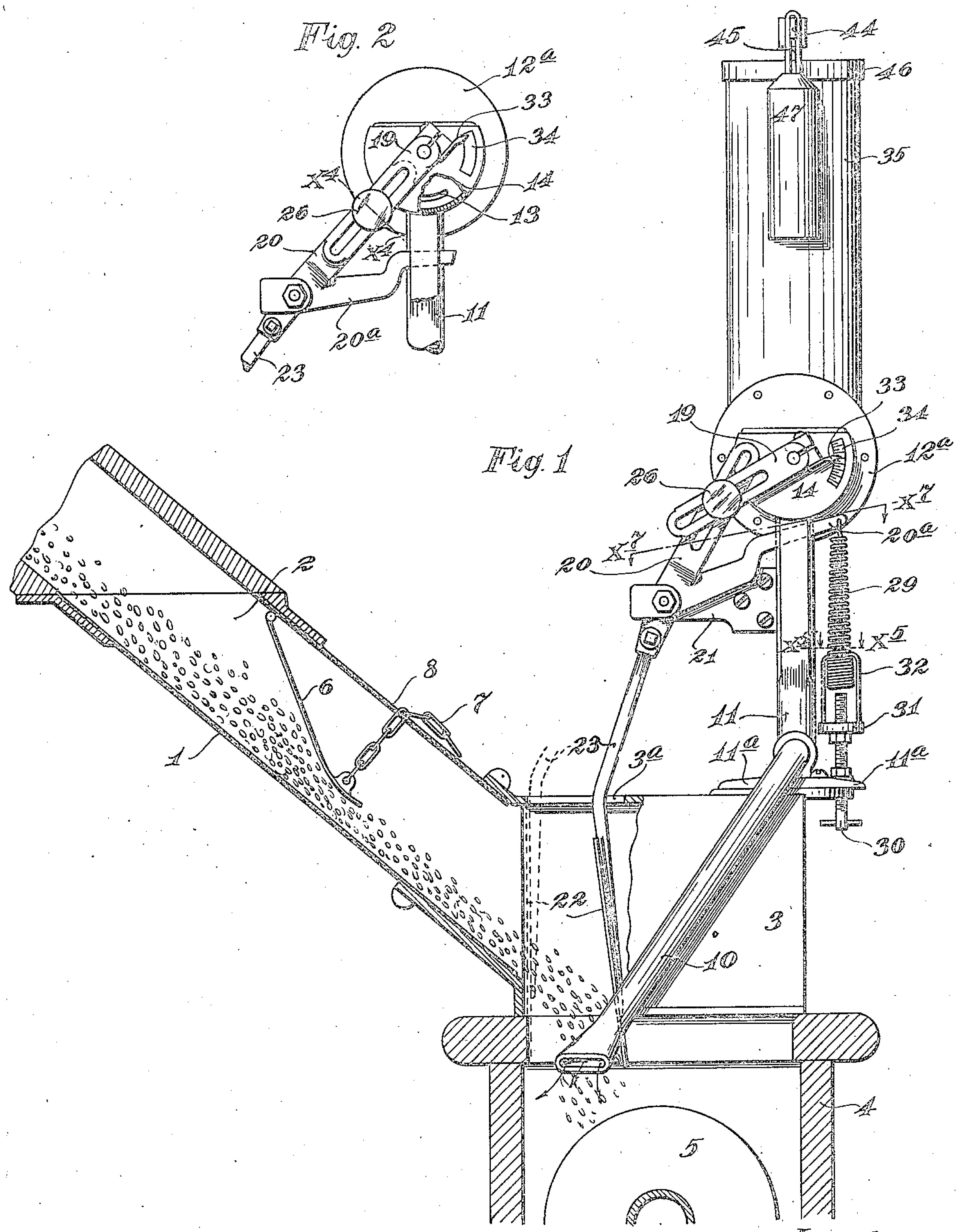
No. 881,135. PATENTED MAR. 10, 1908.

A. H. KIRK.

GRAIN DAMPENER.

APPLICATION FILED SEPT. 27, 1907.

3 SHEETS—SHEET 1.



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Inventor:

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3 SHEETS—SHEET 2.

