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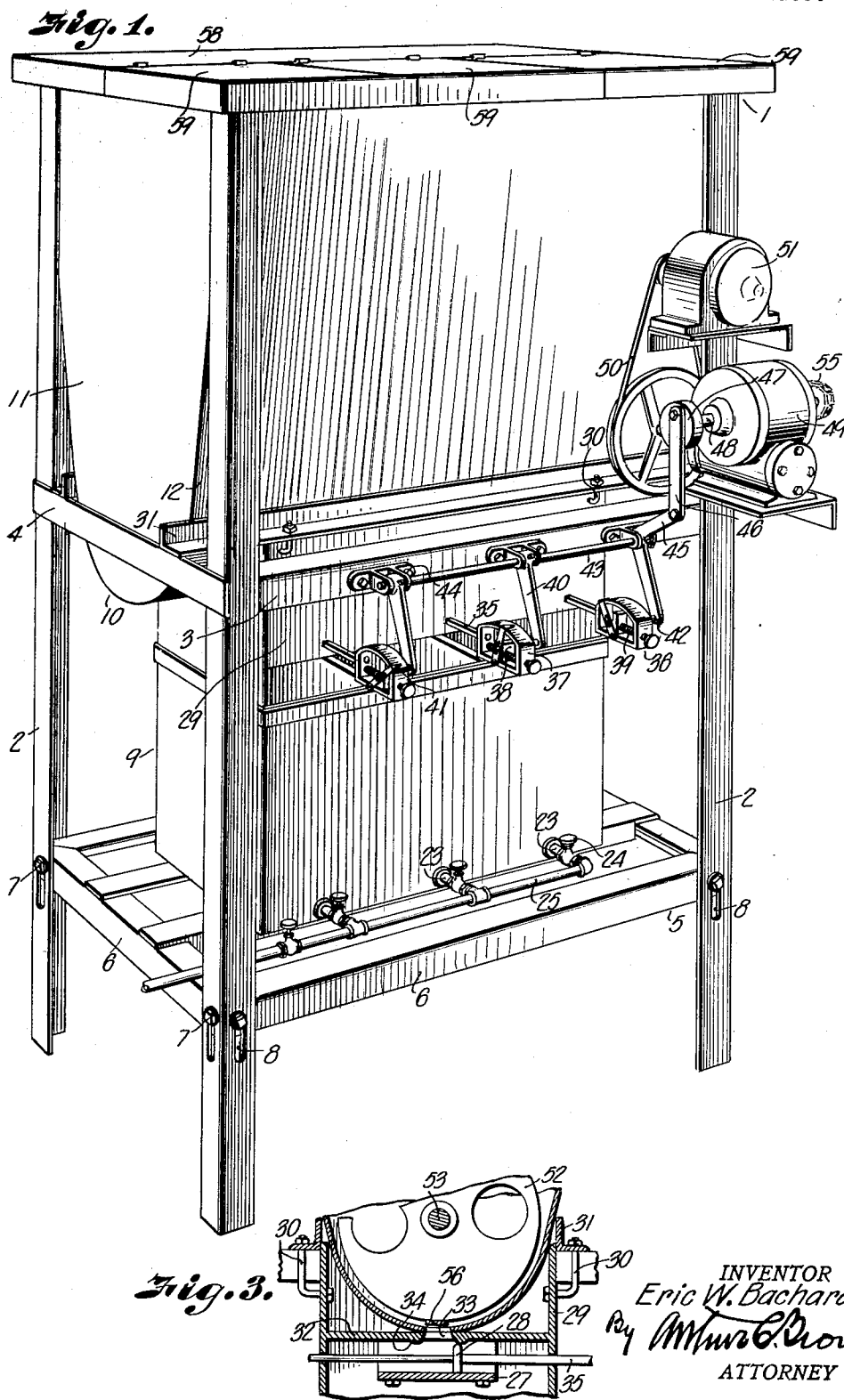
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1,947,441

