No. 896,891. PATENTED AUG. 25, 1908.

H. A. CAMPBELL.

GRAIN SEPARATOR.

APPLICATION FILED APR. 18, 1907.

3 SHEETS—SHEET 1.

Fig. 2

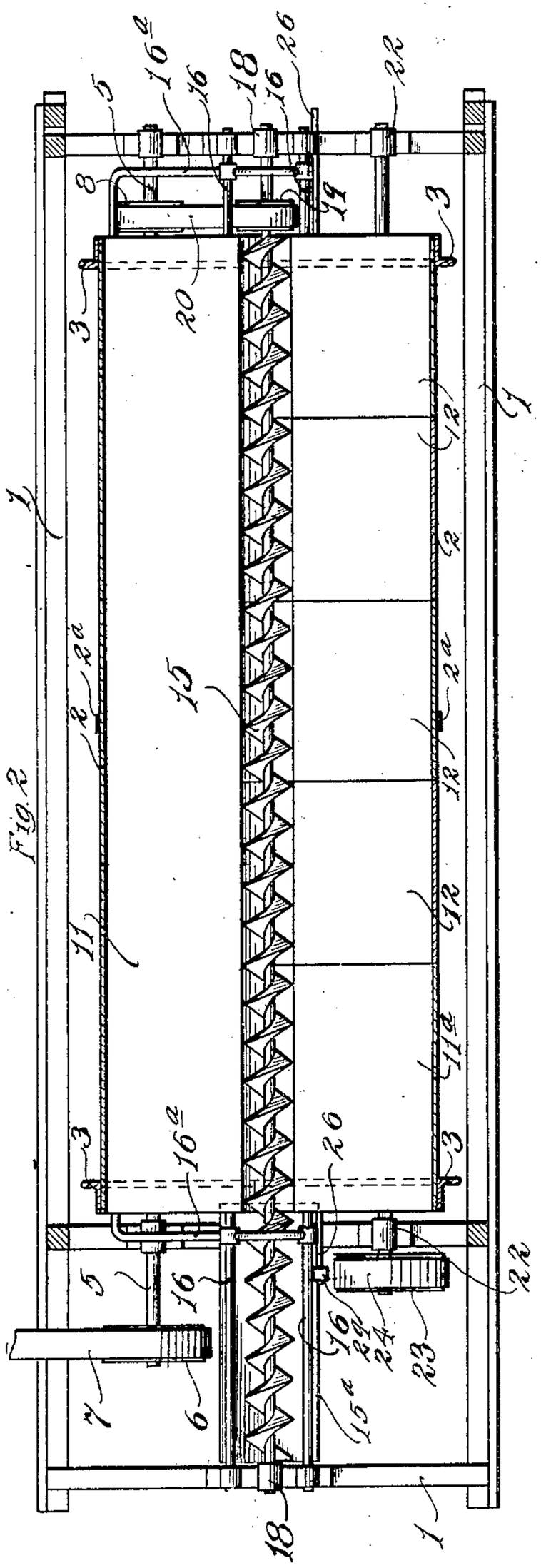
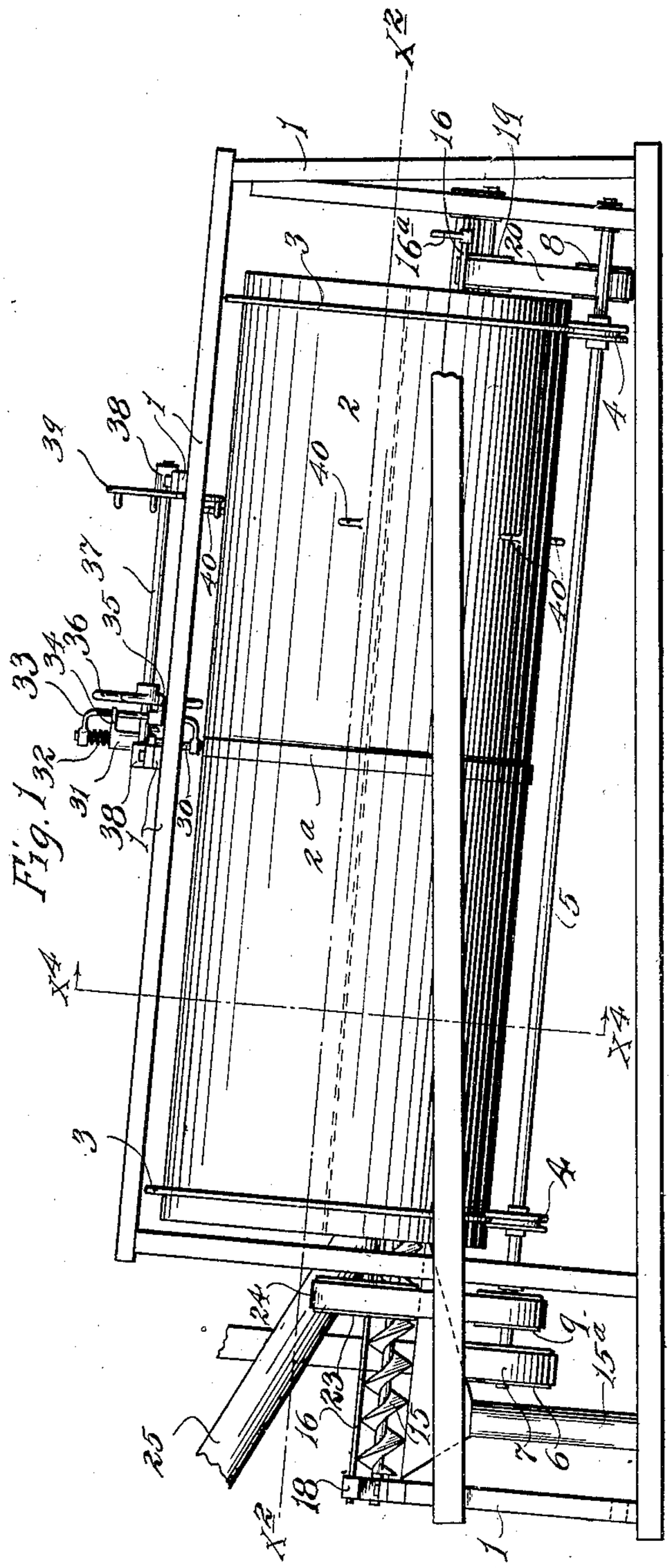