Fig. 4

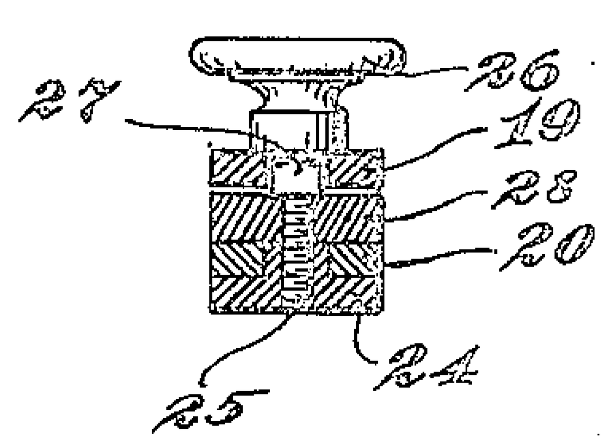

Fig. 5

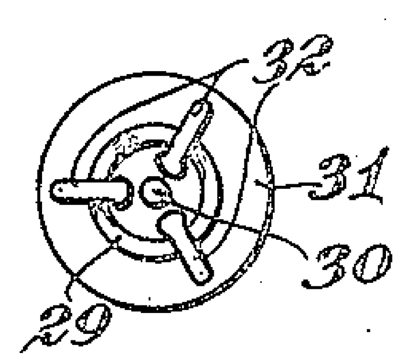

Fig. 3

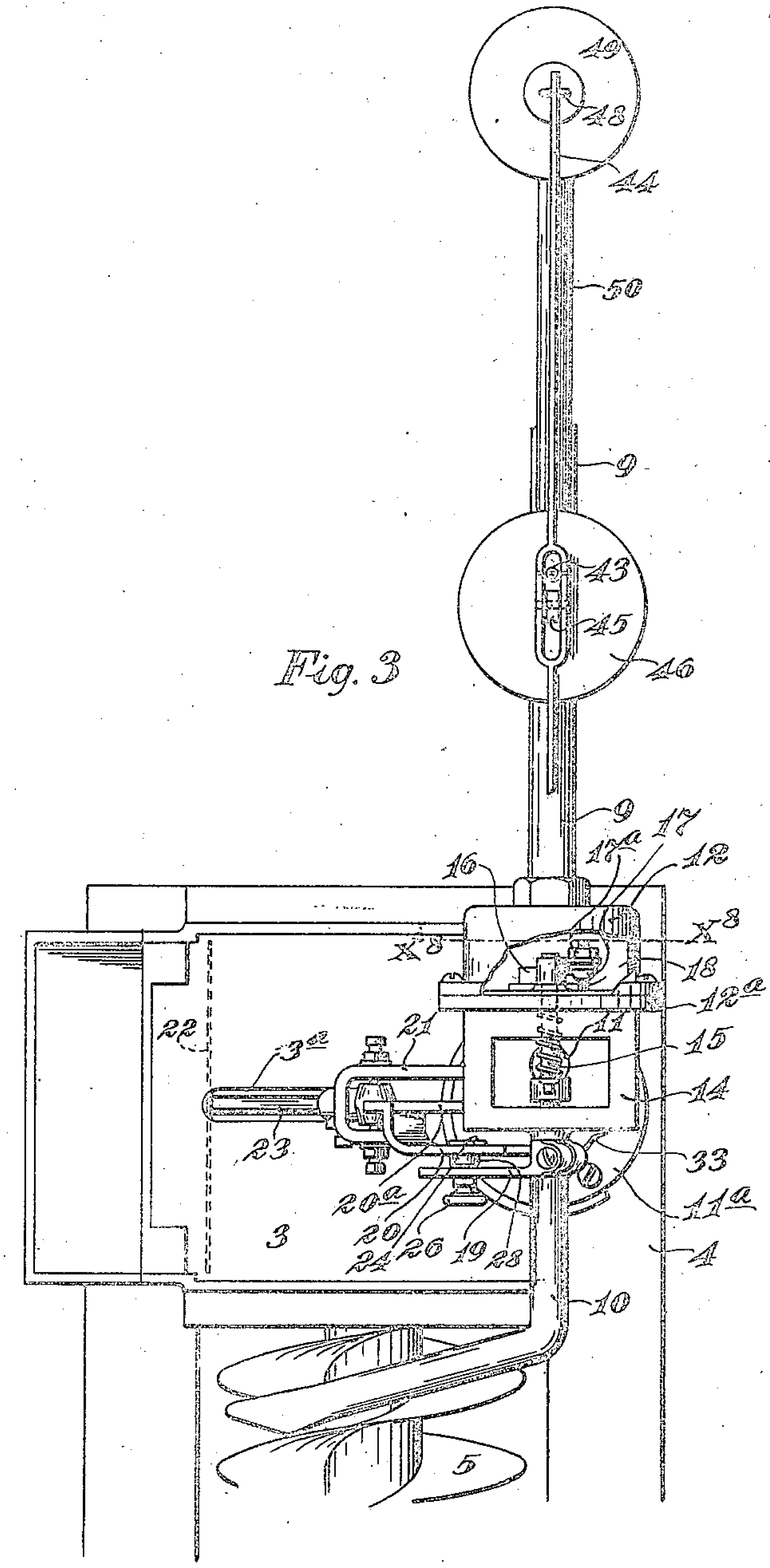

