

April 24, 1945.

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2,374,462

SPRAYING, BLENDING, AND IMPREGNATING METHOD

Filed April 6, 1942

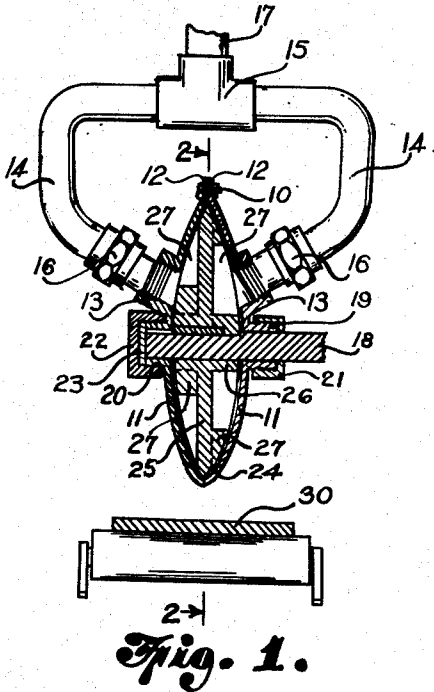


Fig. 1.

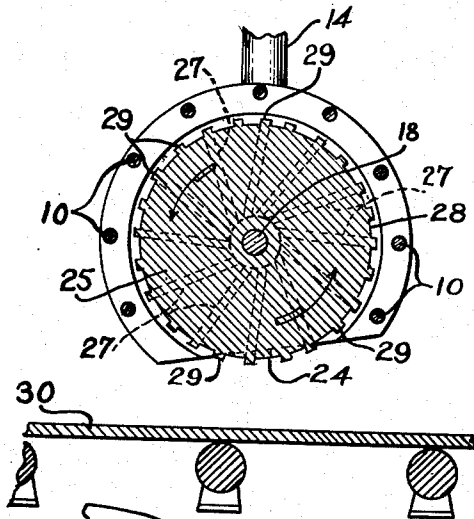


Fig. 2.

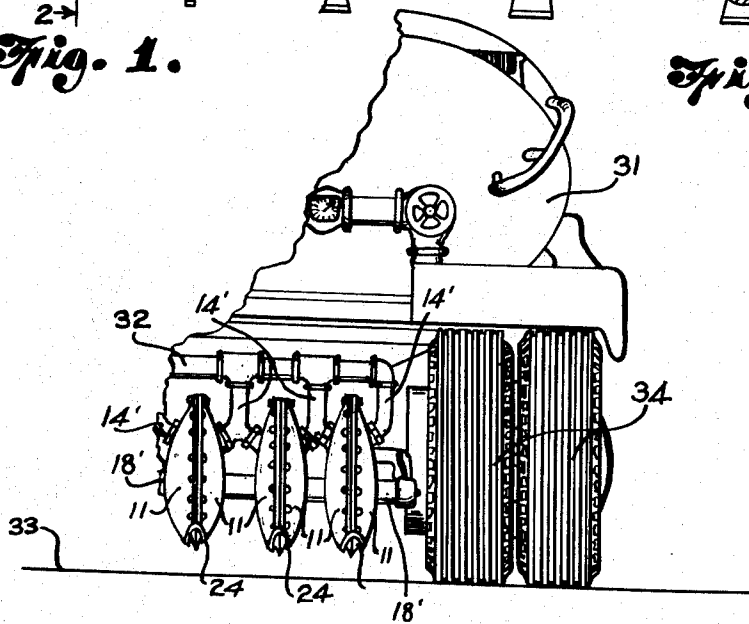


Fig. 3.

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2,374,462

SPRAYING, BLENDING, AND IMPREGNATING METHOD

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Application April 6, 1942, Serial No. 437,867

18 Claims. (Cl. 299—38)

My invention relates to a method of spraying a liquid or other similar mobile material on other materials, or impregnating such other materials therewith, and to blending a plurality of mobile materials and spraying the same on other materials, or impregnating such other materials therewith. This application is a continuation in part of my application Serial No. 196,524, filed March 17, 1938, on Method of mechanically changing characteristics of liquids.

It is a purpose of my invention to provide a new and improved method of spraying liquids, particularly viscous liquids, or other mobile, or fluid, materials, such as powdered materials, and mixtures of powdered and liquid materials.