Fig. 1



Witnesses:
L. L. Simpson.
A. H. Ossahl.

Inventor:
Harry A. Campbell
By his Attorneys.
Williamson & Merchant

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Fig. 3

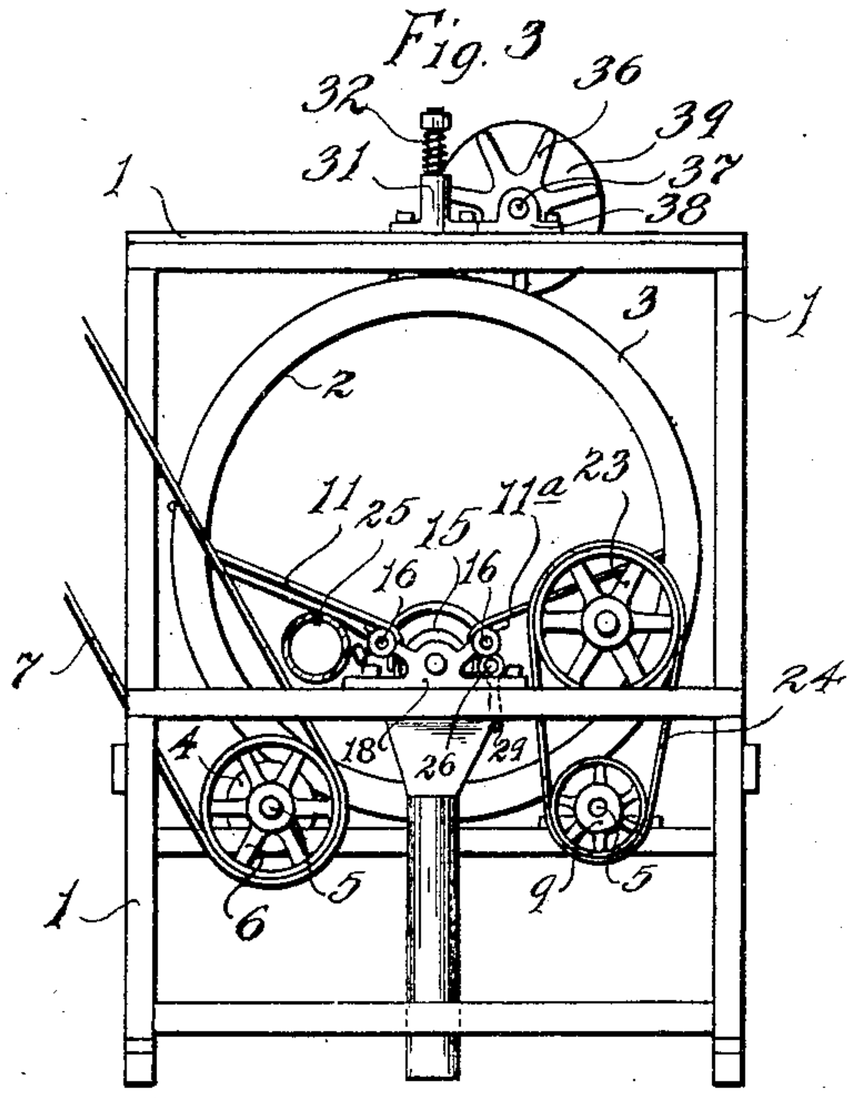


Fig. 4

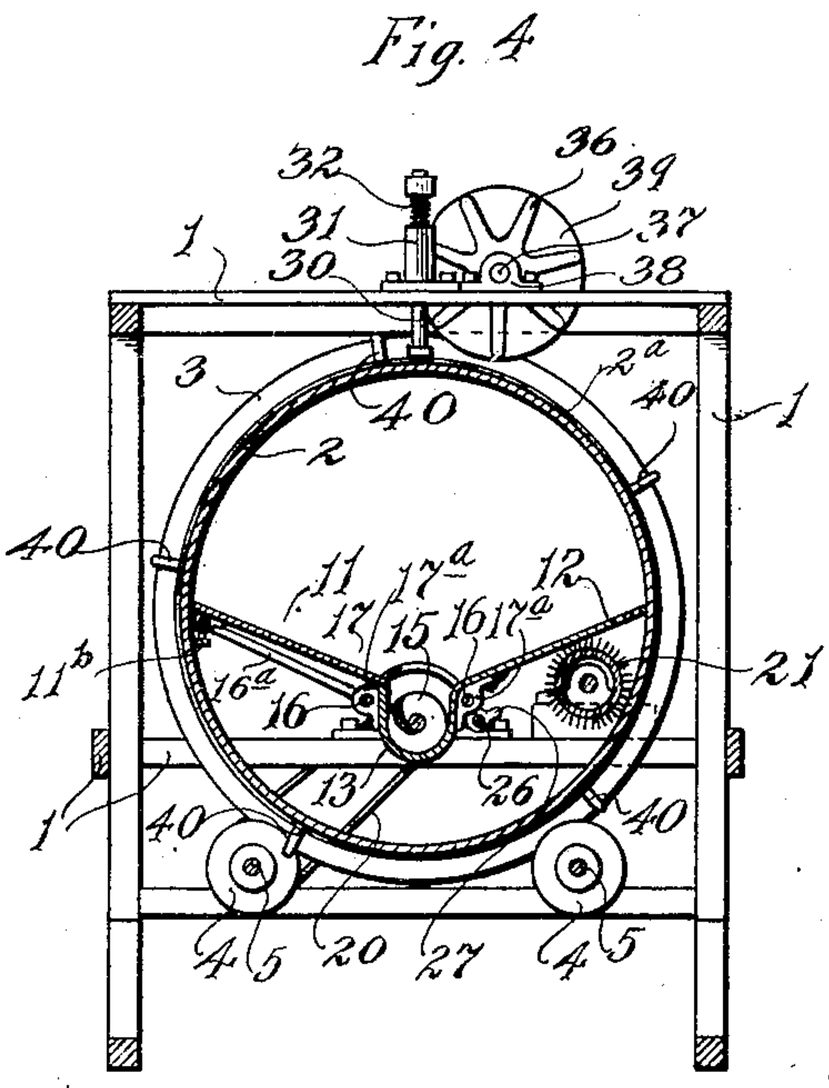


Fig. 5

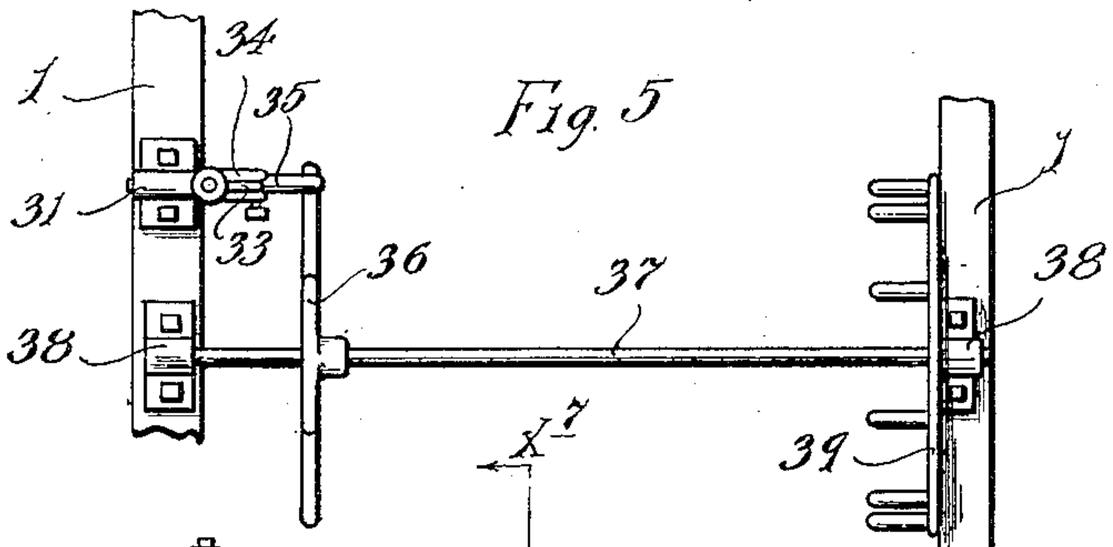


Fig. 6

