1. This invention relates to fluid discharging and distributing devices and relates more particularly to sprinkler heads and nozzles. It is a general object of the invention to provide improved sprinkler heads and nozzles of the type disclosed in my co-pending application for United States Letters Patent Serial Number 80,287, filed March 8, 1949, now Patent No. 2,568,942.

In my earlier-filed application, above identified, I have disclosed nozzles and sprinklers characterized by a tubular body through which the stream of water or other fluid is discharged, a stem of smaller diameter extending longitudinally in the body and loosely restrained therein and means for imparting a rotary or swirling motion to the fluid as it passes outwardly around the stem, this motion of the fluid causing the stem to gyrate or wobble around in the body while inclined with respect to the axis thereof, so that the stem breaks the issuing fluid stream into well distributed rain-like drops.

In accordance with the present invention, the above-mentioned stem is tubular to conduct an inner fluid stream of substantial volume and is provided at its outer portion with discharge orifices whereby the moving inclined stem not only breaks up the rotating fluid stream flowing around it but also discharges one or more jets of fluid which follow a generally rotary course to obtain an effective wide distribution of rain-like drops. It is therefore another object of this invention to provide a sprinkler head or nozzle of the character mentioned embodying simple, effective means for producing inner sprays of rain-like drops and one or more outer streams of rain-like drops for covering or irrigating the area around the space covered by the inner sprays. The elements of the device may be related and arranged so that the streams issuing from the tubular stem discharge through the substantially annular outer end rotating stream to wipe or carry away this fluid in the form of somewhat fan or curtain-like inner sprays while the streams from the tubular stem continue outwardly beyond these fan or curtain-like streams. Thus the spray pattern obtained by the device assures the heterogeneous or unpredictable "area drop" not only in the outer region of the area being irrigated but also in the inner region of that area. By actual observation of the operation of my device, it has been found that there is a substantially equal distribution or discharge of fluid throughout the entire selected area without an undesirable excessively concentrated fall of the fluid in any given zone or portion of the area. Owing to the eccentric motion of the inclined wobbling tubular stem, the spray pattern is in the nature of a series of intermeshing ellipses which do not necessarily repeat identical paths during the successive cycles of stem movement and therefore do not concentrate the drop fall at any given point or points.

Another object of the invention is to provide a sprinkler or nozzle of this character that is operable to discharge a large volume of fluid in a most economical manner. The device offers a minimum of resistance to flow and therefore creates little back pressure and operates to discharge the water or other fluid in the form of relatively large drops with high supply pressure and volume fine spray. This is of prime importance in low humidity areas and in windy districts where the wasteful evaporation and blowing of the mist produced by most prior sprinklers and nozzles is a distinct disadvantage of such prior devices. Furthermore, the free action of the device of my present invention is such that an effective delivery of the rain-like drops is obtained even where only low pressures are available and assures the delivery of a maximum volume of water and the maximum coverage or distribution with a given supply pressure and volume condition. This is important to the farmer or orchardist who is often obliged to procure the largest volumetric delivery of water possible in a given period of time. The large capacities of the discharge passages and orifices and the eccentric wobbling action of the tubular stem preclude clogging of the device by sand, dust or other solid matter and, in fact, the motion of the stem serves to actually clear large solid matter particles from the sprinkler. The ability of the sprinkler to discharge a large volume of water with a minimum of back pressure permits liquid fertilizer to be induced or aspirated directly into the supply stream to be discharged from the sprinkler together with the water. In the past it has been necessary to employ expensive pumping equipment to force the liquid fertilizer into the supply stream because of the high back pressure or resistance to flow created by the conventional sprinklers.

Another object of the invention is to provide a sprinkler or nozzle of this class incorporating means of adjustment to obtain practically any desired extent distribution or coverage under various prevailing supply conditions. The device may incorporate an adjustment for the port or ports of discharge from...
the tubular stem to control or regulate the volume and the vertical angle of the streams issuing from the stem and, if desired, the device may include means of adjustment at the intake end of the tubular stem to adapt the device to handle supply pressures of different values and yet obtain the desired vertical angle of discharge from the outer end of the stem.