My invention further relates to a method of blending a plurality of materials, such as a plurality of liquids, of which at least one thereof may be of a somewhat viscous character, or liquids and powders, or a plurality of powdered materials, and spraying the resulting blended material.

It is one of the important purposes of my invention to provide a method of impregnating a surface, such as the surface of a road that is to be oiled, with oil, or similar viscous material, which can be accomplished either by heating the oil before spraying the same, or without such heating, and which will force the oil into the absorbent road surface under sufficient pressure that it will not stand on the surface of the road in pools. Tarry materials can be similarly applied to surfaces by my improved method.

It is the purpose of my invention to provide a method, or methods, of the above referred to character, in which the material that is to be sprayed is divided into a plurality of portions, is rotated at high velocity in a chamber in such a manner that each of the portions is formed into a centrifugal whirl, said portions being directed crosswise of the direction the materials in the whirls normally would take due to the action of centrifugal force, so as to provide streams of the material so centrifugally whirled that engage each other, so as to finely divide the material that is to be sprayed, and if a plurality of different materials are being whirled to make a blend thereof, to thus provide a mist-like or vaporous material, due to the violent engagement of the inter-engaging streams of the liquid, or similar material, that is so directed under the centrifugal force, which is discharged from the whirl substantially at the periphery thereof under centrifugal force sufficient to force the same in finely divided condition into the pores of a sur-

face upon which the material is sprayed to impregnate the same with the sprayed material, said centrifugal force resulting from continuing to rotatively impel said material during and after engagement of said streams.

Blends of such materials as sawdust and oil, or similar materials, or of other solid somewhat absorbent and liquid materials, can also be provided in this manner, by whirling separate portions of said materials centrifugally and interengaging the same by streams directed transversely of the direction that the material would normally take under the influence of centrifugal force, to thus provide a very uniform blend or impregnation of the liquid material and the solid material. This is particularly desirable in making sweeping compounds, or similar materials.

While several applications of the method have been referred to whereby desirable products can be made in a more efficient and uniform manner by my improved method, or surfaces can be impregnated more uniformly and thoroughly without having excess impregnating material on the surface thereof, my method is capable of adaptation to many materials in the blending thereof and to many objects in impregnating the same with a liquid, or other fluid, or mobile, material.

Other objects and advantages of my invention will appear as the description of the accompanying drawing proceeds. I desire to have it understood, however, that I do not intend to limit myself to the particular details shown or described, except as defined in the claims.

In the drawing:

Fig. 1 is a view partly in vertical section and partly in elevation of one form of my apparatus that may be used for carrying out my method of blending and spraying materials, portions thereof being broken away.

Fig. 2 is a view taken substantially on the line 2—2 of Fig. 1, and

Fig. 3 is a fragmentary elevational view of one form of apparatus that may be used for carrying out my method of impregnating a surface with a material or blend of materials.

Referring in detail to the drawing, in Figs. 1 and 2 is shown an apparatus which is adapted for blending materials and spraying the materials onto other materials, or objects, that are conveyed into and through the spraying zone of the apparatus. While conveying means is shown, as will be described below, obviously the conveying means can be omitted if it is only desired to blend the materials and discharge the same onto any desired surface. The apparatus

shown in Figs. 1 and 2 comprises a casing, preferably, made up of a pair of casing portions 11, which are provided with flanges 12, through which the securing elements 10 extend to secure the halves of the casing together in fluid tight relationship. Each casing portion 11 is provided with an inlet passage 13 to which the inlet conduits 14 are connected, said inlet conduits being branches of a piping system extending from a T 15, the conduits 14 being connected with the inlet connections 13 by any suitable connecting means, such as the unions 16, the T being connected with an inlet conduit 17 leading from any suitable source of supply for the liquid or other material that is to be acted on by the apparatus. The shaft 18 is driven in any desired manner, by any desired driving means, and is mounted in suitable bearings 19 and 20, which are provided on the casing portions. A suitable packing nut 21 is provided on the bearing member 19 and suitable packing means can, of course, be provided, if necessary, between the packing nut and the threaded bearing member. The bearing portion 20 has a threaded cap member 22 connected therewith and a packing 23 between said cap member and said bearing to provide a fluid tight joint. The lower part of the casing is cut away as shown at 24 to provide a discharge opening of large capacity at the bottom of the same, the cut away portion being shown as being inclined, as will be clear from Fig. 2, said cut away portion providing for free access of air into the casing, said casing being thus freely open to the atmosphere.

