M. E. GATES.

FLUID CONTROLLING DEVICE.

APPLICATION FILED APR. 28, 1920.

1,427,455.

Patented Aug. 29, 1922.

2 SHEETS—SHEET 1.

Fig. 1.

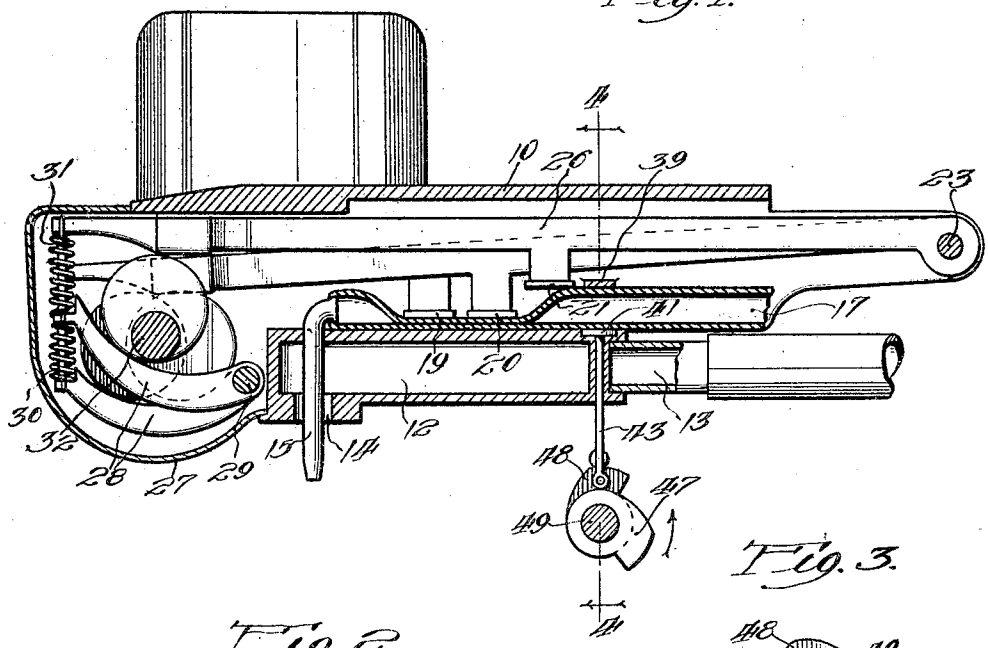


Fig. 3.

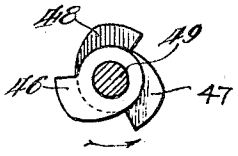
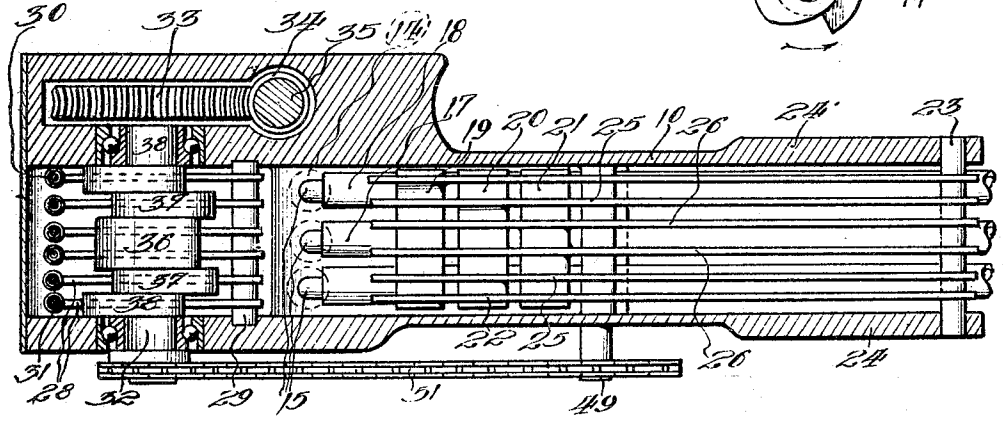


Fig. 2.



Witness:

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2 SHEETS—SHEET 2.

Fig. 4.