A further object of the invention is to provide a device of this character wherein the rotating or spiraling outer stream of water serves as the motive power, while offering a minimum of check pressure, causing the tilted tubular stem to swing through an annular path and about its point of mounting so as to roll or ride on the internal surface of the tubular body, thus obtaining a sun-and-planetary friction drive. In actual operation the stem may move through its inclined circular path at a speed of from 1,000 to 2,000 revolutions per minute, depending upon the pressure and volume conditions, while the frictional rolling engagement of the stem on the inner surface of the body causes the stem to rotate about its own inclined axis at a speed of from 25 to 75 revolutions per minute. If desired, a positive "gear" drive may be provided between the stem and the wall of the body by forming meshing teeth or serrations thereon so that the stem is positively rotated about its own longitudinal axis as it swings about its point of attachment. In certain embodiments of the invention, where a slower rotation of the stem is desired, as in orchard irrigators, the discharge orifices or tubes of the stem may be pitched in such a manner that the reactive effect of the fluid discharging therefrom tends to reduce the rate of rotation of the stem without, of course, materially affecting the speed of wobbling or gyration of the stem about its point of mounting in the body. It is significant that the motor action which produces the wobbling and rotation of the tubular stem is not conducive to appreciable back pressure.

A still further object of the invention is to provide a device of the class mentioned that is extremely simple and inexpensive to manufacture. The major portions of the sprinkler or nozzle may be fabricated from standard metal tubing appropriately force fitted or otherwise assembled.

Other objectives and features of the invention will become apparent from the following detailed description of typical preferred embodiments, throughout which description reference is made to the accompanying drawings, wherein:

Figure 1 is a longitudinal sectional view of one form of the invention;

Figure 2 is an enlarged fragmentary longitudinal sectional view illustrating the loose mounting or restraining means for the tubular stem, being a view taken as indicated by line 2—2 on Figure 3;

Figure 3 is a transverse sectional view taken as indicated by line 1—1 on Figure 2;

Figures 4 and 5 are longitudinal sectional views of other embodiments, Figure 4 illustrating a portion of the device in side elevation;

Figure 6 is a perspective view of a sprinkler of the invention embodying a deflector;

Figure 7 is a plan view of the device illustrated in Figure 6 with the tubular stem appearing in transverse cross section;

Figure 8 is a longitudinal sectional view of still another form of the invention;

Figures 9 and 10 are transverse sectional views taken as indicated by lines 9—9 and 10—10, respectively, on Figure 3; and

Figures 11, 12 and 13 are diagrammatic views illustrating typical spray patterns obtained with the sprinklers of the invention.

The embodiment of the invention illustrated in Figures 1, 2 and 3 may be said to comprise generally a tubular body 10 adapted to be connected with a source of fluid under pressure such as a hose or pipe P, a tubular fluid-discharging stem 11 in the body 10, means 12 for restraining and positioning the body 10 and stem 11, and a means 13 for deflecting the fluid discharged from the tubular body 10 and stem 11 by rotation and angular or swinging movement about a point spaced from the outer end of the body, orifices 13, or their equivalent, for causing a stream of fluid to spiral or rotate around the stem 11 to actuate the same, and means 14 for regulating or adjusting the fluid flow through the stem 11.

The body 10 may be varied greatly in construction and design, depending upon the intended application or use of the device. In the simple preferred embodiment illustrated, the body 10 is a lengthened axis at a speed of from 25 to 75 revolutions for the discharge of fluid. To facilitate connection of the body 10 with the pipe P or other source of fluid supply, an adapter-like part 15 may be press fitted or otherwise secured on the outer portion of the body and the adapter part is shown screwed threads in the pipe P. The body 10 may extend into the pipe P and is received therein with considerable clearance, leaving an annular fluid passage 16. In the preferred construction the interior of the body 10 is beveled or flared at the outer extremity of the body as shown at 17.

