practice to utilize an air compressing device driven either by a small gasoline engine or an electric motor. A number of difficulties are presented in use of such complicated and expensive apparatus, and especially is this so in painting surfaces which are inaccessible and where it is often impossible to operate with an air compressing and power installation, whether gasoline or electric. Still less is it practicable to use compressed air in storage containers, because in order to have sufficient volume to carry on painting operations of any but insignificant extent, the storage containers are even more bulky and more difficult to transport than the power plant hereinabove referred to. The use of compressed air, whether supplied by storage tanks or a pump driven by a gasoline engine, is attended by further disadvantages, inasmuch as it always contains a certain amount of moisture, which moisture condenses in the atomizing operation and mixes with the paint, with accompanying deleterious effect upon the surface painted. Moreover, the oxygen in the air coming into intimate contact with the paint has a tendency to oxidize it and this action while in some cases not very material, can be extremely injurious to the paint in the case where such oxidation tends to set up chemical reactions in the paint affecting its durability.

In accordance with the method of my invention I utilize carbon dioxid in liquid form which I expand and heat, and the gaseous carbon dioxid thereby obtained is utilized as a motive medium for effecting the atomizing of the liquid paint composition. My method presents a number of advantages over methods of applying liquid paint, such as referred to above, some of which will now be enumerated, to wit: Liquid carbon dioxid or carbonic acid gas is a well known marketable commodity and can be purchased cheaply in the open market. A large volume of carbon dioxid gas, when liquefied, occupies relatively little space, and a simple container, receptacle, or drum of readily transportable dimensions can contain sufficient liquid carbon dioxid to furnish a large volume of carbon dioxid gas

under pressure, which can be utilized for atomizing the paint. It will therefore be appreciated that an extremely important advantage results from my method, in that it enables painting to be carried on on surfaces inaccessible to the ordinary compressed air apparatus, by using liquid carbon dioxid in a portable container. While this point is of particular importance, my invention offers further advantages in that owing to the fact that the carbon dioxid gas is neutral, this gas does not exert any unfavorable action upon the paint, as, for instance, oxidation. Moreover, the heating of the gas prevents any freezing thereof which tends to take place in the transition of the carbon dioxid from liquid to gaseous form under the expanding action of the gas, so that the supply of liquid carbon dioxid gas is continuous and takes place without any freezing of the gas. A further advantage resides in the fact that the carbon dioxid gas contains no water, so that the disadvantages present in the use of compressed air are also avoided. Under my improved method the painting is effected with hot dry gas which is especially useful in applying enamel paint to surfaces.

A preferred form of apparatus for carrying out my method will now be described.

Referring to Fig. 1, it will be seen that the installation comprises the following devices; the liquid carbon dioxid container 1 containing the liquid carbon dioxid under pressure, the gasifier 2 including the heating means 3, the expander 4, the receptacle 5 for the liquid composition and the atomizing tool 6 for applying said composition. It will be understood that the liquid gas in the receptacle 1 passes into the gasifier 2 where it is heated by the heating means 3; from the gasifier it passes to the expander 4 where the pressure of the gas is reduced, and the reduced-pressure gas is returned to the gasifier for reasons hereinafter explained. After being reheated, the gas passes to the painting or atomizing tool where it atomizes the liquid paint composition, and a portion of the gas is supplied to the paint receptacle in well known manner so as to force the paint under pressure into the painting tool.

With this understanding of the operation of the system, the various operating members thereof will now be described in detail.

The liquid gas container 1, which is made strong enough to withstand the internal pressure to which it is subjected, but the dimensions of which are such that it can be transported with ease, is provided with a special outlet or valve which prevents freezing of the liquid gas as it passes out of the container. In the normal positions of said container, that is, the positions in which the container is filled and transported be-

fore being used in my improved installation, this outlet may be regarded as being located at the top of the container; but when used in connection with my system, the container is inverted so that the liquid passes out from its lower end. This is important in the practical working of my apparatus, inasmuch as such containers are never completely filled with liquid, and indeed the amount of liquid contained is being constantly reduced by its use, so that were the outlet located in the top of the container during use, the carbon dioxid would tend to leave in gaseous state with accompanying choking of the outlet due to freezing of the gas. My improved outlet or valve located at the bottom of the container in its position of use, effectively prevents any freezing of the carbon dioxid as it passes out of the container. More specially, this outlet comprises a central tubular member 7 and an outer casing or inverted cylindrical member 8 communicating at its lower end with the container 1 through passages 9, and at its upper end with the said tubular member by means of passages 10. The tubular member 7 is secured in position by screwing it on the plug 11 which keeps the whole assemblage in vertical position inside the container. The liquid carbon dioxid in the annular space between the casing 8 and the tubular member 7, passes through the passages 10, and flows down through the central passage 12 whence it passes out through the pipe *z*. It then flows through the pipe 13 to the gasifier 2, which will now be more specifically described.

The gasifier consists of a horizontal metal member 14 of rectangular shape in section, in which there is formed longitudinally a helical passage 15, produced by tapping one or more square threads and bounded internally by a cylindrical hollow member 16 closed at both ends. The liquid carbon dioxid arrives at one end of the passage 15 through said pipe 13 and it passes out at the other end in the gaseous state through an outlet 17. The burner 18 utilizing any suitable fuel, and preferably a suitable mineral oil, is located in a chamber having the shape of an inverted truncated pyramid, the base of which is formed by the member 14. By this means a good distribution of the heat produced by the burner is obtained.