Mounted within the casing and keyed to the shaft 18 is an impeller member, or rotor, which, preferably, rotates in the direction indicated by the arrows in Fig. 2, and which comprises a disk-like central web portion 25 extending from the hub portion 26, which is keyed to the shaft outwardly toward the inner periphery of the casing 11, but spaced therefrom a slight distance, as will be evident from Fig. 2. It will be noted that the casing portions 11 are curved inwardly toward each other, so as to form a gradually narrowing chamber from the axis of rotation of the shaft 18 outwardly to the annular peripheral edge thereof at the flanges 12, thus having concavely curved annular walls. The impeller member is provided with vanes, or fangs, preferably, made in the form of ribs 27, said ribs or vanes being tallest adjacent the hub portion 26 and having a gradually tapering form, the side edges thereof being curved to conform to the curvature of the inner faces of the portions 11 of the casing and extending closely adjacent the inner faces of the casing, so as to just clear the same when the impeller is rotating within the casing.

It will be noted that the rib-like members 27 on said rotor extend outwardly in a non-radial direction, extending at a somewhat acute angle to the radius in a backward direction from the hub to the periphery of the disk, the direction of rotation of the rotor being indicated by the arrows in Fig. 2, the angularity of the ribs to the radial being slightly less than 45 degrees, although it is obvious that this can be varied as may be found desirable. Said rib-like members extend outwardly beyond the peripheral edge 28 of the disk-like portion, as shown at 29, so as to form breaker members or fangs extending transversely across the periphery of the disk-like member, and closely adjacent the casing 11, so as to just allow clearance between said por-

tions 29 of said ribs and said casing, as will be obvious from Fig. 1.

It will be noted that said members 27 are arranged in staggered arrangement, that is, the members 27 on opposite sides of the partition 25 are staggered relative to each other. This provides twice as many rib-like members 29 on the periphery of the disk-like partition 25 than if such staggered arrangement were not provided. Furthermore the breaking, agitating and vaporizing effect of the rib-like members is greatly increased by this arrangement, as the tendency is for the material on one side of the disk-like member to be thrown across the periphery thereof toward the other side thereof at the peripheral portions of the whirls provided on opposite sides of the disk-like member, thus providing inter-engaging streams of the liquid or other material that is being whipped about by the impeller member to further break up and more finely divide the material so whipped about.

The apparatus described thus provides for dividing the material that is to be acted upon thereby into two portions, entering on opposite sides of the disk-like member where the two portions are whirled separately at a high speed to centrifugally throw the same outwardly against the walls of the chamber and across the periphery thereof into inter-engaging streams, and finally out through the discharge opening 24 in finely divided condition. If desired, a conveyor of any desired type, indicated by the numeral 30 in Figs. 1 and 2, may be provided for conveying objects or other materials through the spraying zone of the above described apparatus, a belt-type of conveyor being shown in the drawing, although this is merely shown by way of example, the arrangement of apparatus being somewhat diagrammatic.

If it is desired to spray, or to blend and spray, material on a surface that is not a movable object, such for example as the surface of a roadway, the apparatus shown in Fig. 3 may be provided, in which a portion of a vehicle is shown that has a tank, or container, 31 thereon for the liquid, or liquids, that are to be sprayed on the surface. Such tanks, or containers, 31 are ordinarily provided with compartments, so that if a mixture of liquids are to be mixed and sprayed, suitable compartments can be filled therewith and the liquid conducted to a manifold 32, from which the pipes 14', corresponding to the inlet conduits 14, shown in Figs. 1 and 2, extend to the impeller casings 11 made as described in Figs. 1 and 2, and having rotary impeller members that are driven in any suitable manner by means of a common shaft 18', and discharge through the openings 24 after whipping the material about in the casings made up of the members 11 and causing inter-engaging streams thereof to cooperate to blend and spray, or merely to finely divide or atomize and spray the material from the casings through the discharge openings 24 onto a surface 33 that is to be impregnated or coated with the desired material. Any number of the casings with the rotary impellers therein may be provided, and any suitable means for rotating the shaft 18' may be provided, which may be driven with the vehicle wheels 34 or independently thereof. Also the liquid that is sprayed may be of a very thick character, such that in order for it to flow through the conduits it must be pre-heated, and this can be done by either any well known heating means within the tank, or con-

tainer, or prior to being put in the tank, or container.