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Fig. 6

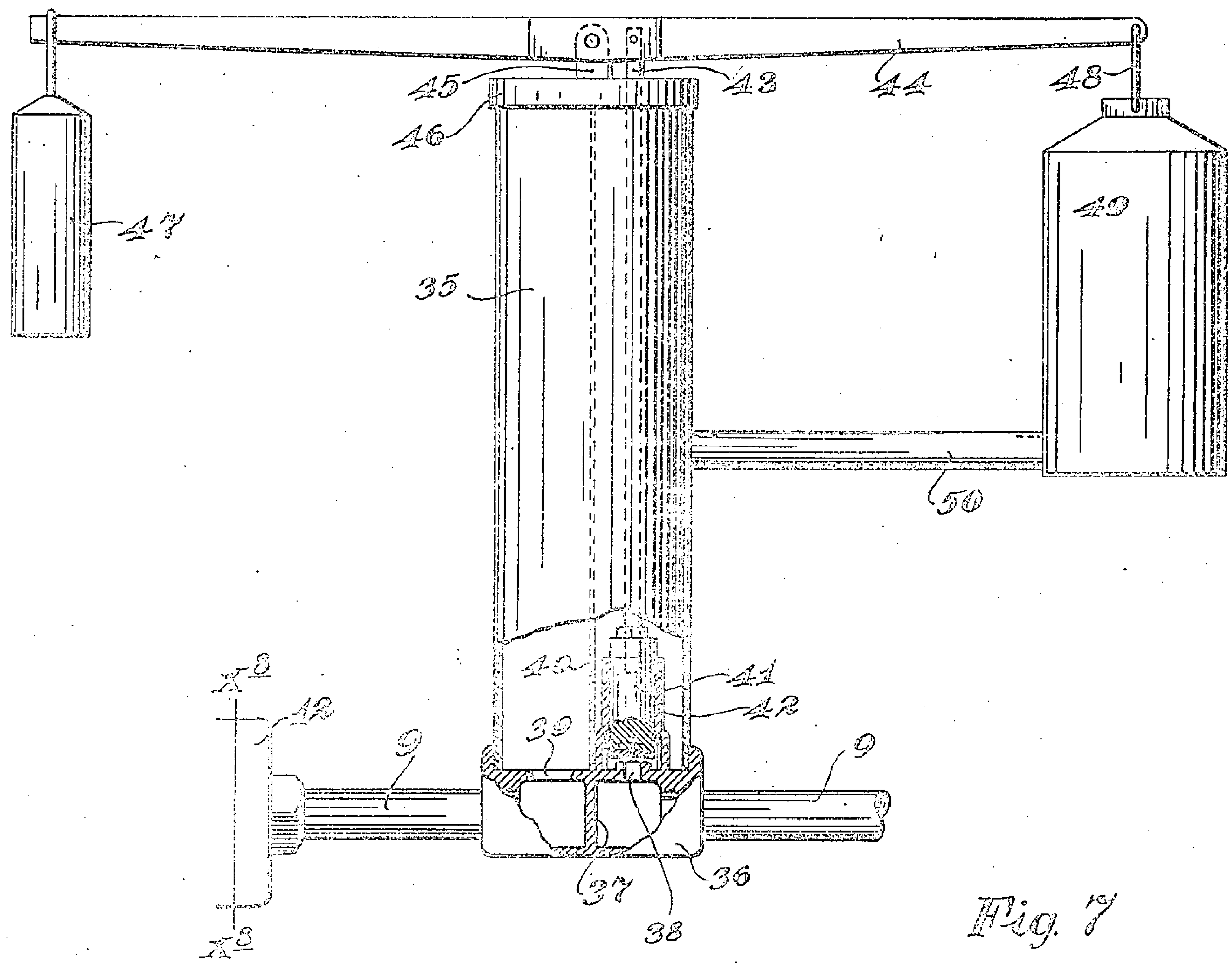
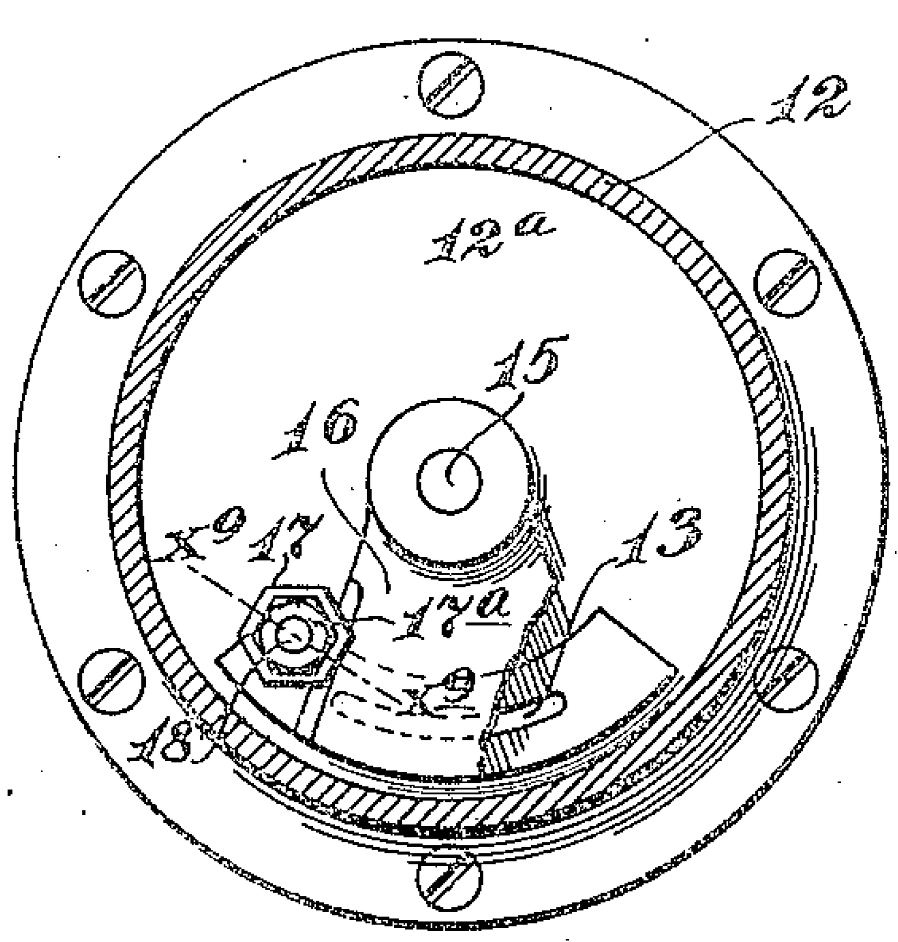


