

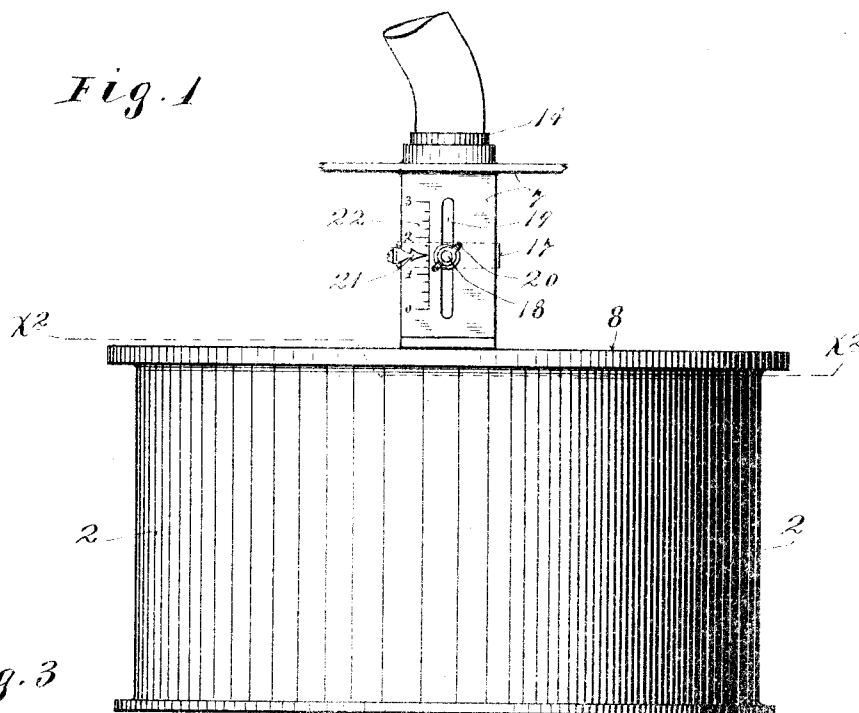
J. L. WILLFORD.  
ADJUSTABLE FEEDER AND MIXER.  
APPLICATION FILED DEC. 1, 1911.

1,061,348.

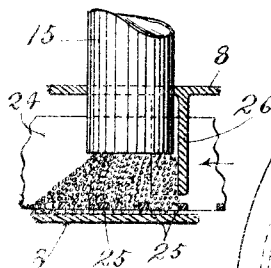
Patented May 13, 1913.

3 SHEETS—SHEET 1.

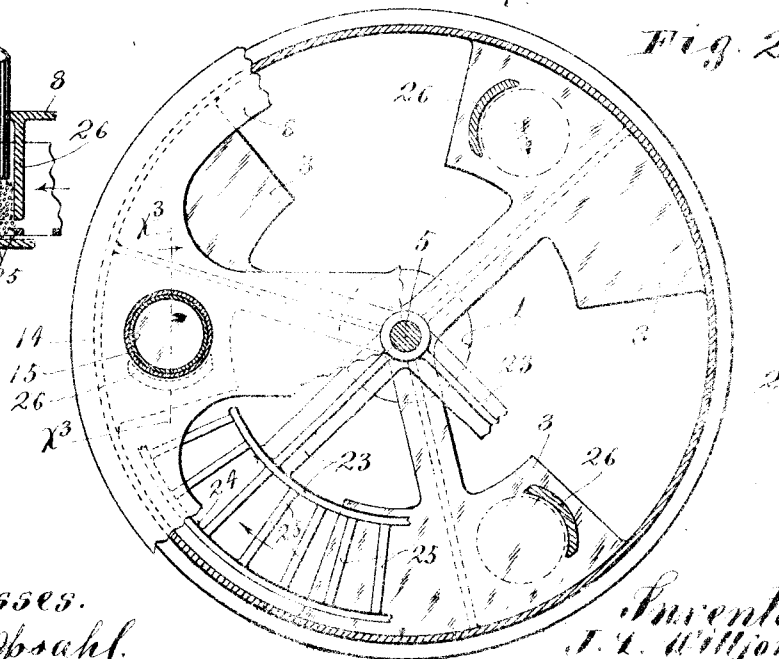
*Fig. 1*



*Fig. 3*



*Fig. 2*



Witnesses.  
a. H. Opsahl.  
Geo. Knutson.