In carrying out the methods by either form of the apparatus shown, the material that is to be blended, or the material that is to be sprayed, or the material that is to be blended and sprayed, is fed into engagement with the rotative impelling means to set up a violent whirling, or centrifugal whipping motion thereof, to cause the same to be thrown outwardly away from the center of rotation. As will be noted, the impelling means is mounted within a confined space, or chamber, so that the material, when caused to rotate at a rapid rate, or speed, is centrifugally thrown against the walls of the confining means, or chamber, so as to violently engage or bombard the same. The use of the centrifugal force produces the bombardment of the material against the walls of the chamber within which the rotative movement takes place, the centrifugal action and bombardment and the resulting interengaging streams of material cooperating to finely divide the material that is being whirled about in the chamber. The material can be either a liquid, a powder, or a liquid and a powder, or a plurality of liquids or powders. If a single liquid or a single powder, is whirled about in the chamber, or confined space, it is finely divided and substantially converted into a mist-like condition, whereby the same can be readily discharged in the form of a spray under centrifugal force from the chamber onto a surface, or an object, or some other material, to coat, or impregnate the same by centrifugally impelling the same during and after the engagement of said streams. If more than one liquid, either of which or both can be viscous, or of a thick, sticky, or gummy character, are treated in the above referred to manner by being introduced into the chamber simultaneously or in a mixed condition, said liquids are blended into a substantially homogeneous blend of the liquids so whirled in the chamber. In a similar manner, powdered materials and liquids, or a plurality of powders, can be blended into a homogeneous, or substantially homogeneous, form in this manner.

In any case, a mist-like vapor, or fog is formed thereof, which is discharged while under the centrifugal force created by continuing to rotatively impel the same until discharged from the chamber, either onto a material that is to be coated or impregnated therewith, or onto some surface where the material can be collected.

In the form of apparatus shown in Figs. 1 and 2 of the drawing the material, or materials, can be discharged from the chamber onto either pieces of solid material of relatively large character, which are to be coated, or impregnated, therewith, or more finely divided solid material, such for example, as sawdust, which can be impregnated with oils, or other similar materials, discharged onto the same under centrifugal force to form sweeping compounds, or similar materials. Or if desired, in the case of a sweeping compound, the sawdust, or similar material, can be introduced as finely divided solid material with the oil, or similar material, with which it is to be impregnated, into the whirls in the chamber and whirled about therein to thus blend the oil and the sawdust thoroughly, so that the material will discharge in the form of a sweeping compound from the discharge opening of the chamber and can be carried away

progressively as it is discharged on conveying means such as shown in Figs. 1 and 2.

In blending such materials as heavy viscous syrups, such as molasses, honey, and similar viscous, sticky, materials, and lighter grade syrups or other liquids with which the same are to be blended, these can be whirled about in the centrifugal whirls and then streams of the materials directed substantially transversely of the direction of the centrifugal force into inter-engagement with each other, resulting in a uniform or homogeneous blend of the more viscous and less viscous liquids.

Oils can be similarly blended, such as lubricating oils, which are ordinarily made up of a heavy viscous ingredient and a lighter gravity ingredient.

If desired, the material that is to be treated can be heated either before or after treatment. The heating is not necessary to obtain the blending of the materials nor to spray the material or impregnate other materials therewith. However, in the case of some highly viscous, sticky materials, such as tarry materials, thick oils or thick syrupy viscous liquids, the flow thereof into the apparatus is simplified by heating the material, so as to increase the mobility thereof and cause the same to flow into the whirls more readily. In materials that are gummy or fibrous, the fibre, tissue and gum contained therein are broken up due to a shearing action between the rotating impelling means and the walls of the chamber, thus further aiding in the fine division of the material and causing the same to be prepared for being thrown about under centrifugal force and streams thereof engaged with each other to more finely divide or blend the same while in finely divided condition. Thus in applying oil or tarry materials to roadways, such materials, even though applied hot in the manner which has been customary, the same will stand in pools and gradually soak into the roadway. This makes it necessary to either abandon use of the roadway until a large part of the material has soaked into the roadway, or to cover the same with sand or other materials to reduce hazards created by the material that is standing on the roadway in pools. By my improved method this is avoided, as the oil or tarry material is so finely divided and discharged under such high velocity while in such finely divided condition, that there will be no collection of the same in pools, but it will be applied uniformly on the surface and will be absorbed into the absorbent surface of the roadway at the time of application much more deeply than it would ordinarily penetrate by a soaking process, and there will thus be no tar or similar material, or oil, on the surface of the roadway while the actual improvement of the roadway by impregnation of the oil or tar in the surface of the roadway will be increased over what would be true if it were merely applied by ordinary application thereof in fine streams, as is now customary. The material, if subjected to my method of applying the same to a roadway surface, will be continuously subjected to centrifugal whirling action until discharged under centrifugal force from the periphery of the final whirl onto the surface that is to be impregnated and is discharged onto such surface at a high enough velocity that it will be absorbed into the roadway practically as rapidly as it is sprayed thereon.