The stem 11 is the moving element of the nozzle or sprinkler and is arranged longitudinally within the body 10. In accordance with this invention, the stem 11 is tubular and in practice may be a simple length of metal tubing. I prefer to make the stem 11 of substantial length to extend through the body 10 from one end to the other. As shown in the drawings, the stem 11 extends outwardly beyond the outer end of the body 10 and projects from the inner end of the body to protrude into the pipe P. The external diameter of the stem 11 is considerably less than the internal diameter of the body 10, leaving an annular fluid passage 18 which also forms a space in which the stem is free to gyrate or wobble. The outer end portion of the tubular stem 11 is provided with a deflector or head 19 which may either be formed integral with the stem or formed as a separate part press fitted or otherwise secured on the stem. The head 19 may be given various shapes as desired. In the construction illustrated in Figure 1, the head 19 has a polygonal margin and its under side slopes upwardly and outwardly to assist in directing the fluid issuing from the passage 16, the angle of inclination being selected to suit the intended use. The head 19 is larger in diameter than the body 10 so as to serve as a valve. When fluid is discharging from the sprinkler, the fluid flow raises the stem 11 so that it is in a position such as illustrated in the drawings, but, when the device is not in use, the under side of the head 19 rests or seats against the outer end of the body to seal off the sprinkler. This prevents the entrance of soil and other solid matter into the body 10 and seals off the body against the entrance of air, thereby preventing rusting of the sprinkler parts. The deflector head 19 may be quite large in diameter as illustrated in Figure 5 and where the sprinkler is intended for
against and ride along the internal surface of the body 10 at its exit as shown in Figure 1. However, the engagement of the outwardly disposed end of the body 10 and bushing 22 closes off the lower end of the above-mentioned passage 18 without interfering with the free movements of the stem 11.

The water or fluid flowing outwardly through the passage 18 is caused to rotate or spiral in order to actuate the stem 11. In the simple preferred arrangement illustrated, pitched or tangential openings 19 are provided in the wall of the tubular body 10 for this purpose. The openings 19, which are spaced above the bushing 22, may be drilled tangent to the internal surface of the body as illustrated in Figure 3, and are correspondingly pitched to cause the fluid flowing from the outer passage 18 into the intermediate passage 18 to rotate or spiral as it passes out through the body. The tangentially flowing fluid impinges against the tubular stem 11 and this action, together with the friction between the stem and the spirally-flowing column of fluid, causes the stem to gyrate or vibrate as will be more fully described.

The tubular stem 11 is provided adjacent its outer end with means for discharging one or more streams of fluid, the stem receiving fluid through the openings 21 or through its open inner end 22 as above described. In the devices illustrated in Figures 1 and 4 to 7, inclusive, the stem 11 has two diametrically opposite discharge openings 28 spaced below the deflector head 18. I have shown straight radial openings 28, it being understood that there may be one or more openings pitched or inclined as desired. With the stem 11 in its raised operative position, the openings 28 are spaced above the outer end of the body 10 to discharge fluid streams laterally or radially, the streams being partially directed by the head 18. It should be observed that these radial streams from the openings 28 intersect the stream of fluid passing upwardly around the stem 11 from the passage 18 and serve to pick up and carry outwardly a portion of this stream.

The above-mentioned means 14 is provided to regulate or adjust the flow through the openings 28 and thus proportion the flow through the openings with respect to the flow around the stem 11 to obtain the desired action. The means 14 includes a flow-regulating member in the form of a screw 27 threaded in the upper end of the stem 11 and provided with a conical lower end. The upper end of the screw 27 is slotted or otherwise shaped for convenient engagement by a tool for turning it. By rotating the screw 27 it may be adjusted vertically to bring its tapered inner end to any selected position relative to the openings 28 and thereby regulate the fluid flow. With the valve screw 27 threaded upwardly clear of the openings 28, there is a full volume flow through the openings and with proper pressure the streams discharge substantially horizontally from the openings. By threading the screw 27 downwardly, the openings 28 may be partially restricted to reduce the volume of flow through the openings 25 and cause the streams issuing therefrom to arch upwardly. Further downward threading of the screw 27 further reduces the volume and the streams from the openings 28 arch upwardly at a steeper angle. The screw 27 may be threaded to a position to close off the openings 28 so that the only flow from the sprinkler is through the passage 18 around the stem 11 to provide for short-range coverage.
In Figure I have shown a valve screw 28 threaded in the lower end of the stem 11 to control the fluid inlet ports 21. This screw 28 may be employed to regulate the flow into the stem 11 and thus compensate for differences in supply pressure. For example, where a number of the sprinklers are employed in an irrigation system, the screws 28 of the sprinklers at the lower parts of the pipeline system may be adjusted to partially close their respective openings 21 so that the fluid flow through the stems 11 of those sprinklers corresponds with the flow through the stems 11 of the sprinklers located at higher levels where the fluid pressure is lower.