Fig. 7

Fig. 8



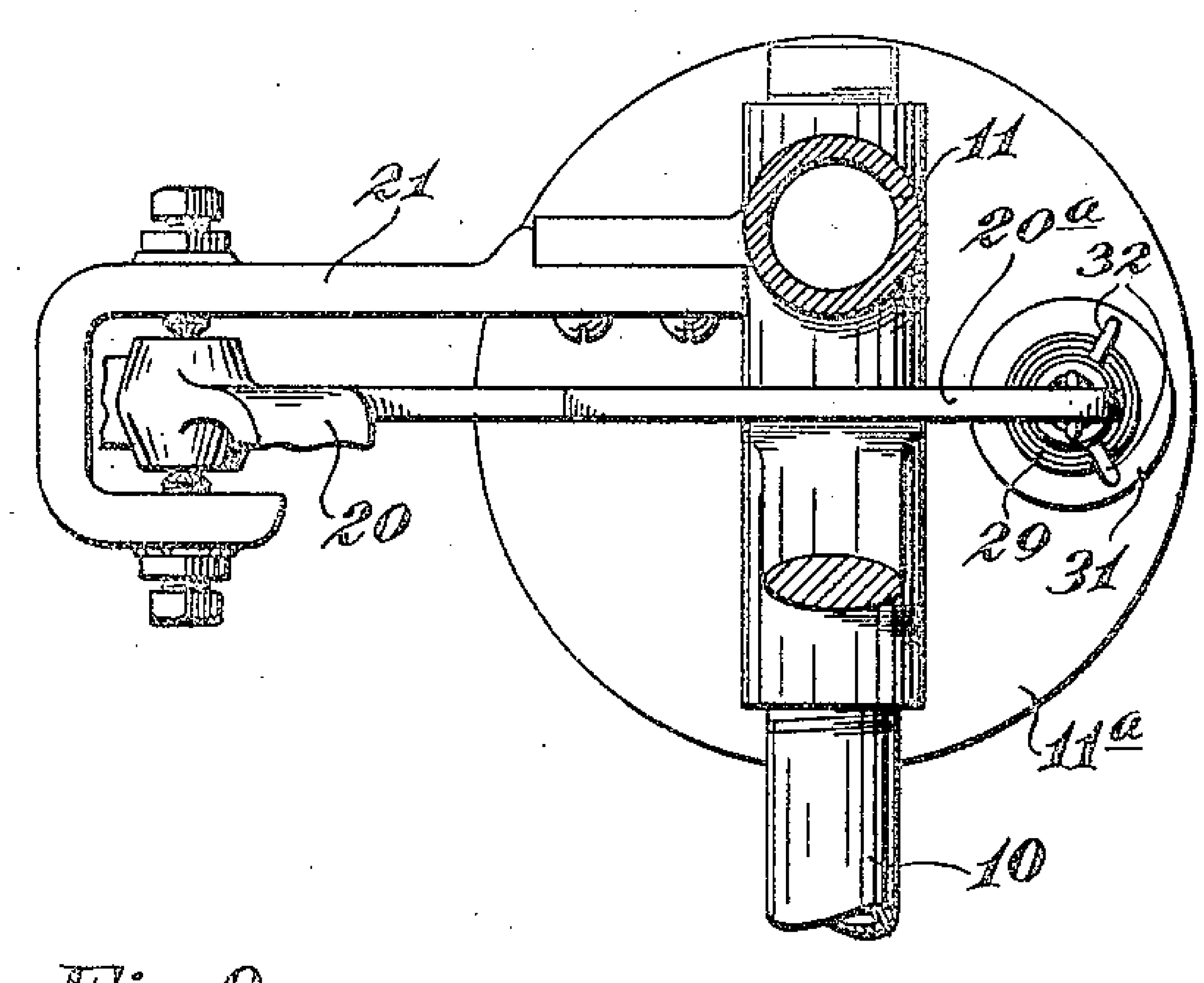
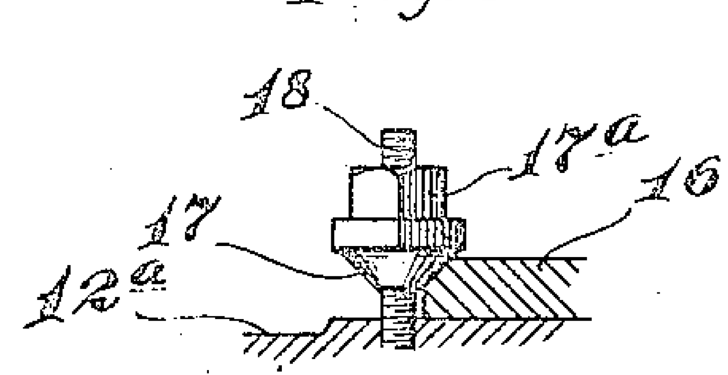