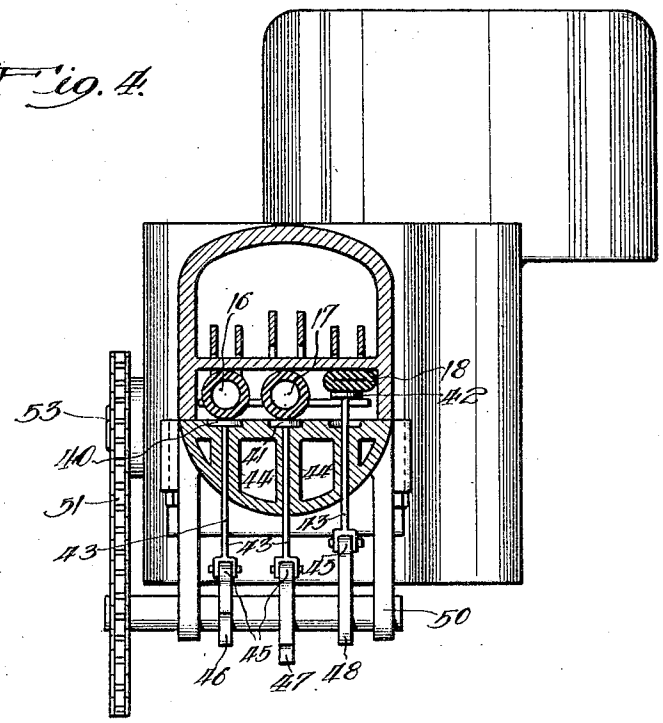
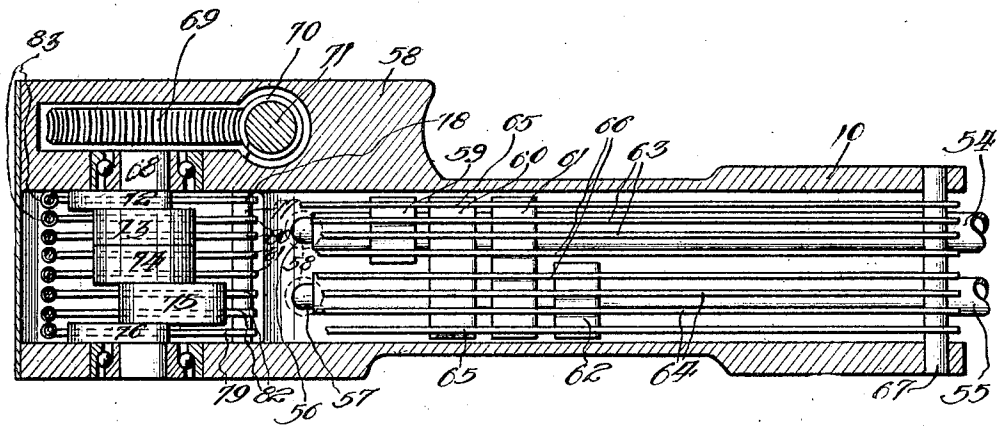


Fig. 5.



Witness:

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UNITED STATES PATENT OFFICE.

MAJOR E. GATES, OF TERRA COTTA, ILLINOIS.

FLUID-CONTROLLING DEVICE.

1,427,455. Specification of Letters Patent. Patented Aug. 29, 1922.

Application filed April 28, 1920. Serial No. 377,342.

To all whom it may concern:

Be it known that I, MAJOR E. GATES, a citizen of the United States, residing at Terra Cotta, in the county of McHenry and State of Illinois, have invented a new and useful Improvement in Fluid-Controlling Devices, of which the following is a specification.

My invention relates, more particularly, to devices for producing the flow, in a desired manner, of fluids, it having been devised for use, more particularly, but not to the exclusion of other uses, in the manufacturing of surfacings presenting a mottled, or speckled, appearance and produced by the projection of bodies of coating fluid against the object on which the surfacing is to be produced, as for example terra cotta blocks, the best effects being obtained by applying to the foundational body on which the surfacing is to be produced, the material to produce the speckled, or mottled, effect by an intermittent discharge of such material against the foundation, this being accomplished by the use of my invention.

One of my objects is to produce the intermittent, or pulsating action referred to, under the control of the operator and to provide for such action by a novel, simple and economical construction of device which, by preference may be caused to discharge a plurality of coating fluids, as for example of different color, against the body to be surfaced. Another object is to provide for the projection of the coating fluid against the object to be surfaced, in a form of separated bodies of any desired dimensions ranging from relatively small bodies to relatively large bodies as compared with those produced by the ordinary atomizing action, and cause such bodies to strike the object to be surfaced with sufficient force to cause them to become flattened on the object and in such condition, without running thereon, become set. Another object is to cause the projection of the coating bodies, either of one color or tone of fluid or of different colors or tones of fluid to be projected against the object by a constantly maintained measured flow, under the control of the operator. Another object is to cause the fluids, where a plurality are used of different colors or tones, to be projected against the object in separated bodies under such conditions that the bodies at intervals on the object will be caused to be relatively grouped, thereby to produce a mottled, or speckled, effect which may be observed from a considerable distance. Another object is to produce a multi-colored surfacing which shall present an appearance of relatively great depth, closely resembling the appearance presented by a body of non-surfaced material and presenting a speckled, or mottled, effect.

Another object is to provide for the production of surfacings presenting different appearances, by causing the fluids, of different colors, to be projected against the object by an irregular flow, yet measured, and other objects, in so far as the invention is used in the production of surfacings, as will be apparent from the following. Another phase of the invention relates to the pumping of fluids, irrespective of the particular use to which the fluids are placed, and in this connection my primary purpose is to provide a novel, simple, economical and positively operating device for this purpose.

Referring to the accompanying drawings:—

Figure 1 shows, by a longitudinal sectional view, a device constructed in accordance with my invention and designed, more particularly for the production of mottled, or speckled surfacings produced by the application to the object to be surfaced, of bodies of coating fluids of different colors or tones. Figure 2 is a plan sectional view of the device of Fig. 1, with certain parts broken away. Figure 3 is a view in end elevation of certain cam devices which may be employed, the shaft carrying them being shown in section, with the section taken at the line 3 on Fig. 4 and viewed in the direction of the arrow. Figure 4 is a section taken at the line 4 on Fig. 1 and viewed in the direction of the arrow; and Figure 5 a view like Fig. 2, of a modification of the structure shown therein.

