

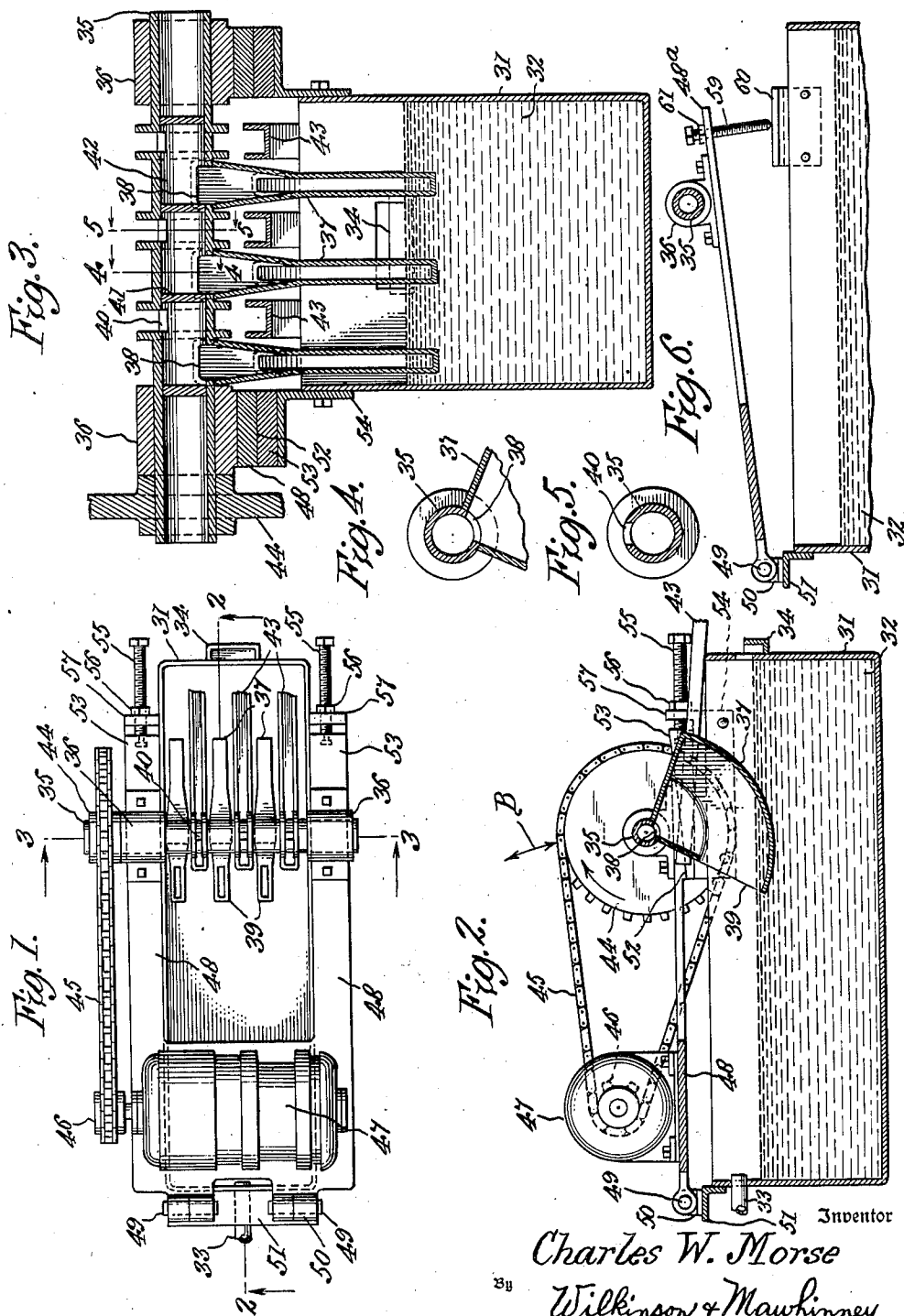
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C. W. MORSE

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LIQUID FEEDING DEVICE

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Inventor
Charles W. Morse
Wilkinson & Mawkinney
Attorneys.