Fig. 9



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UNITED STATES PATENT OFFICE.

ALVA H. KIRK, OF MINNEAPOLIS, MINNESOTA.

GRAIN-DAMPENER.

No. 881,135. Specification of Letters Patent. Patented March 10, 1908.

Application filed September 27, 1907. Serial No. 394,830.

To all whom it may concern:

Be it known that I, ALVA H. KIRK, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Grain-Dampeners; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has for its especial object to provide an improved apparatus for moistening wheat and other grains according to the quantity and condition of the flowing stream of grain, and to this end it consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

In the art of milling it is the universal custom to put wheat through what is known as the tempering process, before it is delivered to the first break rollers. This tempering process consists in commingling water or steam, or both, with the wheat, thereby applying to the wheat berry an amount of moisture sufficient to toughen the bran or outer coating thereof, so that it will not break or cut up finely enough to go through the bolting medium and hence become commingled with the flour. Great care must be taken in thus applying the water to the wheat that there shall not be enough water to penetrate to the interior of the wheat berry and thereby soften the gluten and starch thereof, because if these inner substances are rendered damp and soft the wheat is made unfit for milling. Wheat that is very dry will, of course, require a larger percentage or relative amount of water than wheat that is already quite damp, in order to put the bran or outer coating of the berry in the proper condition above stated. Hence, in supplying the water to the wheat in the so-called tempering process, not only the quantity or amount of wheat flowing, per unit of time, must be taken into consideration, but the condition of the wheat, as to amount of moisture already contained therein, must also be considered. Otherwise stated, regardless of the amount of moisture primarily contained in the wheat, all wheat should come to the first break rollers with the same amount of moisture contained therein. Wet wheat is heavier than dry wheat and, hence, if the water be supplied to the wheat by proportioning it to the weight of the grain or to the impact produced thereby in an unobstructed fall, it is evident that the wettest grain will be given the largest amount of water, and the driest grain will be given the smallest amount of water, which is a result exactly opposite to that which is required for putting the grain into the proper condition for milling.

In my invention I have taken advantage of the fact that the dry grain will pass more rapidly than the damp or wet grain over an inclined frictional runway. This action is due to the fact that the bran or outer coating of the wheat berry is composed of a woody, glutinous fiber which, when wet or containing any considerable amount of moisture, will loosen up and make the berry rough and, furthermore, will exude a glutinous, sticky substance, thereby materially increasing the tendency of such damp wheat to cling to the inclined frictional runway. This increasing tendency of moist wheat to adhere to the inclined frictional runway will retard the velocity of the flowing stream thereof approximately in proportion to the amount of moisture therein contained. In a highly efficient apparatus, the mechanism for controlling the supply of water to the wheat must be affected by or subject to variations in the quantity of grain flowing per unit of time, and to the moist condition of the flowing grain. In my present invention I provide an apparatus which automatically accomplishes these results.

Broadly stated, the above noted results are accomplished by the provision, in connection with a conduit for supplying water to the wheat and a valve or device for regulating the flow of water through said conduit, of an inclined frictional runway, so-called, over which the wheat is caused to run, and a coöperating valve controller or actuator comprising an impact plate, so-called, so arranged that it is directly subject to the force of the momentum of the wheat which has passed over the said inclined frictional runway. Now, as the force of the impact on the so-called impact plate of the valve controller will depend both upon the weight and the velocity of the stream of flowing wheat running over and from the inclined frictional runway, and as the velocity of said wheat is decreased by the moisture primarily contained in the wheat, it of course follows that if this impact plate be set under any certain predetermined yielding pressure, the opening movement of the valve, and consequently the amount of water supplied to the wheat, will be approximately that required to properly moisten the dry wheat or to complete the moistening or dampening of the wheat which primarily or previously contained less than the required amount of moisture.

In the accompanying drawings I have illustrated an apparatus involving the features of my invention above outlined and which apparatus, in actual practice, has been found highly efficient for the purposes had in view.

In these drawings like characters indicate like parts throughout the several views.