The particular construction of device illustrated is formed of a casing 10 shown as formed of a casting open at its opposite ends and provided with a diaphragm 11 forming with other parts of the casing 10 a passage 12 for compressed air, this passage containing at one end a pipe section 13 adapted to be connected at its outer end with any suitable supply of gaseous fluid under pressure, as for example compressed air. The passage 12 at its opposite end contains a plurality of

restricted outlets 14 shown as extending at an angle to the direction in which the air flows through the main portion of the passage 12. In this construction provision is made for discharging in a plurality of streams, the coating fluids of different colors, or tones, from the device, the pipes through which these streams discharge being represented at 15, there being three of these pipes shown, which extend crosswise through the passage 12 and through the several outlets 14 for the compressed air, from the walls of which latter the pipes 15 are spaced as shown. The other ends of the pipes 15 connect with the ends of flexible tubes 16, 17 and 18, as for example of common heavy rubber tubing, which lead from suitable sources of the coating fluids, of different colors, or tones, to be applied to the surface on which the mottled effect is to be produced.

The sources of the material are not shown, but the material may either flow to the device or be drawn to the latter by the action of the device as desired. Thus it may be provided in receptacles arranged either above the device now being described, in which case the coating material would flow to the device under a head, or on the same level as the outer ends of the tubes 16, 17 and 18, or below such level, and in the two latter instances provision may be made, or not, as desired, for forcing the fluid to the said device. The outer ends of the tubes 16, 17 and 18 extend along the top of the partition 11 which latter thereby forms a support for these tubes in the operation of the mechanism hereinafter described for effecting the discharge of the coating material through these tubes and their outlet pipes 15 in the desired manner. The mechanism just referred to is formed, in the particular construction illustrated, with three presser devices 19, 20 and 21 shown in the form of plates which extend transversely of the tubes 16, 17 and 18 and across the tops thereof. The plate 19 is carried by a pair of levers 22 located within the casing 10 and pivoted each at one end, on a shaft 23 mounted in opposed extensions 24 provided as a part of the casing 10. The plate 20 is connected with a pair of levers 25 likewise pivoted, each at one end, on the shaft 23; and the plate 21 is connected with a pair of levers 26 also each pivoted at one end on the shaft 23, these various sets of levers being independently movable on the shaft 15. The opposite end of the casing 10 is equipped with a housing member 27, within which are located a plurality of rocker-arms 28, shown as six in number to correspond with the number of levers 22, 25 and 26 beneath which they are directly positioned, respectively, as shown, these rocker-arms being pivoted on a shaft 29 secured in the sides of the casing 10, and with their outer extremities connected through the medium of tension springs 30, with the several levers 22, 25 and 26 directly above them, each of the rocker-arms 28 being provided with a pin 31 extending upwardly through the spring and adapted to co-operate with the under side of the respective one of the levers with which the spring, enclosing it, co-operates. Extending through the spaces between the various levers referred to and the rocker-arms 28, is a shaft 32 journaled at its opposite ends in the sides of the casing 10 and adapted to be driven, as through the worm wheel 33 secured thereon and meshing with a worm 34 on a shaft 35 driven in any suitable manner (not shown). The shaft 32 is provided with a plurality of eccentrics, one of which, represented at 36, extends immediately above the two central rocker-arms 28 connected with the two levers 26, two of which represented at 37, extend above the rocker-arms 28 to which the respective levers 25 are connected, and two more of which, represented at 38, extend above the two rocker-arms 28 with which the levers 22 are respectively connected, the two eccentrics 37 occupying the same angular position on the shaft and the two eccentrics 38 occupying the same angular position, the eccentric 36 and the two sets of eccentrics 37 and 38 occupying different angular positions about the shaft, in the arrangement shown being positioned about the shaft at an angle of 120° to each other. The described arrangement of the eccentrics is such that in their movement, in the rotation of the shaft 32 in anti-clockwise direction in Fig. 1, they will successively operate the several pairs of rocker-arms 28 which through the described spring connections with the various sets of levers described, cause the presser devices 21, 20 and 19 to close the tubes 16, 17 and 18 at points immediately beneath them in succession, the arrangement being such that at no time are all of the presser devices in a position in which the tubes 16, 17 and 18 immediately beneath them, are open, it being understood that the tubes 16, 17 and 18, by reason of their resiliency expand as the respective presser devices rise relative to these tubes.

Associated with the mechanism described, are means adapted to operate on the tubes 16, 17 and 18 and effect control of the flow of fluid therethrough, auxiliary to the action of the mechanism hereinbefore described and for the purpose hereinafter explained, these means comprising a stationary bar 39 carried by the casing 10 and extending across the tops of the tubes 16, 17 and 18, and presser devices 40, 41 and 42 located immediately beneath the tubes 16, 17 and 18, respectively, and carried on the

upper ends of rods 43 which are slidable in webs 44 in the casing 10, the rods 43 having rollers 45 at their lower ends at which they bear against the peripheries of cams 46, 47 and 48 rigidly secured to a shaft 49 journaled in brackets 50 extending from the casing 10, these cams occupying different angular positions about the shaft 49 preferably 120° apart as represented. The shaft 49 is driven through the medium of a sprocket chain 51 passing over sprockets 52 and 53 on the shafts 49 and 32 respectively.