The invention may be embodied in a "pop-up" type lawn sprinkler as shown in Figure 5. In this construction the above-described part 15 is replaced by a member 30 force fitted or otherwise secured to the outer end of the body 10 and provided with a large horizontal flange 31 to be installed at ground level. The upper end of the member 30 has a central recess 32 to receive the deflector head 19 when the device is not in use and the stem 11 is retracted. In this case the deflector head 19 is preferably at the upper extremity of the stem 11 so that there are no projecting parts above the flange 31 when the device is not in use. The self-closing feature is, of course, embodied in other types of sprinklers of the invention.

It is contemplated that stationary deflectors of various shapes and sizes may be employed on the sprinklers. Thus in Figures 6 and 7 I have shown a deflector 33 secured to the body part 15 by brazing or the like. The deflector 33 has a generally horizontal basin portion 43 with upturned margins and the deflector extends vertically upward from the basin to project above the stem 11 when the latter is in its normal operating position. An upwardly and inwardly sloping or curved roof portion 44 continues upwardly from the deflector. The particular deflector 33 illustrated is designed to provide a flow pattern or sprinkler coverage of about 180 degrees, the deflector extending a substantial distance in both directions from the body part 15. The intermediate or main wall portion of the deflector 33 may be substantially flat and rearwardly inclined while its two vertical margins are curved inwardly or forwardly, as at 34, to direct the streams of water forwardly.

The arrow A in Figure 7 indicates the direction of gyration of the stem 11 about its mounting means 12 while the arrow B designates the direction of rotation of the stem about its own axis as a result of the sun-and-planet type frictional engagement of the inclined stem with the internal surface of the body 10. As the inclined stem 11 is gyrated about the means 12 in the direction of arrow A, by the action of the angular stream of fluid flowing through the passage 18, the stem rides or rolls along the inner surface of the body 10 and as a consequence is rotated in the direction B. Thus the streams C from the openings 26 discharge radially and move in the direction of arrow B and as these streams impinge against the deflector 33 they are directed forwardly or away from the deflector by the curved margins 34. As shown in the left-hand portion of Figure 7, these streams C deflected in this way cross the paths of the same streams C that have moved beyond the end of the deflector 33. As the inclined stem 11 gyrates in the body 10, the eccentricity of the stem leaves a constantly moving or rotating area of the passage 19 open for the discharge of fluid. This region is designated 35 in the drawings. The fluid stream discharging from this region 35 of the passage 18 is deflected outwardly by the head 19 and is designated D in Figure 7. The stream D rotates by reason of the gyration or circular path taken by the stem 11 and the stream is deflected by the margin 34 of the deflector 33 so as to cross the path of the same stream that has moved beyond the deflector. This is shown in the right-hand portion of Figure 7. A portion of the water falls into the basin 43 as a result of the interference of the streams and as a result of the water being stopped at the deflector. This water is not retained in the basin but is picked up and carried away by streams C and D as they move across the deflector.

As described above, the stem 11 gyrates and rolls about in the end of the body 10 at a much greater rate than the speed of rotation of the stem on its own axis. However, in certain sprinklers, for example, in the large types intended for orchard irrigation, it may be desired to further reduce the speed of rotation of the stem about its own axis so that the streams C issuing from the stem and irrigating the water zone of the sprinkled area travel at a slower rate. In Figures 8 and 9 I have shown discharge nozzles or tubes 40 secured in the openings 26 of the stem 11 and shaped or arranged to retard the speed of rotation of the stem 11. The tubes 40 project outwardly beyond the stem 11 and are either curved or pitched tangentially and in corresponding directions so that the reactive effect of the fluid discharging from them slows down or "brakes" the rotation of the stem 11 about its own axis. Because the stem 11 rotates about its own axis in the direction D, which is opposite to the direction of gyration produced by the angular flow of fluid in the passage 18, the tubes 40 are pitched in the same direction as the openings 13. This relationship is illustrated in Figures 9 and 10. The distribution tubes 40 project some distance from the stem 11 so that the streams C issuing from the tubes do not intersect the inner stream D issuing from the passage 18. However, the tubes 40 themselves pass through the stem D to assist in breaking up the stream.