Referring to the drawings, Figure 1 is a view partly in side elevation and partly in vertical section, with some parts broken away, illustrating the improved apparatus. Fig. 2 is a detail view in side elevation, showing an adjustable lever connection between the water feed valve and impact plate, some parts being broken away. Fig. 3 is a plan view of the apparatus, with some parts broken away. Fig. 4 is a detail in section on the line x^4 x^4 of Fig. 2. Fig. 5 is a detail in section, taken on the line x^5 x^5 of Fig. 1. Fig. 6 is a view in rear elevation, showing the elevated water supply tank and coöperating devices. Fig. 7 is an enlarged detail in horizontal section, taken approximately on the line x^7 x^7 of Fig. 1. Fig. 8 is a horizontal section taken on the line x^8 x^8 of Figs. 3 and 6, some parts being broken away; and Fig. 9 is a detail in section on the line x^9 x^9 of Fig. 8.

The inclined frictional runway 1 for the wheat or material to be dampened, is preferably formed by the bottom of an inclined spout 2 which, as shown, is arranged to deliver directly into one side of a box-like casing 3. This casing 3 is provided with an open bottom that registers with an opening in the top of a feed trough 4 in which, as shown, works a spiral conveyer 5 by means of which the tempered or dampened grain will usually be delivered to the so-called break rollers (not shown).

Located within the inclined spout 2 and pivotally connected to the top thereof is a so-called dash board or deflecting plate 6, the function of which will hereinafter appear. As shown, the downwardly extended free edge of this dash board 6 is adjustably supported from the top of the spout 2 by a chain 7 that works through a suitable passage 8 in the top of the said spout, with which passage the chain is adapted to be interlocked in different positions. The water supply conduit, as shown, is afforded by pipe sections 9 and 10, a tubular column 11, and certain interposed casings, hereinafter described. At its lower end, the column 11 has an extended base 11ª that is rigidly secured, as shown, to the top of the box-like casing 3. The pipe section 9 leads from any suitable source of water supply, such as one of the distributing pipes of city water system, and the pipe section 10 leads from the bottom of the tubular column 11 and terminates in position to discharge water onto the stream of grain as it falls from the inclined runway 1 into the trough 4. A box-like valve casing 12 is supported by the tubular column 11 and is interposed between said column and the pipe section 9, and the only passage for the water from the pipe section 9 to the column 11 is through an elongated segmental port 13 formed, as shown, in a detachable head 12ª of said casing 12. A bearing bracket 14 is rigidly secured to the said head 12ª. A rock shaft 15 is mounted in the head 12ª and bracket 14 with its inner end extending into the casing 12. To the inner end of said rock shaft 15 is secured a segmental spring-seated valve 16 that coöperates with the port 13, to open and close the same, as hereinafter described. In its closed position, one edge of the valve 16 is engaged with a beveled stop 17, shown as in the form of a cone, formed as part of the nut 17ª that works on a threaded stud 18 secured to the head 12ª. This conical stop 17 is adjustable toward and from the head 12ª to vary the amount of lap which will be given to the valve 16 in its closed position, and, furthermore, it has a camming action on said valve, tending to force the same against its seat on the head 12ª when the said valve is closed.

To the extreme outer end of the rock shaft or oscillatory valve stem 15 is secured a slotted arm 19 that coöperates with a similar overlapping slotted arm 20, shown as pivoted to a supporting bracket 21, which, in turn, is rigidly secured to the tubular column 11. The so-called impact plate 22 of the water valve controller is located within the box 3 in such position that it is directly subject to the impact or force of the momentum of the stream of wheat which has passed over the inclined frictional runway 1. This impact plate 22, as shown, is rigidly secured to a stem 23 that works through a suitable slot 3ª in the box 3, and the upper end of which is rigidly secured to a short depending portion of the slotted arm 20. The two overlapped slotted arms 19 and 20 are pivotally connected by a longitudinally adjustable pivotal coupling shown in detail in Fig. 4. This coupling includes a nut 24 which has a hub arranged to work in the slot of the arm 20. This nut 24 is engaged by the threaded stem 25 of a clamping screw 26, which, adjacent to its head, has an unthreaded portion 27 of larger diameter than the said screw. The stem 25 works loosely or without threaded engagement through a clamping block 28 interposed between the arms 19 and 20. The screw portion 27 works freely in the slot of the arm 19 and at all times serves as a pivot. When the screw 26 is tightened, the nut 24 and block 28 are caused to frictionally clamp the arm 20 and thus hold the frictional coupling in any desired position on said arm 20. The slotted arm 20 has an arm extension 20^a to which the upper end of a coiled spring 29 is attached. The lower or inner end of this spring 29 is adjustably connected to a fixed support, as shown, to the column base 11^a. This device, as herein illustrated, comprised a threaded rod 30 anchored to the said base 11^a in position and axially alined with said spring. Working with threaded engagement on the upper portion of the rod 30 is a nut-like head 31 provided, as shown, with fingers 32, the upper ends of which are hooked and work between the coils of the said spring. By rotary adjustment of the head 31 a greater or less portion of the spring 29 may be brought into or cut out of action so as to thereby vary the strength of the said spring. The spring 29 should be so wound that it is normally tight and its coils, when closed, should have the same number of threads per inch as the threaded rod 30. This spring 29 exerts a force which tends to hold the impact plate 22 in the position indicated by dotted lines in Fig. 1, the slotted levers 19 and 20 in the alined position shown in Fig. 2, and the valve 16 in the closed position shown in Fig. 8, and in these normal positions of the parts the coils of the spring will be drawn together. Hence, the head 31 and the fingers 32 may be adjusted upward or downward with respect to the spring, and at such times, when the spring is closed, without varying the tension which the spring will normally exert. It is, however, evident, that the shorter the spring the greater will be the force required to move the impact plate 22 and, hence, the valve 16, any predetermined distance away from its normal position.