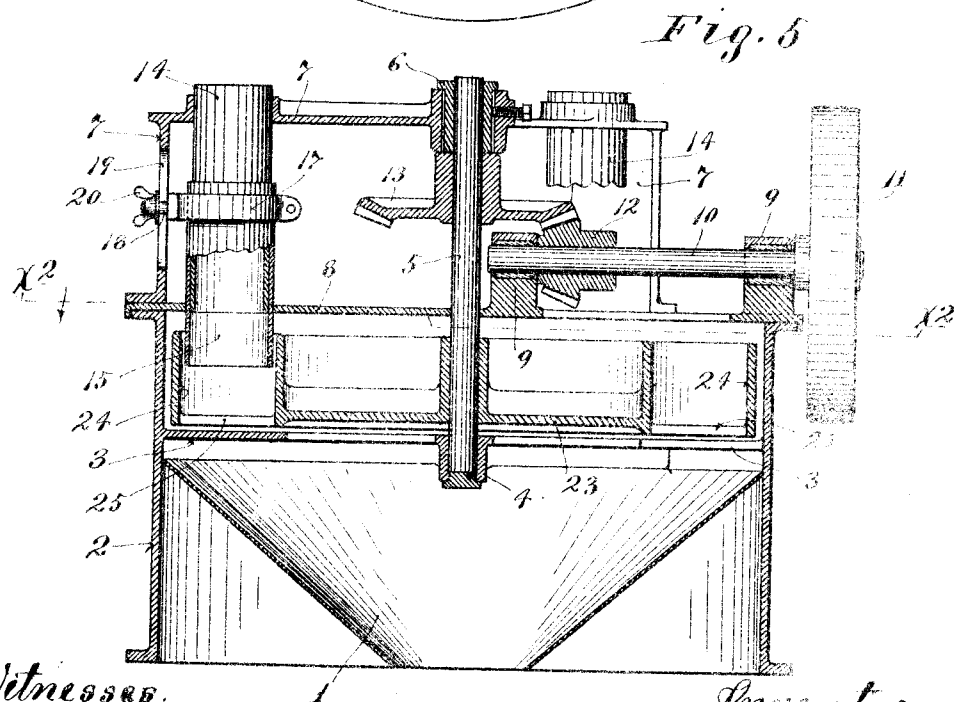
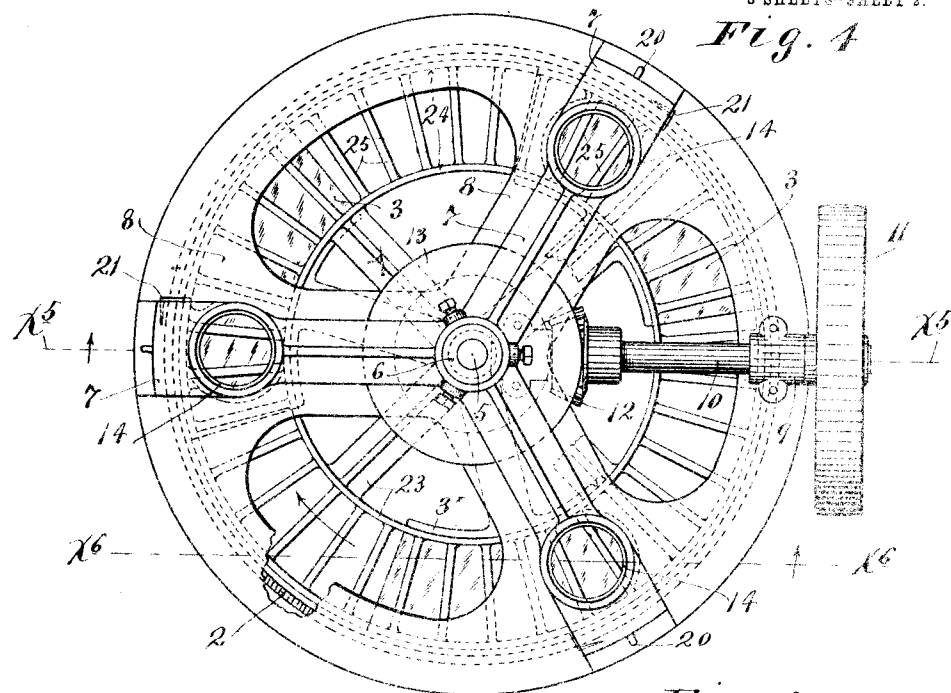
Inventor.  
J. L. Willford.  
By his attorneys  
Williamson & Macdonald

J. L. WILLFORD.  
ADJUSTABLE FEEDER AND MIXER.  
APPLICATION FILED DEC. 1, 1911.

1,061,348.

Patented May 13, 1913.