The operation of the mechanism involving the presser devices 19, 20 and 21 and the operating mechanism therefor, is as follows: Assuming the parts to be in the position shown in the drawings, wherein the presser devices 19 and 20, by reason of the illustrated position of the eccentrics 37 and 38 are in lowermost position in which the tubes 16, 17 and 18 are closed at the portions thereof beneath these presser devices, and the presser device 21 is raised, the continued rotation of the shaft 32 in anti-clockwise direction in Fig. 1 first causes the eccentrics 37 to move against the under sides of the levers 25 and in a direction away from the rocker-arms 28 immediately beneath them, thereby lifting these levers to raise the presser foot 20 which permits the tubes 16, 17 and 18 to expand at these points. During this movement of the eccentric 37, the eccentric 36 moves into engagement with the rocker-arms 28 immediately beneath it, with the result of causing these rocker-arms and the levers 26 to lower by reason of the spring connections between these rocker-arms and levers, forcing the presser foot 21 against the tubes 16, 17 and 18 with sufficient pressure to close the tubes at these points, these spring connections elongating in this operation, and the arrangement of the parts being preferably as shown by which the levers 26 move downwardly a slight distance only before the levers 25 have reached their uppermost position. Further movement of the shaft 32 in anti-clockwise direction in Fig. 1 operates to move the eccentrics 38 into engagement with the levers 22 immediately above them thereby operating to raise the presser device 19. In the continued movement of the shaft 28 the eccentrics 37 operate to force the presser device 20 against the tubes 16, 17 and 18, while the presser device 21 holds these tubes closed at the portions thereof immediately below it, the presser device 19 thereafter moving against the tubes 16, 17 and 18, the presser device 21 moving to the position shown in Fig. 1 after the presser device 20 has closed the tubes beneath the latter. The arrangement of the eccentrics referred to, relative to the presser devices 19, 20 and 21 is such, as shown, that at all times one of the presser devices closes the tubes 16, 17 and 18 and these presser devices are operated in succession from the right to the left in Fig. 1, these successive operations of the presser devices as stated serving to produce a pulsating action on the fluids in the tubes thereby to cause the fluids to be intermittently projected through the outlets of the pipes 15 where the coating fluids are supplied to the presser devices through the tubes 16, 17 and 18 by pressure produced by gravity flow, or otherwise, the operation of the presser devices 19, 20 and 21 serving to control the discharge of the fluids through the pipes 15 and causing the fluids to discharge from these pipes intermittently, the fluids spurting from the outlets of these pipes intermittently and thereby causing the fluids to issue in separated bodies of relatively large size, depending upon the dimensions of the various parts, as compared with the size of the bodies resulting from the subjection of such fluid to an atomizing action. Where the supply of coating fluids is not supplied to the presser devices 16, 17 and 18 under pressure, as for example where it is located in tanks below these presser devices and does not flow thereto under pressure, the device operates to cause the fluids to flow to the device and forces the fluids out through the pipes 15 as stated. In the case of the use of the device with supplies of coating fluids under conditions requiring the drawing of the coating fluids to these presser devices, as stated, the result above explained is due to the operation of the presser devices 16, 17 and 18 in succession, and in the timed relation as stated, due to the fact that in the operation of these presser devices they are operated in succession from a position in which the tubes 16, 17 and 18 are closed, to a position in which these tubes are open, from the right hand toward the left hand end of the series in Fig. 1, thereby forcing the fluids along the tubes to the left in this figure in such operation producing, by the expanding of these tubes to normal condition, after being contracted, the reduction in fluid pressure at this point which operates to cause the fluids to flow to the left through the tubes 16, 17 and 18. While under some conditions the discharge of the coating fluids from the pipes 15 by the action of the presser devices 16, 17 and 18 alone, may be sufficient to effect the delivery to the surface to be coated, of the coating bodies of the desired size and in the desired flattened condition against the surface, it is preferred that there be associated with the coating fluids discharged through the pipes 15, any suitable gaseous fluid under pressure, as for example, and by preference, compressed air as hereinbefore referred to, which is caused to flow in the direction of movement of the coating fluids discharging from the pipes 15, in en-

veloping relation to the coating fluids, and preferably at a greater velocity than that at which the coating fluids discharge from the pipes 15, the primary purpose being to present between the bodies of coating fluid and the atmosphere, in the movement of the streams of separated bodies of the coating fluids, from the device to the object to be coated, a protecting envelope, whereby the breaking up of these bodies into relatively finely divided condition, by the propulsion thereof against the resistance of the air, as would occur if such shielding means were not provided, is avoided. Where conditions are such that it is desirable, or necessary, that the coating fluids as they issue from the pipes 15, as stated, be subjected to an accelerating action, the fluid pressure discharged through the openings 14 may be under such pressure that it will operate on the separated bodies of coating fluids to accelerate their movement toward the object to which they are to be applied, this accelerating action being in the nature of a boosting action. In accordance with the preferred manner of operating the device such boosting fluid pressure is applied adjacent the outlets of the pipes 15 and such use thereof as to break up the separated bodies of coating fluid, as they issue from the pipes 15 into such small bodies as are produced when a stream of fluid is subjected to an atomizing action, is to be avoided. However, in so far as a certain phase of my invention is concerned, it is within my invention to provide such a pressure and flow of fluid-pressure that the bodies of coating fluid delivered with each pulsating action of the device, through the outlets 15, are reduced to finely divided condition resembling those produced by an atomizing action, the device in so operating presenting an advantage over the use of an atomizing action alone, in that the fluid is propelled through the outlets by a force which alone would cause the fluid to be spurted from the device toward the object against which it is to be applied.