As shown in Fig. 1, the arm 19 is provided with a pointer 33 that coöperates with a scale 34 on one end of the bearing bracket 14 to indicate the position of the water supply valve 16. As is evident, by adjustments of the pivotal connection between the two levers 19 and 20 the amount of movement that will be given to the valve 16 under any certain amount of movement of the impact plate 22 may be varied. For instance, when the said pivotal connection is moved upward, the amount of movement that will be given to the valve 16 under any definite movement of the said impact plate 22 will be increased and, conversely, when the said pivotal connection is lowered, the said relative movement of the valve will be decreased.

It is, of course, desirable that the water be supplied to the valve 16, under a constant pressure, and to this end I provide novel means for automatically maintaining a constant head of water in a suitable elevated water supply tank. This supply tank 35, at its lower end, is connected to a casing 36 that is interposed between the two parts of the pipe 9, as shown in Fig. 6, and is provided with a dividing partition 37. On the receiving side of the partition 37, the casing 36 is provided with a port 38 that constitutes an ingress passage to the tank 35, and on the discharge side of said partition 37 said casing is provided with a port 39 that constitutes an egress port to said tank. A perforated vertical partition 40 divides the tank 35 into two compartments on a line between the ports 38 and 39 and prevents the passage of sand or other foreign material with the water to the wheat. A vertically movable plunger valve 41 coöperates with the ingress port 38. As shown, this valve is guided by a tubular projection 42 of the casing 36, which tube is open at the sides of its lower portion to permit the free discharge of water into the tank 35. The valve 41 is provided with an upwardly projecting stem 43 that is connected to a lever 44 which, as shown, is intermediately pivoted to a lug 45 on the top or cover 46 of the tank 35. At one end, the lever 44 is provided with an adjustable counter-weight 47, and suspended from the other end of said lever, as shown, by means of a link 48, is a water receiving vessel 49, herein designated as a water can. The lower portion of this can 49 is connected by a flexible tube 50, to the intermediate portion of the water tank 35. With this valve actuating device, the weight 47 should be so set that when there is no water in the can 49 the valve 41 will be raised into position to open up the port 38 and allow water to enter the supply tank 35. When the water rises in the tank 35 to a point above the outlet to the can 49 through the tube 50, the water will, of course, run into said can and will rise therein until the weight of the water in said can overcomes the force of the weight 47, whereupon the valve 41 will be forced downward into position to close the ingress port 38 and thus temporarily shut off the supply of water to the tank 35. When water is drawn from the tank 35 it will also run from the can 49 until the effective weight of said can is less than that of the weight 47, and then the valve 41 will be again moved into an open position. In this way, the water in the tank 35 is kept approximately at a constant level so that the water will be supplied to the valve 16 under predetermined pressure, which pressure, however, is variable by adjustments of the weight 47.

The operation of the apparatus, briefly summarized, is substantially as follows: The wheat delivered into the upper end of the spout 2 will run by gravity over the inclined frictional runway 1. The so-called dash board or deflecting plate 6 serves to direct any of the wheat berries which may be flying or jumping about within the spout 2 back into the main body of the running stream of wheat and insures a proper frictional engagement between the wheat and the said inclined runway. The effect of the inclined runway on the wheat containing various different amounts of moisture has already been fully discussed. The stream of wheat, as is obvious, in passing from the discharge end of the inclined runway 1, is, by its acquired momentum, thrown against the impact plate 22, thereby forcing the latter in a direction which, through the coöperating arms 19 and 20, will move the valve 16 into a position to open up the port 13 a greater or less extent, depending on the amount of movement given to the said impact plate. As already fully stated, the amount of opening movement thus given to the valve will be that required to give a supply of water sufficient to dampen dry wheat or to complete the dampening of slightly damp wheat, as required to put the wheat in the proper condition for milling. By adjustments of the pivotal connection between the two arms 19 and 20 in a manner already described, the amount of water which will be given to a certain unit or measure of wheat of any degree of initial dampness, may be considerably varied. Different conditions frequently require different amounts of moisture in the bran or outer shell of the wheat berry, and this, as is evident, may be provided for by the adjustments just noted. The wheat and water, more or less commingled, drop into the trough 4 and by the sprial conveyer 5 are further commingled and fed outward, usually to the first break rolls.