3 SHEETS—SHEET 2.



Witnesses.  
A. H. Osrah.  
Geo. Fructon

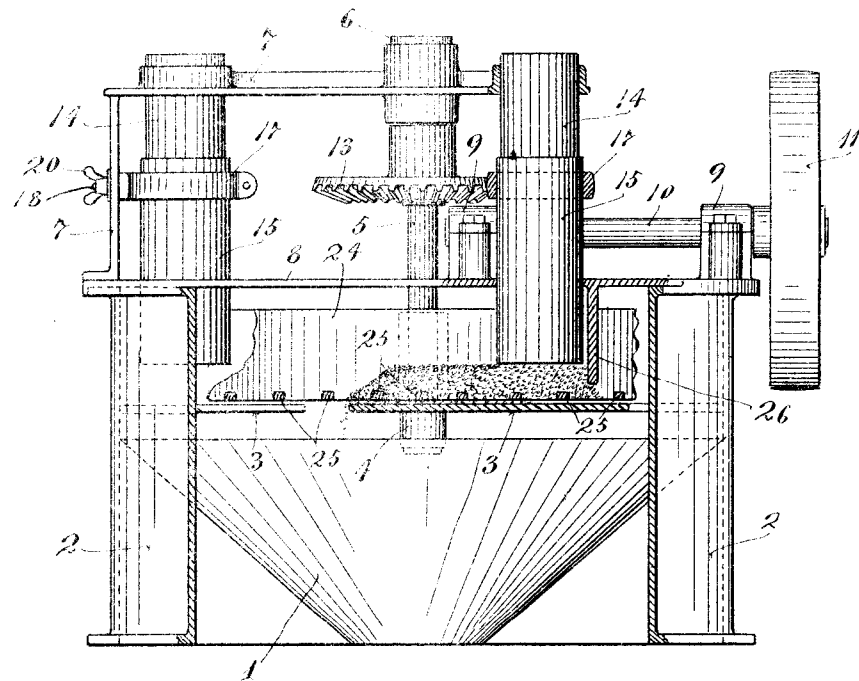
Inventor  
J. L. Willford  
By his attorneys  
Williamson & Merchant

J. L. WILLFORD.  
ADJUSTABLE FEEDER AND MIXER.  
APPLICATION FILED DEC. 1, 1911.

1,061,348.

Patented May 13, 1913.  
3 SHEETS—SHEET 3.

Fig. 6



Witnesses.  
A. H. Oprecht.  
Geo. Knutson

Inventor.  
J. L. Willford.  
By his Attorneys  
Williamson, Murdoch & Co.

# UNITED STATES PATENT OFFICE.

JOSEPH L. WILLFORD, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR OF ONE-HALF TO  
BENJAMIN A. O'NEILL, OF MINNEAPOLIS, MINNESOTA.

## ADJUSTABLE FEEDER AND MIXER.

1,061,348.

Specification of Letters Patent.

Patented May 13, 1913.

Application filed December 1, 1911. Serial No. 685,191.

*To all whom it may concern:*

Be it known that I, JOSEPH L. WILLFORD, 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 Adjustable Feeders and Mixers; 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 object to provide an improved feeding and mixing mechanism, which for convenience, I designate a percentage feeder, and which, generally stated, consists of the novel devices and combinations of devices hereinafter described and defined in the claims. From a broad point of view, this so-called percentage feeder is capable of use to feed one or more streams of any kind of cereals, granular or powdered materials which are capable of flowing in the form of a stream and are not liquid in their nature.

In the preferred embodiment of the invention, the device is arranged to receive and control the supply of several different streams of grain or materials to be mixed and to thoroughly commingle or blend the said materials together and to discharge the same in a single stream. Also, provision is made whereby the relative amounts or percentages of the different materials supplied in the mixture or blend may be varied, at will. Furthermore, means is provided whereby the total feed, either of one or of several different materials, in units of flow per minute, may be varied at will.

A percentage feeder of this character has many uses. For instance, it may be used to blend together in the proper percentages, various grades of wheat or other cereals, or for blending together in the proper proportions or percentages, different grades or kinds of flour or other pulverized materials. However, the possible uses of the device are too numerous for any attempted enumeration thereof, and the above given uses are those for which the improved feeder has been particularly designed.

In the accompanying drawings which illustrate the invention in what I at present believe to be its preferred form, like characters indicate like parts throughout the several views.