Furthermore, as regards the feature of producing and maintaining accurate measured flow of the coating fluids as is possible in the arrangement disclosed, this feature may be used, within my invention, regardless of the manner of effecting the delivery of the bodies of coating fluid to the object to be coated, and regardless of the variation in the regularity of, yet measured, flow hereinafter referred to.

As will be understood from the drawings, the outlets of the pipes 15 are grouped relatively closely together, this being the preferable arrangement, whereby the streams of separated bodies of the coating fluids strike the object to be coated and against which they will discharge (preferably by the operator holding the device by grasping it at the casing thereof) at closely adjacent portions of such surface, some of the bodies of coating fluids becoming commingled with others of such bodies which produces a cluster-effect at different points on the surface, the appearance produced being that of a mottled surface of considerable depth.

It will be understood that surfacing effects of widely differing character may be produced, as for example by varying the dimensions of the parts of the device, and the fluid-pressure employed, which causes the sizes of the bodies of coating fluid delivered to the object to vary. Furthermore widely different surfacing effects may be produced by the employment of mechanism, auxiliary to the presser-devices herein first described, as for example that formed of the presser devices 40, 41 and 42, the operation of which in the particular arrangement shown causes the several streams of bodies to irregularly discharge, but by a measured flow, from the device. The mechanism just referred to as shown is merely illustrative of means for producing variation in the control of the streams, it being readily understood that by omitting certain of the cams on the shaft 49, or varying their shape, or the timed operation thereof, relative to each other, as shown, a great variety of surfacing effects may be produced.

In Fig. 5 I have shown by way of illustration an arrangement of parts whereby a variation in the discharge of fluids from a plurality of conduits may be accomplished in a different manner than shown in the preceding figures. In this particular arrangement two flexible conduits, like the conduits, 16, 17 and 18 are provided, these conduits being represented at 54 and 55, with their discharge pipes 56 and 57 like the pipes 15, projecting through openings 58 and corresponding with the openings 14. In this construction four presser devices, 59, 60, 61 and 62 are provided, the presser device 59 co-operating with the pipe 54 only, the presser device 62 with the pipe 55 only and the presser devices 60 and 61 located between the presser devices 59 and 62 co-operating with both of the pipes 54 and 55 to operate to collapse these tubes as explained of the presser devices of the preceding figures. The presser 59 is carried on a plurality of levers 63, the presser device 62 is carried on a plurality of levers 64, the presser device 60 on a plurality of levers 65 and the presser device 61 on a plurality of levers 66, these levers being pivoted on a shaft 67 secured in the casing 10. These various levers extend to the left in Fig. 5 (these levers being shown broken away in this figure as they are in Fig. 2) over eccentrics mounted on a shaft 68 and corresponding with the shaft 32 and driven through

the medium of a worm-wheel 69 operated by a worm 70 on the shaft 71 driven in any suitable manner. The eccentrics are indicated at 72, 73, 74, 75 and 76, the eccentrics 72 and 76 occupying the same angular position about the shaft 68, and the eccentrics 73, 74 and 75 occupying different angular positions about the shaft, preferably 90° apart, the eccentric 73 extending upwardly and the eccentric 74 extending downwardly. The eccentrics 72 to 76 co-operate with the various levers described to operate the latter by the same kind of an action as explained of the eccentrics in the preceding figures, the eccentrics 72 and 76 extending beneath the levers 65, the eccentric 73 beneath the levers 63, the eccentric 74 beneath the levers 66 and the eccentric 75 beneath the levers 64. Extending below the eccentrics referred to are a series of rocker-arms pivotally supported on a shaft 77 corresponding with the shaft 29, these rocker-arms corresponding with the arms 68 and being provided as follows: One of these rocker-arms represented at 78 extends beneath the eccentrics 72, another rocker-arm 79 extends below the eccentric 76, a pair of these rocker-arms represented at 80 extend beneath the eccentric 73, another pair of these rocker-arms represented at 81 extend beneath the eccentric 74 and another pair of these rocker-arms represented at 82 extend beneath the eccentric 75, the outer ends of these rocker-arms connecting, by means of coil spring devices 83 like the springs 31, with the levers immediately above them as in the case of the structure of the preceding figures. Thus the rocker-arms 78 and 79 are connected with the two levers 65 respectively; the rocker-arms 80 are connected with the levers 63 respectively; the rocker-arms 81 are connected with the levers 66, respectively; and the rocker-arms 82 are connected with the levers 64, respectively.