The invention contemplates a positive "seared" or meshing drive between the gyrating stem 11 and the wall of the body opening 18. Figure 1 illustrates teeth or serrations 41 on the stem 11 for cooperating or meshing with similar serrations 42 on the internal surface of the body 10 to gear the stem to the body and thus insure positive rotation of the stem 11 about its longitudinal axis as the stem gyrates. It is to be understood that the serrations or teeth 41 and 42 may be incorporated in other embodiments of the invention.

It is believed that the operation of the nozzles or sprinklers will be readily understood from the foregoing detailed description. Referring to the type of sprinkler illustrated in Figures 1 to 5, inclusive, the fluid takes two paths or courses through the sprinkler. In one path it flows through the passage 16 to enter the tangential openings 13 and flow outwardly through the passage 18 and discharge from the outer end of the body. The second path of the fluid is through the openings 21 or the end 20 of the stem 11 for flow through the stem and for discharge from the openings 26. The openings 13 impart angular motion to the fluid flowing out through the
opening 18 and this motion causes gyration of the stem 11 about its mounting means. The gyration of the tilted or inclined stem 11 results in a counter or turning of the openings 26 that the stream D issuing therefrom rotates. This stream D is deflected by the head 19 and forms the inner stream for irrigating the region immediately around the sprinkler. The gyration of the tilted or inclined stem 11 results in a counter or turning of the openings 26 in the direction B. These streams whose volume may be regulated by the screw 27, are projected a greater distance than the stream D and serve to irrigate the outer zone of the area covered by the sprinkler. As previously described, the volume and therefore the arched direction of the stream D from the openings 26 may be regulated at will by adjusting the screw 27.

Figures 11, 12 and 13 illustrate in a diagrammatic manner typical spray patterns of the sprinklers. Figure 11 shows a stream D discharging to the left, this stream issuing from one of the openings 26, as above described, and extending downwardly a considerable distance to irrigate the outer region of the area defined by the circle 35. In this Figure 11 the stream D is intersecting the stream of water flowing from the open portion 35 of the pipe 28, it being assumed that in Figure 11 the stream E, is in a position substantially as illustrated in Figure 7. This other stream C picks up water flowing upwardly around the stem 11 from the passage portion 35 and carries this water radially outward. Thus the water of said other stream C and the water from the passage portion 35 is mixed and this mixed flow is represented in Figure 11 by the stream lines E. This "mixed" stream or spray of drops extends outwardly an intermediate distance to effectively irrigate the intermediate zone of the area being watered. It is to be understood that a portion of the water of the stream C, which assists in forming the stream E, may extend or continue outwardly beyond the stream E and perhaps as far as the circle 35. Figure 12 illustrates a condition where the two openings 26 are substantially clear of the passage portion 35 to project their respective streams C without intersecting the water flowing from the passage portion 35. At this time the streams C may both extend to the circle 35. Furthermore, at this time the water issuing from the passage portion 35 is free to flow upwardly around the stem to be deflected laterally by the head 19. This forms an inner spray stream P which serves to irrigate the innermost region of the area being watered. The stream D illustrated in Figure 7 may, in practice, be like the stream E, or may be the stream P just described, the action of the deflector 33 being the same in every event. It is to be understood that the streams C and E leave or drop water in the innermost zone and the streams C drop water in the intermediate zone of the area being irrigated. Furthermore, the combined gyration and rotation of the stem 11 assure desirable variations in the spray patterns to obtain a greater area of coverage. In general, the water issuing from the opening 18 is deflected or directed with a greater concentration of water at any one point or points. The valve screws 27 and 28 may be adjusted to regulate or proportion the volumes of water discharged from the openings 26 and the passage mouth portion 35. Figure 13 illustrates in a general way a typical spray pattern with a given pressure and volume condition and with the valve screw 27 in a particular open position. It will be observed in this figure that the streams C and E both arch upwardly to some extent, being guided or deflected by the deflector head 19, and each drops or leaves the broken-up water throughout a substantial area.