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LIQUID FEEDING DEVICE

Charles W. Morse, Anaconda, Mont.

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6 Claims. (Cl. 221-97)

The present invention relates to improvements in liquid feeding devices and is a division of my co-pending application Serial No. 422,464, filed December 10, 1941, entitled Automatic samplers and liquid feeding devices.

The invention has for an object to dispense exactly regulated quantities of reagents, such as oils, acids or the like, in chemical and metallurgical plants, and to provide a device for this purpose which is simple and compact in construction and requires a minimum of operating and maintenance attention.

A further object of this invention in liquid feeding apparatus is, to provide a device of the character described, which shall operate at a constant speed of revolution, but still be capable of very exact adjustment in order to vary and closely regulate the quantity of liquid dispensed.

A further object of the invention is to provide a form of apparatus equally applicable for use in sampling and liquid feeding and which has the characteristic objects of both devices as hereinbefore set forth.

With the foregoing and other objects in view, the invention will be more fully described hereinafter, and will be more particularly pointed out in the claims appended hereto.

In the drawing, wherein like symbols refer to like or corresponding parts throughout the several views,

Figure 1 is a top plan view of a liquid feeding apparatus complete as constructed in accordance with the present invention.

Figure 2 is a longitudinal section taken along the line 2-2 of Figure 1.

Figure 3 is a transverse section taken on an enlarged scale along the line 3-3 of Figure 1.

Figure 4 is a vertical fragmentary section taken on the line 4-4 in Figure 3.

Figure 5 is a similar view taken on the line 5-5 in Figure 3.

Figure 6 is a fragmentary longitudinal section similar to Figure 2 but showing a different form of adjustable support for the hinged platform.

Referring more particularly to the drawing, 31 designates a reagent tank, in which a supply of liquid 32 is maintained at a constant level by means of a supply pipe 33 and an overflow weir 34. A feeder shaft 35, rotatably carried in bearings 36, extends across the tank 31. The shaft 35 is hollow or tubular and affixed to the same are one or more feed scoops 37, which are also hollow and which communicate with the interior of the hollow shaft 35 by internal openings 38. The scoops 37 are also provided with external or

inlet openings 39. In addition such shaft 35 is also pierced by discharge openings 40, located approximately 180° around its periphery from the internal openings 38. The interior chamber of shaft 35 is blocked at intervals by plugs or diaphragms 41, which divide the same into a series of cylindrical compartments 42, each of which is penetrated by one each of internal openings 38 and discharge openings 40. The openings 38 and 40 are staggered or offset from each other, as shown in Figure 3, in order that the discharge openings 40 can discharge directly into liquid launders or troughs 43. These troughs are disposed in the spaces between the scoops as shown in Figures 1 and 3. The shaft 35 may be rotated in any suitable manner by hand or power drive. In Figures 1 and 2 I have shown a sprocket 44 affixed to one end portion of the shaft 35, which sprocket is driven by a chain 45, from drive sprocket 46 on the armature shaft of an electric or other driving motor 47. The motor assembly and the feeding device are all carried upon a tilting frame or platform 48. At its end adjacent to motor 47, the tilting platform 48 is supported upon pivot pins 49, which in turn are held in pin sockets 50, the latter being supported on extension 51 of reagent tank 31. At its other end, which supports bearings 36, the tilting frame 48 is equipped or formed upon its underside with wedge surfaces 52. Complemental adjusting wedges 53 cooperate with the surfaces 52 and are slidably supported in brackets or extensions 54 of the tank 31. Horizontal movement of the adjusting wedges 53, at right angles to the axis of shaft 35, is effected by threaded adjusting screws 55, equipped with lock nuts 56 which pass through tapped holes in fulcrum lugs 57 which are rigidly attached to extension 54 of the tank 31.