The apparatus above described, while described in its use for treating wheat, may, of course, be used for various other purposes where it is desired to commingle a predetermined amount of water or other liquid and other grain, or other granular or finely divided materials which are capable of running or flowing over an inclined frictional runway.

What I claim is:

1. In an apparatus of the kind described, the combination with an inclined frictional runway for the material to be dampened, of a water conduit for supplying water to such material, a valve in said conduit, and a valve controller comprising a movably mounted impact plate directly subject to the force of the momentum of the material which has passed downward over said inclined frictional runway, substantially as described.

2. In an apparatus of the kind described, the combination with an inclined frictional runway for the material to be dampened, of a water conduit for supplying water to such material, a valve in said conduit, and a valve controller comprising a movably mounted impact plate directly subject to the force of the momentum of the material which has passed downward over said inclined frictional runway, and a yielding element tending to force said impact plate against the force of the momentum of said material, substantially as described.

3. In an apparatus of the kind described, the combination with an inclined frictional runway for the material to be dampened, of a water conduit for supplying water to such material, a valve in said conduit, and a valve controller comprising a pivotally mounted impact plate directly subject to the force of the momentum of the material which has passed downward over said inclined frictional runway, and a spring exerting a force on said impact plate tending to move the same against the force of the momentum of said material, substantially as described.

4. In an apparatus of the kind described, the combination with an inclined frictional runway for the material to be dampened, of a water conduit for supplying water to such material, a valve in said conduit, and a valve controller comprising a movably mounted impact plate directly subject to the force of the momentum of the material which has passed downward over said inclined frictional runway, and an adjustable spring exerting a force tending to move said impact plate against the force of the momentum of said material, substantially as described.

5. In an apparatus of the kind described, the combination with an inclined frictional runway for the material to be dampened, of a water conduit for supplying water to such material, a valve in said conduit, and a valve controller comprising an impact plate directly subject to the force of the momentum of the material which has passed downward over said inclined frictional runway, a yielding resistance device tending to move said impact plate against the force of the momentum of said material, and an adjustable connection between said impact plate and said valve for varying the amount of movement given to said valve under predetermined movement of said impact plate, substantially as described.

6. In an apparatus of the kind described, the combination with an inclined frictional runway for the material to be dampened, of a water conduit for supplying water to such material, a valve in said conduit, and a valve controller comprising a yieldingly mounted impact plate directly subject to the force of the momentum of the material which has been passed downward over said inclined frictional runway, overlapped arms, one connected to said valve and the other to said impact plate, and a longitudinally adjustable pivotal connection between the said two arms, substantially as described.

7. In an apparatus of the kind described, the combination with an inclined frictional runway for the material to be dampened, of a water conduit for supplying water to such material, a valve in said conduit, and a valve controller comprising a pivotally mounted impact plate directly subject to the force of the momentum of the material which has passed downward over said inclined frictional runway, a pair of overlapped slotted arms, the one connected to said valve and the other to said impact plate, a longitudinally adjustable pivotal connection between the said two slotted arms, and a spring tending to move said impact plate against the force of the momentum of said material, substantially as described.

8. In an apparatus of the kind described, the combination with an inclined frictional runway for the material to be dampened, of a dash board or deflecting plate overlying said runway, a water conduit for supplying water to such material, a valve in said conduit, and controller for said valve comprising a yielding impact plate directly subject to the force of the momentum of the material which has passed over said inclined frictional runway, substantially as described.

9. In an apparatus of the kind described, the combination with a conduit for the material to be dampened and a conduit for the water to be supplied thereto, of an elongated port interposed in said water conduit, a valve coöperating with said elongated port, and a controller for said valve comprising an impact plate subject to the flowing material to be dampened, substantially as described.

10. In an apparatus of the kind described, the combination with a conduit for the material to be dampened and a conduit for the water to be supplied thereto, of a port and a coöperating valve interposed in said water conduit, a beveled stop acting on said valve when the latter is closed to press the same against its seat, and a controller for said valve comprising an impact plate connected to said valve and subject to the flowing material to be dampened, substantially as described.

11. In an apparatus of the kind described, the combination with a conduit for the material to be dampened and a conduit for the water to be supplied thereto, of an elongated port and coöperating valve in said conduit, an adjustable beveled stop operative on one edge of said valve when the latter is in a closed position, and a controller for said valve comprising an impact plate, connected to said valve and subject to the flow of material to be dampened, substantially as described.

12. In an apparatus of the kind described, the combination with a conduit for the material to be dampened and a conduit for the water to be supplied thereto, of a valve in said water conduit, a valve controller connected to said valve and subject to the flow of the material which has passed said material conduit, and a yielding device tending to maintain said valve in a closed position, comprising a coiled spring, a threaded rod axially alined with said spring, and a spring adjusting head having threaded engagement with the threaded rod and having one or more fingers adjustably engageable between the coils of said spring, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ALVA H. KIRK.

Witnesses
H. D. Kilgore,
F. D. Merchant