The combined oscillation and rotation of the stem 11 result in a constantly changing angle of discharge of water from the openings 26. The combination of differential-speed motions of the stem results in the discharge of the water in the form of streams of separate discrete drops as distinguished from solid or substantially continuous streams. In fact, so long as the water is discharging, even in very small volumes, it is not possible to obtain a solid or continuous stream from either the openings 26 or the passage portion 35. The streams being of this non-continuous character and being made up of separate rain-like drops, do not exert a sustained force at any one point and therefore cannot injure or knock down even the most delicate plants, erode the soil, or dislodge plant or tree blossoms or pollen.

In actual operation of the sprinklers it has been observed that they produce relatively large rain-like drops which are evenly, although unpredictably, distributed throughout the area being irrigated. The sprinklers produce practically no mist or fine spray and there is a minimum of loss through evaporation. The sprinklers are constructed to produce little back pressure, the water being free to flow through the sprinklers with a minimum of restriction. The imparts of angular motion to the stream in the passage 18, which angular motion constitutes the motive power for the gyrating and rotating stem, is effected without producing any substantial back pressure. The gyration and rotation of the stem 11 automatically clear the sprinklers of dirt, rust, etc., and assures free positive action of the sprinklers at all times.

Having described only typical preferred embodiments of my invention, I do not wish to be limited to the specific details set forth, but wish to reserve to myself any features or variations that may fall within the scope of the accompanying claims.

I claim:

1. A fluid discharging device comprising a body having an internal wall and bore, a tubular stem arranged longitudinally in the outlet-bore and of smaller diameter than the bore to leave a passage therein, bearing means for the stem at a point spaced from the outer end of the body permitting rotation of the stem about its own axis and being made up of separate rain-like drops, not exerting a sustained force at any one point, being guided or deflected by the deflector head, and each being free to flow through the sprinklers with a minimum of restriction; the imparts of angular motion to the stream in the passage 18, which angular motion constitutes the motive power for the gyrating and rotating stem, is effected without producing any substantial back pressure. The gyration and rotation of the stem 11 automatically clear the sprinklers of dirt, rust, etc., and assures free positive action of the sprinklers at all times.

2. In a fluid discharging device of the type comprising a body having a tubular stem arranged longitudinally in the outlet-bore and of smaller diameter than the bore to leave a passage therein, the body having an internal wall and bore, a tubular stem arranged longitudinally in the outlet-bore and of smaller diameter than the bore to leave a passage therein, bearing means for the stem at a point spaced from the outer end of the body permitting rotation of the stem about its own axis and being made up of separate rain-like drops, not exerting a sustained force at any one point, being guided or deflected by the deflector head, and each being free to flow through the sprinklers with a minimum of restriction; the imparts of angular motion to the stream in the passage 18, which angular motion constitutes the motive power for the gyrating and rotating stem, is effected without producing any substantial back pressure. The gyration and rotation of the stem 11 automatically clear the sprinklers of dirt, rust, etc., and assures free positive action of the sprinklers at all times.
2. A fluid discharging device comprising a body having an internal wall defining a fluid outlet bore, a tubular stem arranged longitudinally in the bore and of smaller diameter than the bore to leave a passage therein, bearing means for supporting the stem at a point spaced from the outer end of the body for rotation about its own axis and permitting flexing of the stem about said point while inclined to lean against said internal wall of the body adjacent the outer end thereof, means spaced a considerable distance outwardly from said point for imparting angular motion to the fluid flowing through said passage to gyrate the stem about said point and thus cause rotation of the stem about its own axis by reason of said engagement of the stem with said internal wall of the body, the gyration of the stem breaking up the fluid stream issuing from said passage, the stem projecting outwardly beyond the fluid-discharging outer end of the body and the tubular stem being open at its inner end for the reception of fluid, and a deflector head on the projecting end of the stem for directing said fluid stream, the projecting portion of the stem having a first opening for the discharge of fluid from the stem, the last-named opening being directed laterally and being below said head so that the stream of fluid issuing therefrom intersects the stream issuing from said passage.