In the rotation of the shaft 68, as will be readily understood, the presser devices are operated in succession from the right hand toward the left hand side of Fig. 5, to effect the projection of the fluids through the outlets 57 by an intermittent action, in the same manner as explained of the construction of the preceding figures, except that by arranging the presser devices as shown, the projection of the fluids through the conduits 54 and 55 occurs alternately instead of the projection from these tubes occurring simultaneously, whereby the bodies of coating fluids discharged against the object on which the surfacing is to be applied, from the conduit 54 do not strike the object at the same time that the bodies discharged from the conduit 55, whereby a different effect is produced than in the case where they are discharged simultaneously. It will be understood that such means for producing variation in discharge may, if desired, be used in connection with an auxiliary control mechanism such for example as that shown in the preceding figures and comprising the presser devices 40, 41 and 42.

Under some conditions of use, and as bearing on certain phases of my invention, it may be found desirable, where the fluid, or fluids, are supplied to the device under pressure, to employ a single presser device only for co-operation with the fluid conduit which would operate by its intermittent action to alternately open and close the conduit at the portion thereof with which it co-operates, thereby operating to cause the fluid to be projected intermittently through the conduit, such variation of the device being within certain phases of my invention, it being noted that by such a structure measured flow of the fluid may be maintained constant to an accurate degree, which is highly desirable especially in the production of surface coatings as thereby an operator is able to substantially duplicate surfacings.

While I have illustrated and described certain embodiments of my invention I do not wish to be understood as intending to limit the invention thereto as various modifications and alterations may be made without departing from the spirit of my invention.

What I claim as new, and desire to secure by Letters Patent, is:

1. In an apparatus of the character set forth, the combination of a conduit, means for producing intermittent projection of fluid through the outlet end of said conduit, and means for directing gaseous fluid under pressure into contact with the bodies of fluid discharged from said conduit to envelop the discharged fluid.

2. In an apparatus of the character set forth, the combination of a conduit having a surrounding wall, means for producing intermittent projection of the fluid through the outlet end of said conduit, and means for directing gaseous fluid under pressure into contact with the bodies of fluid discharged from said conduit to envelope the discharge fluid.

3. In an apparatus of the character set forth, the combination of a conduit having a surrounding wall, means operating to produce by pressure exerted upon the fluid, intermittent projection of the fluid through the outlet end of said conduit, and means for directing gaseous fluid under pressure into contact with the bodies of fluid discharged from said conduit to envelope the discharge fluid.

4. In an apparatus of the character set forth, the combination of a conduit, means for producing intermittent projection of fluid through the outlet end of said conduit,

and means for directing gaseous fluid under pressure and at a greater velocity than the velocity at which said bodies are discharged, into contact with said bodies in substantially the same direction as the movement of said bodies.

5. In an apparatus of the character set forth, the combination of a conduit having a surrounding wall, means for producing intermittent projection of fluid through the outlet end of said conduit, and means for directing gaseous fluid under pressure and at a greater velocity than the velocity at which said bodies are discharged, into contact with said bodies in substantially the same direction as the movement of said bodies.

6. In an apparatus of the character set forth, the combination of a conduit, means for producing intermittent projection of fluid through the outlet end of said conduit, a second conduit surrounding, at its outlet, the outlet of said first-named conduit, and means for discharging gaseous fluid under pressure through said second conduit.

7. In an apparatus of the character set forth, the combination of a conduit, means for producing intermittent projection of fluid through the outlet end of said conduit, a second conduit surrounding, at its outlet, the outlet of said first-named conduit, and means for discharging gaseous fluid under pressure through said second conduit, the outlet end of said first-named conduit extending beyond the outlet of said second conduit.

8. In an apparatus of the character set forth, the combination of a conduit, means for causing fluid to flow through said conduit intermittently in a stream of connected particles, and means for subjecting successive portions of the stream to gaseous fluid under pressure.

9. In an apparatus of the character set forth, the combination of a conduit having a surrounding wall, means for causing fluid to flow through said conduit intermittently in a stream of connected particles and in contact with the conduit throughout the area of the inner surface of the latter, and means for subjecting successive portions of the stream to gaseous fluid under pressure.

10. In an apparatus of the character set forth, the combination of a conduit, means for causing fluid to flow through said conduit intermittently in a stream of connected particles, and means for subjecting successive portions of the stream to gaseous fluid under sufficient pressure to reduce each such portions into a plurality of bodies.

11. In an apparatus of the character set forth, the combination of a conduit, means for causing fluid to flow through said conduit and maintain measured flow therethrough, and means for directing gaseous fluid under pressure into contact with the fluid.

12. In an apparatus of the character set forth, the combination of a conduit, means for causing fluid to flow through said conduit intermittently and maintain measured flow therethrough, and means for directing gaseous fluid under pressure into contact with the fluid.

13. In an apparatus of the character set forth, the combination of a conduit, means for producing intermittent projection of fluid through the outlet end of said conduit, and means for directing, at a point adjacent the discharge of the fluid from said conduit, gaseous fluid under pressure, into contact with the bodies of fluid discharged from said conduit.

14. In an apparatus of the character set forth, the combination of a conduit, means for causing fluid to discharge from the outlet end of said conduit in separated bodies, and means for causing gaseous fluid to flow substantially in the direction of movement of said bodies and in enveloping relation thereto.

15. In an apparatus of the character set forth, the combination of a conduit, means for causing fluid to be projected intermittently through the outlet end of said conduit in separated bodies, and means for subjecting the fluid to gaseous fluid under pressure directed against the fluid substantially in the direction of movement of said bodies of fluid, to blow said bodies into separated condition.