The operation of the device as a liquid feeding apparatus is as follows:

As the hollow shaft 35 is rotated by the motor 47 and its drive arrangement, in the direction of the arrow shown in Figure 2, the scoops 37 enter, pass through and leave the pool of liquid 32 in the tank 31; and during their passage dip up a quantity of liquid 32, which passes into the scoops 37 through the external openings 39; the quantity of liquid dipped up being determined by the degree of submergence of scoops 37 in the liquid body 32. When the shaft 35 reaches a position in which the internal openings 38 are on top, the portions of liquid contained in the scoops 37 pass through internal openings 38 in the compartments 42 and thence out through discharge

openings 40 into the liquid launders or troughs 43, which convey the liquid to its various destinations.

This multiplicity of scoops and launders each receiving equal amounts of the liquid, makes it possible to distribute the liquid to a number of operating machines in equal amounts as may be required. Thus any of the many mechanical distributors that frequently follow reagent feeders to effect this distribution can be eliminated and a saving made.

When it is desired to decrease the quantity of liquid dipped per revolution by scoops 37, lock nuts 56 are first backed off, then adjusting screws 55 are turned so as to force wedges 53 in an inward direction (to the left in Figure 2), thus swinging tilting frame 48 upwards about the center provided by pivot pins 49. The direction is shown by the upper of the arrows B in Figure 2. Such movement acts to elevate bearings 37, shaft 35 and the feed scoops 37, decreasing the degree of submergence of the scoops 37 in the liquid 32, and thus decreasing the quantity of liquid dipped up by them.

Conversely, turning of the adjusting screws 55 in the opposite direction will withdraw the wedges 53 toward the right, permitting bearings 36 and shaft 35 to move downward in the path indicated by the lower of the arrows B in Figure 2. Thus the scoops 37 are submerged more deeply in the liquid 32, thus causing them to dip up a greater quantity of liquid per revolution. Lock nuts 56, when tightened against lugs 57, lock the mechanism firmly in the position selected.

It will be noted, particularly from Figure 2, that in side elevation or longitudinal section the scoop presents a segmental form, being in its preferred arrangement substantially a quadrant of the circle; and that its front and rear or forward and trailing walls are disposed convergently substantially on radii of the same circle. This is with reference to the direction of rotation of the scoop which is round the circle referred to. Such arrangement permits the scoops to be relatively thin edgewise as shown in Figure 3 and this is very important where the scoops are offset from the delivery troughs 43, and there is need for a great number of the units comprising the dipping up scoops and corresponding delivery troughs. The segmental or quadrant arrangement provides even in a laterally thin scoop a great capacity for the liquid material and its entrained solids. Moreover the quadrant arrangement with the radial walls, when inverted provides a funneling arrangement for directing the effluent to the outlet 39 and to the interior chamber of the hollow shaft. Moreover this quadrant form of scoop enables a radially deep inlet opening 39 to be formed in the front wall for the purpose, when the scoop is in its lowermost adjusted position to dip up a great quantity of the material which thereafter cannot escape from this opening 39. It will be remembered that the lateral thinness (Figure 3) of the cutters places limitations so that it is desirable to increase the radial length or height of the opening 39 for the purpose in one passage through the liquid of dipping up a substantially ample quantity, and the quadrant arrangement affords the capacity to do so while, also, when inverted, contributing to the rapid evacuation of the scoop.

The quadrant arrangement in its relationship to the direction of rotation of the scoop also prevents escape of the material out through the radially deep opening 39 because the long curved

outer wall 37 requires on rotation that the charge of liquid move therealong rearwardly until it impinges against the outer portion of the rear or trailing wall; and as the latter rotates in follow-up of the arcuate wall 37 it forms an inclined runway for diverting the sample to the outlet 39. All of this action tends to keep the sample away from the front wall so that the front wall need be solid only for a short distance outwardly from the shaft 35 sufficient to form a break water on the opposite side of outlet 38 from the rear wall along which the fluid is moving.