COMPOUND DRY MATERIAL FEEDING MACHINE

Filed July 12, 1929

2 Sheets-Sheet 1



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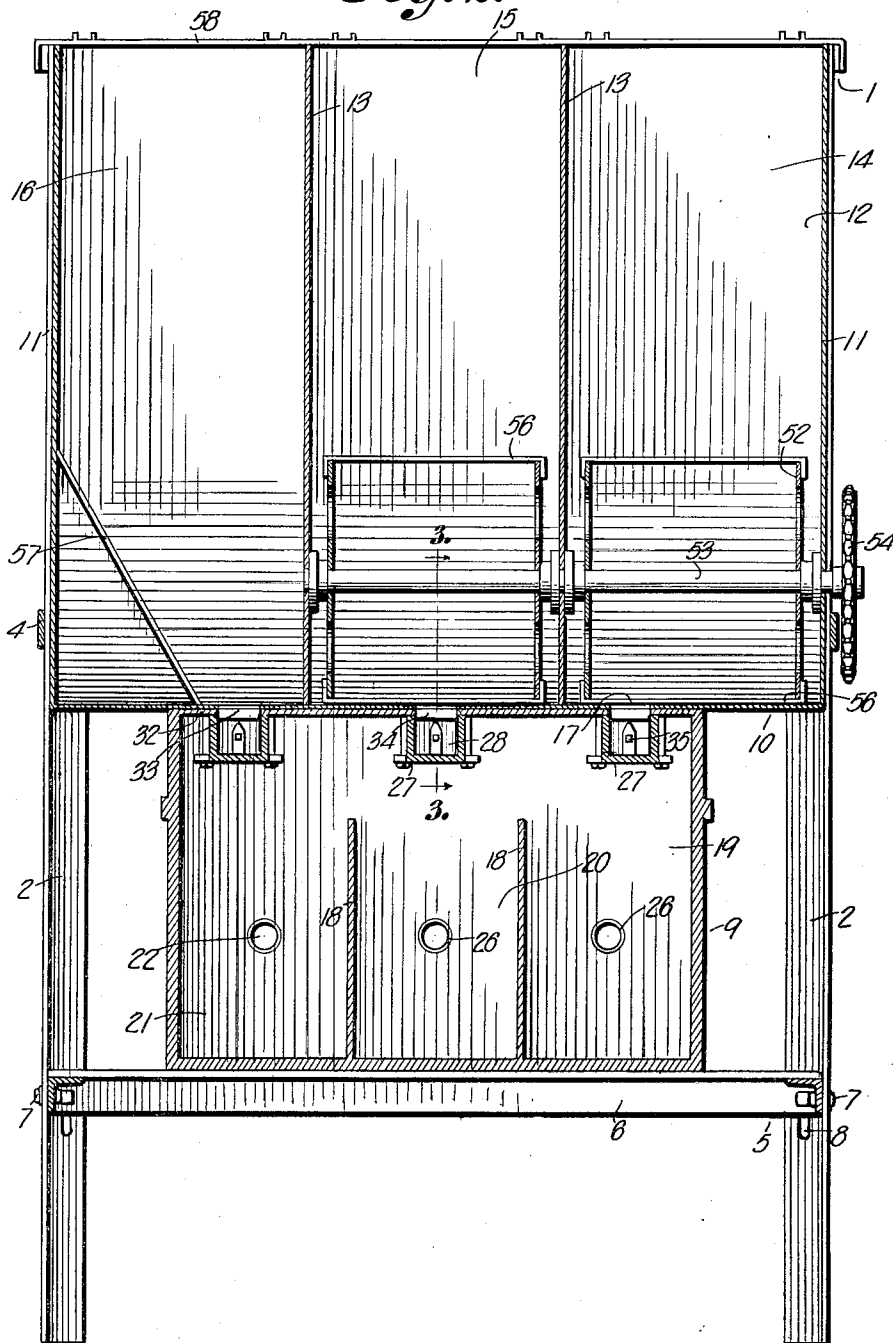
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Fig. 2.



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COMPOUND DRY MATERIAL FEEDING
MACHINE

Eric W. Bacharach, Kansas City, Mo.