Referring to the drawings, Figure 1 is a view in side elevation showing the improved device; Fig. 2 is a horizontal section taken approximately on the line  $x^2 x^2$  on Figs. 1 and 5, certain parts being broken away, and some parts being removed; Fig. 3 is a detail in vertical section on the line  $x^3 x^3$  on Fig. 2; Fig. 4 is a plan view of the device with some parts broken away; Fig. 5 is a vertical section taken approximately on the line  $x^5 x^5$  on Fig. 4, some parts being broken away; and Fig. 6 is a vertical section taken on the line  $x^6 x^6$  on Fig. 4.

In the preferred arrangement of the device, a mixing hopper 1 is shown as supported within a cylindrical casing or main shell 2 that is provided with three internal horizontal extended segmental feed tables 3. Also, as shown, the tables 3 have inwardly projecting arms that terminate in a hub 4 that affords a step box for the lower end of a vertical shaft 5. The upper end of the shaft 5 is journaled in a bearing 6 formed as the hub of the spider-like top of a housing or supplemental case section 7 that is rigidly secured on the top of the main case or shell 2. A horizontal bearing plate 8 is secured on the top of the shell 2, the same, as shown, being interposed between the said members 2 and 7. The bearing plate 8 is provided with bearings 9 in which a horizontal shaft 10 is journaled. At its outer end, this shaft 10 is shown as provided with a pulley 11, and at its inner end with a beveled pinion 12 that meshes with a beveled gear 13 secured on the vertical shaft 5. The shaft 10 is arranged to be driven by a belt, not shown, but which will run over the pulley 11.

As the present device is shown as designed to mix or blend three different kinds or grades of grain or other material, three independent inclined spouts 14 are shown. These spouts 14 would, of course, receive from different bins or sources of supply. These spouts 14 are extended through and rigidly secured to the spider-like top plate of the housing 7, and their depending ends are provided with vertically adjustable telescopically movable delivery sections 15. Means is provided for setting the adjustable spout sections 15 at their lower ends at different elevations for the respective underlying

feed tables 3; and, as shown, such adjustment is provided for by brackets 17 rigidly secured to the upper ends of the said adjustable spout sections 15 and provided with projecting trunnions 18 that work through vertical slots 19 in the vertical walls of the housing 7, and are provided at their outer ends with clamping nuts 20. Also, as an important feature, the brackets 17 or other parts movable with the respective spout sections 15, are provided with projecting pointers or indicators 21 that work over graduated scales 22, shown as directly marked on the adjacent portions of the housing 7, (see particularly Figs. 1 and 5).

The relation of the lower ends of the delivery sections 15 of the feed spouts to the underlying feed tables 3 are such that by gravity, the grain or similar material, will spread out on the said table, but will not run off from the said tables into the hopper. The feeding action is produced by a rotary sweeper or feed wheel 23 formed with an annular trough 24 having an openwork or latticed bottom 25. This feed wheel 23 is secured to and carried by the vertical shaft 5, and the latticed bottom thereof runs with ample clearance over the hopper surfaces of the feed tables 3. The lower ends of the adjustable sections 15 of the several supply spouts 14 are adapted to depend into the annular trough 24 and to work between the vertical walls thereof.

The direction of rotation of the feed wheel 23 is shown by arrows marked on Figs. 2 and 4. Immediately back of the lower end of each delivery spout section 15, the bearing plate 8 is provided with depending back stop flanges 26. The lower edges of these back stops 26 have good clearance above the latticed bottom 25 of the feed trough 24, but the side edges of the said back stops very closely engage with the vertical walls of the said trough and may, if desired, be provided with packing strips of felt or other material.

Operation: In the description of the operation, it will be assumed that three different grades of grain, such as wheat, are to be commingled or blended in certain desired proportions. The supply spouts will, of course, by gravity, be kept filled with grain and the grain will run from the lower ends thereof into the annular feed trough 24 of the feed wheel 23, and will spread out on the feed tables 3, but will not overflow, the latter, being confined to a very considerable extent by the sides of the said trough, and by the back stops 26. Of course the extent to which the grain will spread out on the respective feed tables 3 will depend upon the vertical adjustments of the respective feed spout sections 15, and also, the relative amounts of the several different grades of grain that will be fed under ro-