The hot gas passes, as shown by dotted line arrows 19, through vertical passages 20 formed in the thickness of the member 14 on each side of the helical passage, and opening directly into a chamber 20 containing coiled pipes 21, 22, 23 which may be three in number, as in the example shown, for heating the gasified liquid. These coiled pipes are connected to the outlet 17 of the gasifier by means of a pipe 24. The chamber 20 is of a trapezoidal form in section

as shown in Fig. 1, and the coiled pipes 21, 22, 23 are arranged parallel to the inclined outer walls 25 of said chamber, which are formed with holes 26 for the escape of the hot air. The carbon dioxid coming through the pipe 24 rises in the coiled pipe 21 and passes down again through the coiled pipe 22. At the end of the coiled pipe 22 the gas passes out of the heating chamber through a pipe 27 and enters the expander 4, which is an expanding device of any suitable construction, and which reduces the gas to the desired pressure for use. After the gas has left the reducing device or expander, it is again heated to compensate for the cooling produced by the additional expansion which takes place in the expander. The gas on leaving the expander 4 through a pipe 28 passes into the lower part of the coiled pipe 23 through which it flows in the direction of the arrows; it passes finally from the heating chamber through a pipe 29 on its way to the tool 6. The pipe 29 is provided with a branch pipe 30 and containing the reducing valve 31 leads to the top of the paint receptacle 5, and by suitably manipulating the valve 31 the paint can be forcibly fed at the desired pressure to the painting tool through the flexible pipe 32 where it is atomized by the carbon dioxid gas from the flexible connection 33 connected to said pipe 29.

The installation described above is preferably mounted upon a portable frame as shown in Fig. 2. This frame comprises means for supporting the various parts hereinabove referred to, and these parts will now be more particularly described.

The portable apparatus comprises a vertical structure or frame 34 rigidly secured on a horizontal frame 35 which bears upon the ground by means of legs 36 and rollers 37. Said frame is provided at the front with a small platform 38 upon which is carried a liquid fuel reservoir 39 and adapted to supply the burner 18 of the gasifier and at the rear with a support 40 for the paint receptacle 5, which, as shown, may be removed during the painting operation. In its middle portion the horizontal frame 35 carries by means of legs 41 a yoke or stirrup member 42 in which the outlet end of the inverted container 1 is inserted. Said container is also held in position by means of a ring or clip 43 mounted on a horizontal cross member provided at the upper part of the vertical frame. The vertical frame 34 also supports the gasifier 2 and the expander 4. The apparatus is also provided with handles 44 braced by supporting rods 45. The inclined braces 46 are preferably provided with hooks upon which the pipes used with the apparatus may be conveniently wound or supported during transport.

In the operation of the apparatus, the

liquid gas passes through the pipe 13 to the gasifier 2 where it is heated, thence by means of pipe 27 to the expanding device 4 which is adjusted to reduce the pressure of the gas to that required for atomizing. The gas then passes through pipe 28 to be reheated in the gasifier, from which it is conducted through pipe 27 and branch pipe 30 leading to the paint receptacle, past the reducing valve which is adjusted so that the gas will enter the receptacle at the desired pressure to force the paint therefrom through the pipe 32 to the tool 6 by the action of the gas under pressure acting on the top of the paint in the receptacle. This constitutes a force feed paint receptacle well known in the art. The paint from pipe 32 is atomized by the pressure gas in pipe 33 within the tool 6 and applied to the surface to be coated by said tool.

While I have described and illustrated a preferred form of apparatus for carrying my method into effect, I wish it to be understood that any suitable means may be used for atomizing liquid composition and coating surfaces in accordance with my method. Moreover I do not specifically limit myself to the use of liquid carbon dioxid in the practice of my method, as I contemplate using liquid gas of any character suitable for the purposes of my invention, as I believe it to be generically new in the art of atomizing paints and other liquid compositions applied to surfaces to utilize a liquid gas as motive medium and to heat such gas before applying it to the composition.

I claim:

1. The method of atomizing a liquid composition such as paint, consisting in applying heat above normal atmospheric temperature to liquid carbon dioxid and expanding the dioxid to form carbon dioxid gas under pressure, and subjecting said liquid composition to the atomizing action of said gas.

2. The method of atomizing a liquid composition such as paint, consisting in applying heat above normal atmospheric temperature to liquid carbon dioxid and expanding the dioxid, and subjecting said liquid composition to the atomizing action of said carbon dioxid in the form of a warm gas under pressure.

3. The method of atomizing a liquid composition such as paint, consisting in applying heat above normal atmospheric temperature to liquid carbon dioxid, reducing the pressure of the carbon dioxid gas and expanding the dioxid so formed, and subjecting said liquid composition to the atomizing action of said carbon dioxid gas.

4. The method of atomizing a liquid composition such as paint, consisting in applying heat above normal atmospheric temperature to liquid carbon dioxid, expanding said carbon dioxid, reheating said carbon dioxid

after said expansion and subjecting said liquid composition to the atomizing action of said carbon dioxid in the form of gas under pressure.

5. 5. The method of atomizing a liquid composition such as paint, consisting in applying heat above normal atmospheric temperature to liquefied gas to change it from liquid to gaseous form, and subjecting said liquid composition to the atomizing action of said gas.

6. The method of atomizing a liquid composition such as paint by means of liquid carbon dioxid contained in a receptacle, consisting in leading said liquid carbon dioxid from the bottom of said receptacle, heating it and expanding it to produce carbon dioxid gas under pressure, and subjecting the liquid

composition to the atomizing action of said carbon dioxid gas.

7. The method of atomizing a liquid composition such as paint by means of liquid carbon dioxid in a container, consisting in leading the liquid from the bottom of said container, heating and expanding it to produce carbon dioxid gas under pressure, reheating said carbon dioxid after said expansion and subjecting said liquid composition to the atomizing action of said gas.

Signed at New York in the county of New York and State of New York this 11th day of December A. D. 1914.

FORTUNATO LEVY.

Witnesses:

E. DEPPE,
V. BELLETTI.