The rate of rotation of the impelling means to obtain the desired breaking down and fine division of the material depends upon the charac-

ter of the liquid or other material that is to be treated, and the rate at which the material is fed into the confined space in which the same is whirled. Thus a light liquid at a certain rate of rotation and rate of feed will be so finely divided and broken up as to turn it into substantially a vapor, and will be discharged or sprayed in substantially such vaporous form, and in that case the blending of the liquids will take place in such vaporized condition. A heavy viscous liquid at the same rate of rotation and same rate of feed will be only so finely divided and broken up that it will be more fluid, but will not be reduced to a vapor, although in a somewhat atomized condition. If the heavy viscous liquid is fed into a chamber at a slower rate and the same rate of rotation is used, or if the same rate of feed and a higher rate of rotation is used, the highly viscous liquid can also be ordinarily vaporized. It has been found that the impelling action on liquids must be at a rate of about 2,000 revolutions a minute or more, to get the desired breaking down and fine division of the material to change the characteristics thereof. Also the rate of feed must be such that there will be sufficient room in the chamber in which the material is rotatively impelled that the same can be whipped and violently thrown about therein and bombarded against the walls of the chamber by centrifugal force, and so that the material will not engage in solid streams transversely of the direction of centrifugal force, but in finely divided, substantially vaporized form in streams. There must never be a solid mass of liquid in the chamber or anything approaching a solid mass, or complete filling of the chamber. This is true of any of the materials previously mentioned. Also the chamber walls should closely conform to the path of the impelling means, so as to obtain the disintegration by a shearing action, above referred to. In using the terms "vapor," "vaporous," and "vaporization" these are not used in the narrow sense of a vapor being a substance in a gaseous state, but rather in the sense of a diffused substance suspended in a gas, such as air.

By the discharge of the material under the influence of centrifugal force that is created by the violent rotative impelling, or whipping of the same during and after engagement of said streams, the liquid, or blend of materials, or finely divided powdered material, will more deeply penetrate the material to which it is applied and will, particularly in the case of a liquid, be not only more finely divided so as to make the liquid more penetrative, but due to the centrifugal force created by the final whirling or whipping action, will be physically forced into the surface to which it is applied.

While one form of apparatus is illustrated, the particular shape of the surface of the rotor, or impelling member, is not important to the process. It is, however, important that the impelling member, whatever the shape, conform closely to the confining walls of the chamber or space in which the same rotates. Furthermore it is important that a very narrow passage be provided between the impelling member and the chamber, so as to force the material through such narrow passages under the rotative action of the impelling means to more finely divide and disintegrate the same. Furthermore it is desirable that the chamber be freely open to the atmosphere and that the discharge opening therefrom be unrestricted, as the air picked up and allowed to pass into the chamber appears to aid in the

blending of the materials and in the forming of a vapor or substantially vaporous spray thereof. Furthermore it is necessary, in order to get the desired blending and spraying effect of the method, to provide some means for rotatively impelling the materials in such a manner that inter-engaging streams thereof will engage with each other after the material has been subjected to a rotative action creating centrifugal force in the whirl of the material, and, preferably, the material is further subjected to centrifugal force until it is discharged from the confining means, to get the desired spraying and impregnating action.

What I claim is:

1. The method of spraying a mobile material comprising separately rotatively impelling a plurality of portions of said material in a confined space at a rapid rate to create separate whirls thereof in said space, creating streams of said portions adjacent the peripheries of said whirls, violently engaging said streams with each other, and at the same time imparting additional rotative impelling movement thereto to create a mist-like spray, and discharging said spray under the influence of the centrifugal force resulting from the said additional rotative impelling movement.