3. A fluid discharging device comprising a body having an internal wall defining a fluid-conducting bore, a tubular stem arranged longitudinally in the bore and of smaller diameter than the bore to leave a passage therein, bearing means at a point spaced inwardly from the outer end of the body for positioning the stem and for allowing rotation of the stem about its own axis and gyration of the stem about said point while inclined to lean against said wall in a region spaced outwardly from said point, means for imparting angular motion to the fluid flowing through said passage to cause substantial gyration of the stem and thus cause rotation of the stem about its own axis by reason of said engagement of the stem with said wall, the gyration of the stem breaking up the fluid stream issuing from said passage, the stem projecting outwardly beyond the fluid-discharging outer end of the body and the stem being open at its inner end for the reception of fluid, a deflector head in the projecting end of the stem for directing said fluid stream, the projecting portion of the stem having at least one laterally directed outlet for discharging a stream of fluid, and manually regulable means on the stem for controlling the flow from said outlet.

4. A sprinkler comprising a body having an internal wall defining a liquid-conducting bore which is open at its outer end for the discharge of liquid, a tubular stem of smaller external diameter than said bore arranged longitudinally in the bore to extend from the outer end thereof, bearing means spaced from said outer end of the bore for positioning and restraining the stem for gyration while inclined with respect to the axis of the bore so as to lean against and roll along said wall of said bore adjacent said outer end thereof and carrying the stem for rotation about its own longitudinal axis, means for imparting angular motion to the liquid flowing through said bore to cause such gyration of the stem, the rolling engagement of the stem with said wall of the opening causing rotation of the stem, the interior of the tubular stem constituting a liquid passage which is open at its inner end for the reception of liquid, the gyration of the stem serving to break up the liquid stream discharging from the outer end of said bore, and there being at least one liquid discharge opening in the gyrating rotating tubular stem beyond the outer end of said bore, and manually regulable means for controlling the admission of liquid to the interior of the tubular stem covering the opening dimensioned therein for the reception of the liquid stream discharging from the outer end thereof, restraining and positioning bearing means spaced from said outer end of the bore permitting gyration of the stem while inclined with respect to the axis of said bore so as to lean against and roll along said wall adjacent said outer end thereof and carrying the stem for rotation about its own longitudinal axis, means for imparting angular motion to the liquid flowing through said bore to cause such gyration of the stem, the rolling engagement of the stem with said wall constituting a liquid passage at its inner end for the reception of liquid, the gyration of the stem serving to break up the liquid stream discharging from the outer end of said bore, and at least one laterally projecting nozzle on the stem beyond said outer end of the body opening for discharging liquid from the stem.

5. A sprinkler comprising a body having an internal wall defining a liquid-conducting bore which is open at its outer end for the discharge of liquid, a tubular stem of smaller external diameter than said bore arranged longitudinally in the bore to extend from the outer end thereof, bearing means spaced from said outer end of the bore for positioning and restraining the stem for gyration while inclined with respect to the axis of the bore so as to lean against and roll along said wall of said bore adjacent said outer end thereof and carrying the stem for rotation about its own longitudinal axis, means for imparting angular motion to the liquid flowing through said bore to cause such gyration of the stem, the rolling engagement of the stem with said wall constituting a liquid passage which is open at its inner end for the reception of liquid, the gyration of the stem serving to break up the liquid stream discharging from the outer end of said bore, and there being at least one liquid discharge opening in the gyrating rotating tubular stem beyond the outer end of said bore, and manually regulable means for controlling the admission of liquid to the interior of the tubular stem covering the opening dimensioned therein for the reception of the liquid stream discharging from the outer end thereof, restraining and positioning bearing means spaced from said outer end of the bore permitting gyration of the stem while inclined with respect to the axis of said bore so as to lean against and roll along said wall adjacent said outer end thereof and carrying the stem for rotation about its own longitudinal axis, said bear-

6. A sprinkler comprising a body having an internal wall defining a liquid-conducting bore which is open at its outer end for the discharge of liquid, a tubular stem of smaller external diameter than said bore arranged longitudinally in the bore to extend from the outer end thereof, bearing means spaced from said outer end of the bore for positioning and restraining the stem for gyration while inclined with respect to the axis of the bore so as to lean against and roll along said wall of said bore adjacent said outer end thereof and carrying the stem for rotation about its own longitudinal axis, means for imparting angular motion to the liquid flowing through said bore to cause such gyration of the stem, the rolling engagement of the stem with said wall constituting a liquid passage which is open at its inner end for the reception of liquid, the gyration of the stem serving to break up the liquid stream discharging from the outer end of said bore, and there being at least one liquid discharge opening in the gyrating rotating tubular stem beyond the outer end of said bore, and manually regulable means for controlling the admission of liquid to the interior of the tubular stem covering the opening dimensioned therein for the reception of the liquid stream discharging from the outer end thereof, restraining and positioning bearing means spaced from said outer end of the bore permitting gyration of the stem while inclined with respect to the axis of said bore so as to lean against and roll along said wall adjacent said outer end thereof and carrying the stem for rotation about its own longitudinal axis, said bear-