tation of the feed wheel, will depend upon the vertical elevation of the lower ends of the feed spout sections 15, from the respective tables. When the scales 22 are to be graduated to indicate the number of cubic inches of grain fed per minute under rotation of the feed wheel, a definite speed of rotation of the said feed wheel must be assumed. Otherwise stated, the scale 22 is graduated for a machine in which the speed of rotation of the feed wheel is definitely known. When this is done, the operator may very quickly and easily set the different feed spout sections 15 so that they will feed the desired relative amounts figured in units of cubic inches per minute. Variation in the speed of rotation of the feed wheel will vary the number of cubic inches per minute, but not the relative or proportionate amounts of material fed into the hopper from the several supply spouts 14. Considering further the feeding action under rotation of the feed wheel, it will be noted that the grain or material delivered onto the feed tables from the feed spout sections 15 will be positively prevented from running backward by the back stops 26, and will be confined between the vertical walls of the feed trough 24 and in frictional engagement therewith, so that under rotary movement of the said feed wheel, the side walls, as well as the latticed bottom 25 of the said feed wheel, will operate to positively feed the grain forward and off from the respective feed tables. This insures a positive and evenly proportioned or graduated feed of the material. The accuracy of the feeding action is due very largely to the latticed or open bottom of the annular feed trough of the feed wheel, and it is evident that the circumferentially spaced lateral bars which afford the latticed bottom to the said trough, will continuously sweep the grain or material from the feed tables into the mixing hopper 1. Thus the sides and bottom of the feed trough of the feed wheel operate positively to feed a stream of grain, the cross-section of which is predetermined by the distance between the side walls of the feed trough 24 and the distance between the feed table and overlying lower extremity of the adjustable feed spout section 15. The grain, or material that has been swept off from the feed tables, will, of course, immediately fall through the latticed bottom of the feed trough and the several streams of different grades of grain or material will thus be constantly and evenly commingled in the hopper and delivered from the hopper in a single thoroughly blended stream. By reference particularly to Fig. 6, it will be noted that the feed table 3, in the direction of rotation of the feed wheel, is extended so far from the respective back stops 26 that even when the spout sections 15 are

in their highest adjustment, grain will not run by gravity off from the said feed tables when the feed wheel is stopped. It is also important to note that under rotation of the feed wheel, the several different streams of material to be mixed are swept off from the respective feed tables in the same direction and are delivered with a sort of a tangential movement into the hopper, so that a whirling motion is set up which very thoroughly, evenly and continuously, commingle the materials in the hopper.

The device, as already indicated, is especially designed for commingling or blending different materials or grades of the same material, but it involves novel and important features capable of use as a single feed device for supplying a positive or predetermined quantity of a single kind or grade of material.

What I claim is:

1. In a feed device of the kind described, the combination with a feed table, of a rotary feed wheel having a continuous annular feed trough with continuous parallel walls and openings in its bottom arranged to move immediately above said feed table, and a supply spout having its lower end located vertically over said feed table and extended downward into the annular feed trough of said feed wheel.
2. In a feed device of the kind described, the combination with a feed table, of a rotary feed wheel having a continuous annular feed trough with continuous parallel walls and openings in its bottom arranged to move immediately above said feed table, a supply spout having its lower end located vertically over said feed table and extended downward into the annular feed trough of said feed wheel, and a relatively fixed back stop extended downward into said annular feed trough immediately back of the lower or delivery end of said supply spout.
3. In a feed device of the kind described, the combination with a feed table, of a rotary feed wheel having a continuous annular feed trough with continuous parallel vertical walls and openings in its bottom arranged to move immediately above said feed table, and a supply spout having an adjustable delivery end depending into and

arranged to deliver material into said feed trough immediately above said feed table.

4. In a feed device of the kind described, the combination with a feed table, of a rotary feed wheel having an annular feed trough with continuous parallel vertical walls and openings in its bottom arranged to move immediately over said feed table, a supply spout arranged to deliver material into said feed trough immediately above said feed table, and a back stop located immediately at the rear of said feed spout and depending into said feed trough.

5. In a feed device of the kind described, the combination with a feed table, of a rotary feed wheel having a continuous annular feed trough with continuous parallel walls and openings in its bottom arranged to move immediately above said feed table, a supply spout having its lower end located vertically over said feed table and extended downward into the annular feed trough of said feed wheel, and a relatively fixed back stop extended downward into said annular feed trough immediately back of the lower or delivery end of said supply spout, the said feed table being extended in the direction of rotation of said wheel so as to prevent grain supplied thereto by said spout from running off from the same when the feed wheel is standing still.

6. In a feed device of the kind described, the combination with a feed table, of a rotary feed wheel having a continuous annular feed trough with continuous parallel walls and openings in its bottom arranged to move immediately over said feed table, a relatively fixed back stop extended downward into the annular trough of said feed wheel immediately above said feed table, and a supply spout having a vertically adjustable delivery end extended downward into the annular trough of said feed wheel immediately above said feed table and immediately in front of said back stop.

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

JOSEPH L. WILLFORD.

Witnesses:

F. D. MERCHANT,  
HARRY D. KILGORE.