2. The method of spraying a mobile material comprising dividing said material into a plurality of portions, separately introducing each of said portions into a confined space, rotatively impelling separately from one another each of said portions at a rapid rate to create a whirl thereof in said space, creating streams of said portions adjacent the peripheries of said whirls, violently engaging said streams with each other, and at the same time imparting additional rotative impelling movement thereto to create a mist-like spray, and discharging said spray under the influence of the centrifugal force resulting from the said additional rotative impelling movement.

3. The method of applying a mobile material to a surface, comprising rotatively impelling separately from one another a plurality of portions of said material at a rapid rate to create separate whirls thereof in said space about an axis substantially parallel to said surface, creating streams of said portions adjacent the peripheries of said whirls, violently engaging said streams with each other, and at the same time imparting additional rotative impelling movement thereto to create a mist-like spray, and discharging said spray under the influence of the centrifugal force resulting from the said additional rotative impelling movement while moving said axis relative to said surface substantially parallel to said surface.

4. The method of impregnating a material with a liquid, comprising dividing said liquid into a plurality of portions and introducing each of said portions into a confined space, rotatively impelling separately from one another each of said portions at a rapid rate to create a whirl thereof in said space, creating streams of said portions adjacent the peripheries of said whirls, violently engaging said streams with each other, and at the same time imparting additional rotative impelling movement thereto to create a mist-like spray, and discharging said spray under the influence of the centrifugal force resulting from the said additional rotative impelling movement.

5. The method of applying a liquid to a surface comprising dividing said liquid into a plurality of portions, separately introducing each of said portions into a confined space, rotatively im-

PELLING separately from one another each of said portions at a rapid rate to create a whirl thereof in said space about an axis substantially parallel to said surface, creating streams of said portions adjacent the peripheries of said whirls, violently engaging said streams with each other, and at the same time imparting additional rotative impelling movement thereto to create a mist-like spray, and discharging said spray under the influence of the centrifugal force resulting from the said additional rotative impelling movement while moving said axis relative to said surface substantially parallel to said surface.

6. The method of applying a thick viscous liquid to a surface comprising dividing said liquid into a plurality of portions, separately introducing each of said portions into a confined space, rotatively impelling separately from one another each of said portions at a rapid rate to create a whirl thereof in said space about an axis substantially parallel to said surface, forcing said liquid through narrow spaces while being whirled to break up the same, creating streams of said portions adjacent the peripheries of said whirls, violently engaging said streams with each other, and at the same time imparting additional rotative impelling movement thereto to create a mist-like spray, and discharging said spray under the influence of the centrifugal force resulting from the said additional rotative impelling movement while moving said axis relative to said surface substantially parallel to said surface.

7. The method of applying a thick viscous liquid to an absorbent surface, comprising dividing said liquid into a plurality of portions, separately introducing each of said portions into a confined space, rotatively impelling separately from one another each of said portions at a rapid rate to create a whirl thereof in said space about an axis substantially parallel to said surface, violently impinging said material against walls defining said space under the influence of the centrifugal force of said whirl and forcing said liquid through narrow spaces while being whirled to break up the same, creating streams of said portions adjacent the peripheries of said whirls, violently engaging said streams with each other, and at the same time imparting additional rotative impelling movement thereto to create a mist-like spray, and discharging said spray under the influence of the centrifugal force resulting from the said additional rotative impelling movement while moving said axis relative to said surface substantially parallel to said surface.

8. The method of oiling a road comprising introducing a thick oil into a confined space, rotatively impelling said oil in said space about an axis substantially parallel to the surface of said road in the presence of air and at substantially atmospheric pressure and violently engaging said oil with walls of said space while under the influence of the centrifugal force of said rotation to create a centrifugal whirl of said oil in a mist-like state, and imparting additional rotative impelling movement to said oil in said mist-like state to create a spray, discharging said spray under the influence of the centrifugal force resulting from the said additional rotative impelling movement onto an absorbent road surface while moving said axis substantially parallel to said surface.

9. The method of blending a plurality of different mobile materials comprising separately rotatively impelling a plurality of portions of a mixture of said materials in a confined space at a

rapid rate to create whirls thereof in said space, creating streams of said portions adjacent the peripheries of said whirls, violently engaging said streams with each other and at the same time imparting additional rotative impelling movement thereto to finely divide and uniformly blend said materials in finely divided form.

10. The method of blending a plurality of different mobile materials including a finely divided absorbent material and a liquid comprising separately rotatively impelling a plurality of portions of a mixture of said materials at a rapid rate to create whirls thereof in said space, creating streams of said portions adjacent the peripheries of said whirls, and violently engaging said streams with each other and at the same time imparting additional rotative impelling movement thereto to finely divide and uniformly blend said materials in finely divided form.