7. A sprinkler comprising a body having an internal wall defining a liquid-conducting bore which is open at its outer end for the discharge of liquid, a tubular stem of smaller external diameter than said bore arranged longitudinally in the bore to extend from the outer end thereof, bearing means spaced from said outer end of the bore for positioning and restraining the stem for gyration while inclined with respect to the axis of the bore so as to lean against and roll along said wall adjacent said outer end thereof and carrying the stem for rotation about its own longitudinal axis, means for imparting angular motion to the liquid flowing through said bore to cause such gyration of the stem, the rolling engagement of the stem with said wall constituting a liquid passage which is open at its inner end for the reception of liquid, the gyration of the stem serving to break up the liquid stream discharging from the outer end of said bore, and there being at least one liquid discharge opening in the gyrating rotating tubular stem beyond the outer end of said bore, and manually regulable means for controlling the admission of liquid to the interior of the tubular stem covering the opening dimensioned therein for the reception of the liquid stream discharging from the outer end thereof, restraining and positioning bearing means spaced from said outer end of the bore permitting gyration of the stem while inclined with respect to the axis of said bore so as to lean against and roll along said wall adjacent said outer end thereof and carrying the stem for rotation about its own longitudinal axis, said bear-
ing means including an annular bearing surface in the body receiving the stem with clearance to permit free rotation and said gyration of the stem, a second bearing surface in the body facing inwardly therein, a collar on the stem, and at least one thrust bearing washer on the collar for engaging said second surface, means for imparting angular motion to the liquid flowing through said bore to cause such gyration of the stem, the rolling engagement of the stem with said wall causing rotation of the stem, the interior of the tubular stem constituting a liquid passage, the gyration of the stem serving to break up the liquid stream discharging from the outer end of said bore, and, there being at least one liquid discharge opening in the gyrating rotating stem beyond the outer end of said body bore.

8. A sprinkler comprising a body having an internal wall defining a liquid-conducting bore which is open at its outer end for the discharge of liquid, a tubular stem of smaller external diameter than said bore arranged longitudinally in the bore to extend from the outer end thereof, bearing means spaced inwardly from said outer end of the bore guiding the stem for gyration while inclined with respect to the axis of said opening so as to lean against and roll along said wall adjacent said outer end thereof and journaling the stem for rotation about its own longitudinal axis, means for imparting angular motion to the liquid flowing through said bore to cause such gyration of the stem, the rolling engagement of the stem with said wall causing rotation of the stem, the interior of the tubular stem constituting a liquid passage, the gyration of the stem serving to break up the liquid stream discharging from the outer end of said bore, and there being at least one liquid discharge opening in the gyrating rotating stem beyond the outer end of said body opening, and a stationary deflector on the body for deflecting the streams issuing from said bore and opening.

9. A fluid discharging device comprising a body having a fluid outlet bore, a stem arranged longitudinally in the outlet bore and of smaller diameter than the bore so as to leave a fluid passage in the bore, positioning and restraining bearing means for the stem permitting rotation of the stem about its longitudinal axis and allowing the stem to gyrate about a point spaced inwardly from the outer end of the body while inclined with respect to the longitudinal axis of the bore so as to lean against the wall of the bore, the stem having an outer end protruding beyond the outer end of the body, means for imparting angular motion to the fluid flowing through said passage to cause gyration of the stem, the engagement of the gyrating stem with the wall of the bore causing the stem to rotate about its own longitudinal axis as it gyrates, the gyration of the stem breaking up the fluid stream issuing from the outer end of the outlet bore, the stem having a longitudinally extending fluid conducting bore open at its inner end for the reception of fluid, and means on the protruding outer end of the stem for discharging fluid from said bore of the gyrating and rotating stem.

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