Application July 12, 1929. Serial No. 377,881

7 Claims. (Cl. 221—118)

My invention relates to machines for feeding material in measured quantities, and has for its principal objects to simultaneously deliver a plurality of streams of material in measured quantities, to facilitate adjustment of feeding mechanism for independently varying the rates of flow of the several streams, and to assure coincident delivery of predetermined quantities of material.

In handling solid materials it is sometimes desirable to feed a particular material in different measured quantities. A further object of the invention therefore is to simultaneously and automatically feed solid material from a single container at different rates, for delivery into differentiated receivers.

It may be desirable to feed a plurality of kinds of solid material at measured rates of flow, for example to form a plurality of solutions for treating a water supply. Further objects of the invention therefore are to simultaneously and automatically feed predetermined quantities of different materials, to independently regulate the rates of flow of the several materials, to form separate solutions of the several materials, and to combine the solutions, whereby a single feeding mechanism may be enabled to deliver different solutions in predetermined proportions to a stream of water.

Further objects of my invention are to combine a plurality of adjustable material feeding devices for simultaneous operation by a single power source for producing solutions and delivering the solutions simultaneously to a body of water to be treated, and particularly to effect cooperation of separately adjustable feeding devices such as the machine disclosed in my co-pending application Serial No. 359,045.

In accomplishing these and other objects of the invention, I have provided improved details of structure, the preferred forms of which are illustrated in the accompanying drawings, wherein:

Fig. 1 is a perspective view of a machine constructed in accordance with my invention.

Fig. 2 is a vertical transverse central section of the machine.

Fig. 3 is a fragmentary section on the line 3—3, Fig. 2, illustrating the discharge portion of a hopper and members for delivering material in measured quantities.

Referring in detail to the drawings:

1 designates a support or frame comprising vertical corner legs 2, intermediate transverse cross members 3 and end members 4 secured to

the legs, and a shelf 5 including transverse and end angle bars 6 adjustably supported by bolts 7 slidable in vertically elongated slots 8 in the leg flanges adjacent the lower ends thereof for supporting a receiver such as a liquid container or tank 9.

The frame is transversely elongated to accommodate an elongated dry material container or hopper member 10 having parallel end walls 11 and downwardly converging front and back walls 12 curved to form an arcuate concave bottom or discharge end located slightly below the cross members of the frame. The hopper member is suitably supported by the frame as later described.

The apparatus may be adapted for delivering different measured quantities of one kind of material to different conduits or receivers for any desired purpose, and is therefore provided with a plurality of outlets or gravity discharge mouths, each provided with measuring mechanism later described for controlling the rates of flow through the outlets, and may also be further adapted for delivering measured amounts of different materials to one receiver. When adapted to handle segregated materials, as in the illustrated use of the apparatus, the hopper member is divided by partitions 13 into a plurality of compartments or hoppers 14, 15 and 16, each having an outlet or discharge mouth 17 formed in the concave bottom of the hopper member.

The tank 9 represents receiving means which may be adapted to receive measured quantities of one or more materials simultaneously, and which is illustrated as having differentiated receiving portions defined by partitions 18, forming a plurality of solution chambers or liquefying pots 19, 20 and 21 in receiving relation with the several hoppers. Each of the tank chambers has a solution outlet port 22 formed in one wall of the tank in spaced relation with the bottom thereof, and a liquid inlet nipple 23 is associated with each chamber and inserted in the opposite tank wall adjacent the bottom.

The tank inlets are connected through valves 24 with a valved supply pipe 25 whereby liquid may be delivered to the lower portions of the chambers for treatment by different chemicals delivered from the hoppers through the outlets 17, whereby solutions may be produced for movement through the chamber outlets 22.

Pipes 26 mounted in the chamber outlets may independently convey the several solutions to points of application, and may lead to a common conduit for conducting a stream of combined so-

lutions to a place of use according to the method of employing the device.

Each hopper is provided with means for controlling flow of material toward the tank, preferably including apparatus for segregating measured quantities of material such as disclosed in my co-pending application above referred to, and comprising troughs 27 in receiving relation with the hopper outlets, pistons 28 slidable in the troughs, and means for regulating the strokes of the pistons, as presently described.