11. The method of blending a plurality of different liquids comprising dividing a mixture of said liquids into a plurality of portions, separately introducing each of said portions into a confined space, rotatively impelling separately from one another each of said portions at a rapid rate to create streams of said portions adjacent the peripheries of said whirls, violently engaging said streams with each other and at the same time imparting additional rotative impelling movement thereto to create a mist-like vapor thereof and uniformly blend said liquids in a mist-like condition.

12. The method of blending a plurality of liquids of different mobility including a thick, viscous liquid, comprising dividing a mixture of said liquids into a plurality of portions, separately introducing each of said portions into a confined space, rotatively impelling separately from one another each of said portions at a rapid rate to create a whirl thereof in said space, forcing said liquid through narrow spaces while being whirled to break up said viscous liquid, creating streams of said portions adjacent the peripheries of said whirls, violently engaging said streams with each other and at the same time imparting additional rotative impelling movement thereto to create a mist-like vapor thereof and uniformly blend said liquids in a mist-like condition.

13. The method of spraying a blend of a plurality of different mobile materials comprising dividing a mixture of said materials into a plurality of portions and introducing each of said portions into a confined space, rotatively impelling separately from one another each of said portions at a rapid rate to create a whirl thereof in said space, creating streams of said portions adjacent the peripheries of said whirls, violently engaging said streams with each other, and at the same time imparting additional rotative impelling movement thereto to finely divide and uniformly blend said materials and create a mist-like spray, and discharging said spray under the influence of the centrifugal force resulting from the said additional rotative impelling movement.

14. The method of applying a blend of different mobile materials to a surface, comprising dividing a mixture of said materials into a plurality of portions and introducing each of said portions into a confined space, rotatively impelling separately from one another each of said portions at a rapid rate to create a whirl thereof in said space about an axis substantially parallel to said surface, creating streams of said portions adjacent the peripheries of said whirls, violently engaging said streams with each other and at the

same time imparting additional rotative impelling movement thereto to finely divide and uniformly blend said materials and create a mist-like spray, and discharging said spray under the influence of the centrifugal force resulting from the said additional rotative impelling movement onto said surface.

15. The method of blending a plurality of different mobile materials including a thick viscous liquid, comprising heating said liquid, dividing a mixture of said materials into a plurality of portions and introducing each of said portions into a confined space, rotatively impelling separately from one another each of said portions at a rapid rate to create a whirl thereof in said space, creating streams of said portions adjacent the peripheries of said whirls, and violently engaging said streams with each other, and at the same time imparting additional rotative impelling movement thereto to finely divide and uniformly blend said materials in finely divided form.

16. The method of impregnating an absorbent surface with a thick viscous liquid, comprising heating said liquid, dividing said liquid into a plurality of portions and introducing each of said portions into a confined space, rotatively impelling separately from one another each of said portions at a rapid rate to create a whirl thereof in said space about an axis substantially parallel to said surface, creating streams of said portions adjacent the peripheries of said whirls, violently engaging said streams with each other, and at the same time imparting additional rotative impelling movement thereto to create a mist-like spray, and discharging said spray under the in-

fluence of the centrifugal force resulting from the said additional rotative impelling movement while moving said axis relative to said surface substantially parallel to said surface.

17. The method of oiling a road having an absorbent surface, comprising heating the oil, dividing said oil into a plurality of portions and introducing each of said portions into a confined space, rotatively impelling separately from one another each of said portions at a rapid rate to create a whirl thereof in said space about an axis substantially parallel to said surface, creating streams of said portions adjacent the peripheries of said whirls, violently engaging said streams with each other, and at the same time imparting additional rotative impelling movement thereto to create a mist-like spray, and discharging said spray under the influence of the centrifugal force resulting from the said additional rotative impelling movement while moving said axis relative to said surface substantially parallel to said surface.

18. In a method of the character described, separately rotatively impelling a plurality of portions of a mobile material in a confined space at a rapid rate to create separate whirls thereof in said space, creating streams of said portions adjacent the peripheries of said whirls, violently engaging said streams with each other, and at the same time imparting additional rotative impelling movement thereto to create a mist-like spray, and discharging said spray under the influence of the centrifugal force resulting from the said additional rotative impelling movement.

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