16. In an apparatus of the character set forth, the combination of a plurality of conduits, and means for maintaining simultaneous predetermined measured flow of fluids through said conduits by force within said conduits.

17. In an apparatus of the character set forth, the combination of a plurality of conduits, means for causing fluids to flow through said conduits, and means, operating automatically, to cause variations in the flow of the fluids relative to each other.

18. In an apparatus of the character set forth, the combination of a plurality of conduits, means for causing fluids to flow through said conduits, and means, operating automatically, to cause the timing of the flow of the streams of fluid relative to each other.

19. In an apparatus of the character set forth, the combination of a plurality of conduits, means for causing fluids to be projected intermittently from said conduits, and means, operating automatically, to cause variations in the flow of the fluids relative to each other.

20. In apparatus of the character set

forth, the combination of a conduit, means for causing fluid to flow intermittently along said conduit, and means for causing successive portions of the fluid to become separated into smaller bodies of fluid.

21. In an apparatus of the character set forth, the combination of a conduit, means for causing fluid to flow intermittently along said conduit, and means for causing successive portions of the fluid in unsupported condition to become separated into smaller bodies of fluid.

22. In an apparatus of the character set forth, the combination of a conduit, means for producing intermittent projection of fluid through the outlet end of said conduit, and means for directing gaseous fluid under pressure into contact with the bodies of fluid discharged from said conduit and beyond said conduit, to envelope the discharged fluid.

23. In an apparatus of the character set forth, the combination of a conduit, means for causing fluid to flow through said conduit intermittently in a stream of connected particles, and means for subjecting successive portions of the stream beyond said conduit to gaseous fluid under pressure.

24. In an apparatus of the character set forth, the combination of a conduit having a surrounding wall, means for producing intermittent projection of fluid through the outlet end of said conduit, and means for directing gaseous fluid under pressure into contact with the bodies of fluid discharged from said conduit, beyond said conduit, to envelope the discharged fluid.

25. In a device for controlling the flow of liquid fluid, the combination of a flexible pipe through which the fluid is to pass, a presser device movable toward and away from a side of the pipe for collapsing the latter, and means for actuating said presser device having a yielding portion, for the purpose set forth.

26. In a device for controlling the flow of liquid fluid, the combination of a flexible pipe through which the fluid is to pass, a presser device movable toward and away from a side of the pipe for collapsing the latter, a movable member, a spring connection between said member and said presser device, said movable member operating, when actuated, to force said presser device, through the medium of said spring-connection against said conduit, and means for actuating said member.

27. In a device for controlling the flow of liquid fluid, the combination of a flexible pipe through which the fluid is to pass, a presser device movable toward and away from a side of the pipe for collapsing the latter, a pivotally supported member, a spring connection between said member and said presser device, said member operating, when actuated, to force said presser device, through the medium of said spring connection, against said conduit, and means for actuating said member.

28. In a device for controlling the flow of liquid fluid, the combination of a flexible pipe through which the fluid is to pass, a presser device movable toward and away from a side of the pipe for collapsing the latter, a movable member, a spring connection between said member and said presser device, said movable member operating, when actuated, to force said presser device, through the medium of said spring-connection against said conduit, and cam means for actuating said member.

29. In a device for controlling the flow of liquid fluid, the combination of a flexible pipe through which the fluid is to pass, a presser device movable toward and away from a side of the pipe for collapsing the latter, a rotatable shaft, a cam device thereon, a movable member operated by said cam device, and means operated by said movable member operating to pull said presser device into a position for collapsing said conduit.

30. In a device for controlling the flow of liquid fluid, the combination of a flexible pipe through which the fluid is to pass, a presser device movable toward and away from a side of the pipe for collapsing the latter, a rotatable shaft, a cam device thereon, a movable member operated by said cam device, and means having a spring section, operated by said movable member and operating to pull said presser device into a position for collapsing said conduit.

31. In a device for controlling the flow of fluid, the combination of a flexible pipe through which the fluid is to pass, a pivotally supported lever provided with a portion, forming a presser device for movement against a side of said pipe to collapse it, a rotatable shaft, a cam on said shaft operating to move said lever to a position in which said presser device is moved away from said pipe, a rock-member positioned to be engaged by said cam device at the opposite side of said shaft for forcing said rock device in a direction opposite that in which said lever is forced by said cam device, and a spring connection between said rock member and said rock lever, whereby the latter is actuated by said rock lever.

32. In an apparatus of the character set forth, the combination of a conduit, means for producing intermittent projection of fluid through the outlet end of said conduit, and means for subjecting successive portions of the stream to gaseous fluid under pressure.

33. In an apparatus of the character set forth, the combination of a conduit, means

for causing fluid to flow through said conduit intermittently in a stream of connected particles, and means for subjecting to gaseous fluid under pressure, successive portions of the stream, intermittently caused to flow by said first-named means.

34. In an apparatus of the character set forth, the combination of a conduit, means for causing fluid to flow through said conduit intermittently in a stream of connected particles of a cross-sectional area the same as the internal cross-sectional area of said conduit, and means for subjecting successive portions of the stream to gaseous fluid under pressure.