The tank is shorter and narrower than the hopper member and its walls are preferably extended upwardly into engagement with the transverse arcuate walls of the hopper member, to form a housing portion 29. Bolts 30 mounted in angle bars 31 on the cross bars 4 of the frame may engage the housing portion to support and stabilize the liquid container.

Extending across the housing 29 intermediately thereof, and engaging the lower end of the hopper member, is a horizontal plate 32 having openings 33 registering with the outlets of the hoppers and provided with depending lips 34 for controlling flow of materials from the hoppers. The pistons are preferably adapted to fit snugly in the troughs and are slidably operable through rods 35 slidably supported by the frame and projecting from the front side of the frame.

Mounted on the outer end of each rod is a yoke-like head 36 having a vertical end bearing flange 37 and adapted to slidably support a horizontally adjustable bearing block 38 movable into desired spaced relation with the bearing flange 37 by a screw 39, the block and flange comprising spaced bearing members to receive the impulses of a rocking arm or crank 40 operated as presently described, for reciprocating the piston. Indicating devices represented by fingers 41 may be provided for disclosing the spaced relation of the bearing members, and magnifying the indication.

The arms 40 are provided with lateral pins 42 projecting from their outer ends adapted to engage the bearing members, and have opposite ends fixedly mounted on a rocking shaft 43 pivotally supported by brackets 44 secured to the transverse intermediate bar 3 of the frame and adapted to be rocked through a crank arm 45 pivotally connected to a link 46 having one end eccentrically pivoted on a disk 47 mounted on the shaft 48 of a reduction unit 49 driven through a belt 50 by a motor 51 mounted on the frame.

The crank arm 45 preferably comprises an arm of a bell crank lever formed by combining said crank arm with one of the arms 40, for example the terminal crank arm on the shaft 43.

Cutter disks 52 are provided in spaced parallel relation in each of selected hoppers to form a pair and are mounted on a shaft 53 extending through the selected hoppers and supported by the hopper walls and partitions, a sprocket 54 on the protruding end of the shaft being operated by a chain 55 from the reduction unit 49. Cutting straps or blades 56 attached to the peripheries of the disks connect each pair.

A selected hopper, for example the terminal hopper 16 in the series shown, may be provided with a slanting guide wall 57 having its lower end located adjacent the compartment opening for guiding the material into the trough below the opening.

The rear portion of the hopper member is covered by a lid 58, and each hopper division is covered by a lid 59 hinged to the cover 58.

The hopper member is preferably secured as by

welding or riveting to the lower legs 2 and cross members 4, and is braced and additionally supported by the angle bars 31. The plate 32 is suspended from the bars 31.

As more fully explained in aforesaid pending application, the sliding block 38 on each reciprocating rod yoke may be moved a minute distance toward or away from the end flange 37 for varying the stroke of the piston by small amounts, and thus effecting minute variations in the quantities of material moved from the trough upon each movement of the piston.

It is apparent that the outward swinging movement of the arms 40 will always retract the rods and pistons to the same positions, whereas the degree of spacing of the sliding blocks from the vertical flanges will regulate the lengths of the delivering strokes of the pistons.

The housing portion of the tank may be provided with openings for inspection and insertion of trays to obtain samples, for example for testing the rates of flow.

The shaft 43 may be rocked under impulses conferred by any suitable driving device, and any suitable connections may be provided for transferring motion from actuating elements to the shaft, the electric motor, reduction unit and constantly rotating shaft illustrated being an example of rock-shaft actuating means. The actuating element, for example a motor, may operate at constant speed, the shaft 43 may rotate constantly, and variation in feed will then be effected by adjustments of the length of feed strokes of the pistons.

In using the invention, the storage hopper is adapted for a particular purpose, by provision of a suitable number of bottom outlets, through which material may flow toward receiving means. A trough, piston and reciprocating rod are provided for each outlet to receive, measure and deliver measured quantities of material toward the receiving means, and the sliding block on each rod yoke may be adjusted to provide for delivery of material in desired proportions and different amounts during a predetermined period.