In comparison to cases where the effluent is led out axially at the open ends of the operating shaft 35, where there is ordinarily no or little inclination for gravity flow, the outlet ports 40 (Figures 3 and 5) present a radial outlet from the chamber 42 of the shaft 35 such that when the port 40 is down the full force of gravity acting directly earthward will tend to evacuate the shaft chamber 42 in the quickest space of time thus contributing to the efficiency of the device and permitting of axially short chambers 42 in the shaft 35 to have relatively great capacities for handling large quantities of the liquids; this being important where large numbers of the units comprising the scoops and launders 43 are to be mounted in offset relation axially along said shaft to provide a number of discharges for different destinations.

It will be appreciated that the screw-and-wedge regulating device accomplishes the delicate and exact control of the feeder delivery within a limited range. In case of the device being transferred to another service, in a different range, outside of that attainable by the wedge adjustment, change of capacity would be accomplished by variation of the elements of the drive or change in motor speed.

It will further be appreciated that the invention provides a simple, compact, and readily operated and maintained liquid feeder for the purposes specified, normally operating at a constant speed but with closely regulable capacity of liquid fed, and also capable of being readily adjusted for service in another capacity range but under equally close regulation.

Referring more particularly to Figure 6, I have shown a modified form of adjustment which might be used in place of the wedge adjustment. Substantially vertical set screws 59 are threaded through tapped openings in the platform or tilting frame 48^a after the manner of jack-screws. The lower ends of the screws 59 engage a fulcrum or block 60 carried by the tank or an extension thereof or any fixed part. Lock nuts 61 may be used to bind the screws 59 in the adjusted position. By backing off the lock nut 61 the screws 59 are free to be turned in one or the other direction which will increase or shorten the length of the screws between the fulcrum block 60 and the platform 48^a; and this length is of course determinative of the angular position of the platform and the degree of submergence of the scoops in the liquid body.

It will be appreciated that the device may be used for collecting samples, which samples are conveyed to destination by means of the launders 43.

On the feeding device launders 43 may be connected to different machines so the feeder also acts as a distributor and eliminates the rotating distributor used in addition to reagent feeders in many instances.

In flotation plants, most of the reagent feeders deliver the total reagent in one stream sufficient for a plurality, for instance 5, flotation machines. The bulk of the reagent is then divided into five portions by a mechanical distributor.

In accordance with the present invention as many scoops as there are machines would be put on the shaft. The mechanical distributor would be thus eliminated. If then, one machine was to be shut down for any reason, the operator would slip that launder from under the shaft and allow the reagent from that cutter to fall back into the tank.

It is obvious that various changes and modifications may be made in the details of construction and design of the above specifically described embodiment of this invention without departing from the spirit thereof, such changes and modifications being restricted only by the scope of the following claims.

What is claimed is:

1. In a liquid feeding device, a source of liquid, a hollow shaft journaled above the source and having a chamber therein with inlet and outlet ports axially offset and angularly displaced, means gravitationally beneath the outlet for carrying off the effluent, and an axially thin scoop placed axially beside said means and communicating with said inlet, said scoop fixed to and rotating with said shaft and being of segmental form

in the direction of rotation with substantially radial front and trailing walls having an inlet opening of great radial length in said forward wall.

2. In a liquid feeding device according to claim 1, said inlet opening extending over the maximum radial length of said forward wall.

3. In a liquid feeding device according to claim 1, said scoop having an outer arcuate wall connecting at its rear with the outer part of said radial trailing wall.

4. In a liquid feeding device according to claim 1, a movable platform supporting said shaft, and means to raise and lower said platform to alter the depth to which the scoop penetrates the source of liquid.

5. In a liquid feeding device according to claim 1, a movable platform for carrying said shaft, power means mounted on said platform and coupled to said shaft for rotating the shaft, and means coacting with said platform for raising and lowering the scoop with reference to the surface level of the liquid source.

6. In a liquid feeding device according to claim 1, a platform pivotally supported above the source and carrying said shaft, and wedge means engaging beneath said platform for elevating and lowering the scoop with reference to the liquid source.

CHARLES W. MORSE.