35. In an apparatus of the character set forth, the combination of a conduit, means for causing fluid to discharge from said conduit with such force that it would flatten against the object to be coated if unimpeded by resistance of the atmosphere, and means for causing gaseous fluid to flow substantially in the directon of movement of the fluid issuing from said conduit and in such relation to the first-referred-to fluid and under such pressure, as to substantially reduce the resistance of the atmosphere to the travel of the coating fluid to the surface to be coated.

36. In an apparatus of the character set forth, the combination of a conduit having a surrounding wall, means for producing intermittent projection of the fluid through the outlet end of said conduit, and means for subjecting successive portions of the stream of fluid to gaseous fluid under pressure.

37. In an apparatus of the character set forth, the combination of a plurality of conduits, and means for maintaining simultaneous predetermined measured flow of fluids through said conduits to strike the objects within substantially the same area.

38. In an apparatus of the character set forth, the combination of a plurality of conduits, means for causing fluids to flow through said conduits, and means, operating automatically, to cause the timing of the flow of the streams of fluid to vary relative to each other.

39. In an apparatus of the character set forth, the combination of a plurality of conduits, devices operating in a predetermined timed relation for causing fluids to flow intermittently through said conduits, and means independent of said devices for controlling the flow of fluid through said conduits whereby variations in the flow of fluid, determined by the operation of said devices, may be effected.

40. In an apparatus of the character set forth, the combination of a plurality of conduits, devices operating in a predetermined timed relation for causing fluids to flow intermittently through said conduits, and cam means independent of said devices for controlling the flow of fluid through said conduits whereby variations in the flow of the fluid, determined by the operation of said devices, may be effected.

41. In an apparatus of the character set forth, the combination of a plurality of conduits, devices operating in a predetermined timed relation for causing fluids to flow intermittently through said conduits, and means independent of said devices for controlling the flow of fluid through said conduits whereby variations in the flow of the fluid, determined by the operation of said devices, may be effected, said last-named means involving a presser device adapted to effect the flow of fluid by contraction of the conduit, and means for actuating said presser device.

42. In an apparatus of the character set forth, the combination of a plurality of conduits, devices operating in a predetermined timed relation for causing fluids to flow intermittently through said conduits, and means independent of said devices for controlling the flow of fluid through said conduits whereby variations in the flow of the fluid, determined by the operation of said devices, may be effected, said last-named means involving a presser device adapted to effect the flow of fluid by contraction of the conduit, a cam, means for driving said cam, and a connection between said cam and presser device.

43. In an apparatus of the character set forth, the combination of a plurality of flexible conduits, means involving presser devices operating against said conduits for causing fluids to flow through said conduits, and means operating automatically, to cause variations in the flow of the fluids relative to each other.

44. In an apparatus of the character set forth, the combination of a plurality of flexible conduits, means involving presser devices operating against said conduits for causing fluids to flow through said conduits, and means operating automatically to cause variations in the timing of the flowing of the streams of the fluid relative to each other.

45. In an apparatus of the character set forth, the combination of a plurality of flexible conduits, means involving presser devices operating against said conduits for causing fluids to flow through said conduits, and means operating automatically, to cause variations in the flow of the fluids relative to each other, comprising a presser device, and means for operating said last-named device.

46. In an apparatus of the character set forth, the combination of a plurality of flexible conduits, and means involving presser devices operating against said conduits for causing fluids to flow through said conduits,

certain of said presser devices engaging a greater number of said conduits than others of said devices.

47. In an apparatus of the character set forth, the combination of a plurality of conduits, means for causing fluids to be projected intermittently through said conduits, and means, operating automatically, to cause variations in the flow of the fluids relative to each other.

48. In an apparatus of the character set forth, the combination of a plurality of conduits, means for causing fluids to be intermittently projected through said conduits, and means, operating automatically, to cause variations in the flow of the fluids relative to each other.

49. In an apparatus of the character set forth, the combination of a plurality of conduits, means for causing fluids to be intermittently projected through the outlet ends of said conduits, and means operating to cause the fluids to discharge non-simultaneously from said conduits.

50. In an apparatus of the character set forth, the combination of a plurality of conduits, and means operating to cause fluids to discharge non-simultaneously from said conduits and of different volumes for any given length of time.

51. In an apparatus of the character set forth, the combination of a plurality of conduits, and means for causing fluids to be intermittently projected through the outlets of said conduits and discharge therefrom non-simultaneously.

52. In an apparatus of the character set forth, the combination of a plurality of conduits, means for causing fluids to flow through said conduits, and means, operating to cause the fluids to discharge non-simultaneously from said conduits.

53. In an apparatus of the character set forth, the combination of a plurality of conduits, means for causing fluids to flow through said conduits, and means operating to cause the fluids to discharge non-simultaneously from said conduits and of different volumes for any given length of time.

54. In an apparatus of the character set forth, the combination of a plurality of conduits, means for causing fluids to flow through said conduits, and means operating to cause the fluids to discharge from said conduits in different measured volumes for any given length of time.

55. In an apparatus of the character set forth, the combination of a plurality of conduits, means for causing fluids to be intermittently projected through the outlets of said conduits, and means operating to cause the fluids to discharge non-simultaneously from said conduits.

56. In an apparatus of the character set forth, the combination of a plurality of conduits, means for causing fluids to be intermittently projected through the outlets of said conduits and means operating to cause the fluids to discharge from said conduits in different volumes for any given length of time.

MAJOR E. GATES.