The flow-controlling devices are operated simultaneously, having their operating arms connected with the operating shaft 43, and the shaft being rocked through the crank 45, link 46 and reduction unit 49 by the motor, whereby a single power unit may synchronously actuate the several reciprocating rods.

As apparent in the different positions of the sliding blocks in Fig. 1, one block may be adjusted to relatively close relation with its associated vertical yoke flange, so that the operating arm will cause the piston on said rod to move a maximum distance over the trough and thus displace a relatively large quantity of material at each stroke. The intermediate rod may have its sliding block spaced a greater distance from the related yoke flange so that the crank arm pin will not encounter the block until the pin has moved over a substantial portion of its arc and therefore will move the piston on said rod a shorter distance than the first named arm will move the first named piston.

The third sliding block may be positioned a maximum distance from the flange of the yoke so that the associated crank pin will encounter it at the end of its arc and thus effect delivery of a relatively small amount of material from the third trough.

Each of the piston operating elements may be adjusted independently to deliver a greater

or smaller amount of material, and may be spaced sufficiently from the yoke flange so that the crank pin will not engage it and the piston will therefore not be operated when the shaft 43 is

5 rocked and operates the other pistons.

The storage hopper may be provided with partitions forming hopper compartments, each compartment being related to one of the outlets, and a different material may be supplied to each of the hopper compartments. Materials requiring no special devices to promote flow may be installed in compartments constructed similarly to the compartment 16. Materials such as finely pulverized and cohesive substances may be put into compartments having the cutting disks and dividing straps for cutting cylindrical sections from the masses of materials to permit the segregated sections to fall toward the hopper outlets and the straps will then drag portions of the materials toward the outlets.

The several streams of material may be delivered to receiving means adapted for a particular purpose, and in the illustrated use of the invention being adapted to keep the streams temporarily segregated. When solutions are to be formed, the receiving means comprises a liquefying pot or solution tank.

The solution tank as described includes separate chambers, each related with one of the hopper compartments and in the preferable application of the invention, the several materials are discharged in measured quantities into water supplied through the pipe 25 so that solutions may be formed in the chambers and may move from the chambers through the outlets thereof.

Each dry material may thus be separately dissolved to form a homogeneous solution before being mixed with other materials, and solutions.

Each of the measuring and delivering devices may be adjusted at any time, and during operation of the machine, to vary the rate of flow of the material from any hopper.

It is apparent that variation in the speed of the motor will effect corresponding variation in the intervals of actuation of the individual feed mechanisms. Therefore, if the different feed regulating mechanisms are set to deliver different amounts of material upon each occasion of actuation, due to their particular lengths of travel, the outputs of the troughs will be increased or decreased in accordance with any changes made in the speed of the drive shaft, for example in proportion to the rate at which treated fluid moves.

The drawings illustrate a machine constructed for measuring three different kinds of material and for feeding each of these measured quantities into a separate point of application. The illustration, furthermore, indicates that the solid materials discharged from the machine are to be converted into solutions and a liquefying pot so divided that each solution will be kept separated from the others.

Among the advantages of installing a single unit machine that will do the work of a number of individual devices are reduced initial cost of apparatus, decreased installation expense, saving of space and power, less repairs and depreciation. The multiple feed machine may be calibrated and regulated in the same time that it takes to perform these operations on a single feed machine. As the multiple feed machine is driven by one power unit, it is less noisy, simpler in construction, and cheaper and easier to operate than a number of single feed devices.

Any number of desired materials may thus be fed in measured quantities, and the proportions of the materials delivered during a prescribed period may vary greatly, since the adjusting mechanism is susceptible of fine gradations between extremely wide ranges, varying from a few grains of material to the conducting capacity of a trough.

The feeding devices illustrated and described are further particularly adapted for actuation by means including members responsive to changes in conditions for varying the speed of the rocking shaft, for example, members influenced by changes in temperature or rate of flow of substances in gaseous liquid or solid state, whereby the operation of the manually adjustable feeding elements may be automatically controlled proportionately to the changes in conditions.

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

1. In apparatus of the character described, a hopper member having a plurality of compartments, each provided with an outlet, means for controlling movements of the material from the compartments including a piston rod related to each compartment outlet and having a yoke on its outer end and a horizontally adjustable block in said yoke, and means for reciprocating the pistons including a shaft supported by the frame, cranks fixed to the shaft having lateral pins engageable alternately with the yokes and with the adjustable blocks for moving the rods in opposite directions, and means for rocking the shaft.

2. In apparatus of the character described, a frame, a hopper having a plurality of compartments provided with bottom outlets, means for controlling movements of materials from the compartments including a piston rod related to each compartment outlet and having a yoke on its outer end and a horizontally adjustable block in said yoke, and means for reciprocating the pistons including a shaft supported by the frame, cranks fixed to the shaft having lateral pins engageable alternately with the yokes and with the adjustable blocks for moving the rods in opposite directions, and means for moving the shaft rotatively.

3. A compound dry material feeding machine including a frame, a hopper on the frame having a partition defining a plurality of compartments and a bottom provided with restricted outlets for gravity flow of materials from the several compartments, a trough below each of said outlets having side walls engaged with said bottom to form restricted supporting means for materials moving by gravity from the compartments, means including cutters in each compartment and a rotatable shaft supporting the cutters for promoting gravity flow of materials to the troughs, pistons operating in the several troughs for displacing materials therefrom, individual means for varying the strokes of the pistons, and piston-operating means including a shaft supported by the frame, cranks on said shaft and operably connected with said pistons, and means for rocking the shaft to swing the cranks for operating the pistons.

4. A compound dry material feeding machine including a unitary hopper, a partition defining a plurality of compartments in the hopper, a bottom for the hopper provided with outlets for flow of materials from the compartments, a member below each of said outlets for receiving materials from the compartments, a rotatable shaft

- extending through the compartments, cutters on the shaft in each compartment for promoting simultaneous flow of materials to said receiving member, reciprocating pistons operable over said receiving members for displacing materials therefrom, individual means for varying the strokes of the pistons, and means for operating the pistons including a shaft, cranks on the shaft and operably connected with said pistons, and means for rocking the shaft to effect operation of the pistons including means for actuating the cutter shaft.
5. In a machine of the character described including a unitary hopper having spaced end and side walls and a bottom having spaced outlets therein, a partition extending across the hopper between said outlets to form separate compartments for separate materials, a shaft extending through the partition and one of the end walls, cutting blades carried by the shaft in each compartment and operable in close relation with said bottom to promote movement of the separate materials simultaneously through said outlets, means for operating the shaft to effect continuous rotation of the cutters in one direction, means located below said openings for receiving the respective materials, means operable over said receiving means to feed said materials from the receiving means at a rate to effect a predetermined ratio, common driving means for operably actuating said feeding means, and individual means for variably connecting the common driving means with said feeding means for selectively varying said ratio.
6. A dry material feeding machine including a hopper, a partition in the hopper defining a plurality of compartments for separately containing different materials and having a bottom provided with outlets for gravity flow of materials from the compartments, a member below each of the outlets for receiving materials from the compartments, pistons reciprocable over the receiving members for displacing the materials therefrom, means for operating the pistons, and individual means for varying the strokes of the pistons whereby regulated amounts of the respective materials are discharged from the respective receiving members to effect a predetermined fixed ratio of the quantities of the materials.
7. In a machine of the character described for feeding a free flowing material and a material of caking nature, a hopper having spaced end and side walls and a substantially semi-cylindrical bottom arranged with its axis extending in the direction of the end walls and having spaced outlet openings, a partition extending across the hopper between the outlets to form a compartment for the free flowing material and a compartment for the caking material, a shaft extending through the end wall of the last named compartment in the axis of said cylindrical bottom, cutting blades carried by the shaft and arranged to move in close proximity to the bottom of said compartment and across the opening to promote flow of the caking material, means located below said openings for receiving the respective materials, and means movable over said receiving means to feed said materials at a rate to effect a predetermined ratio.
- ERIC W. BACHARACH.

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