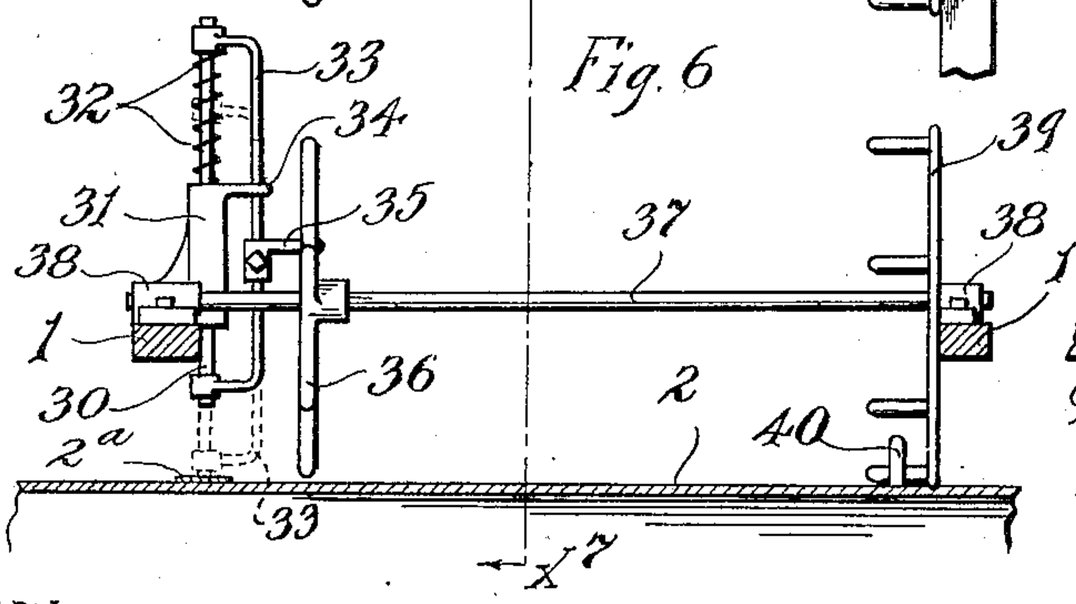
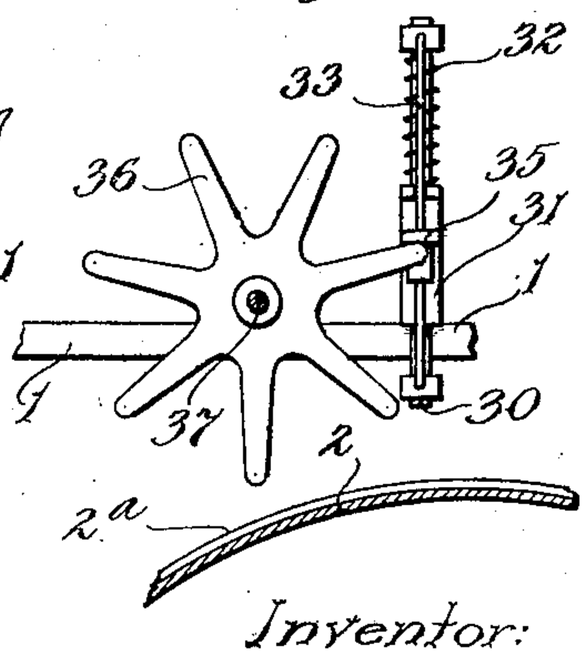


Fig. 7



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3 SHEETS—SHEET 3.

Fig. 8

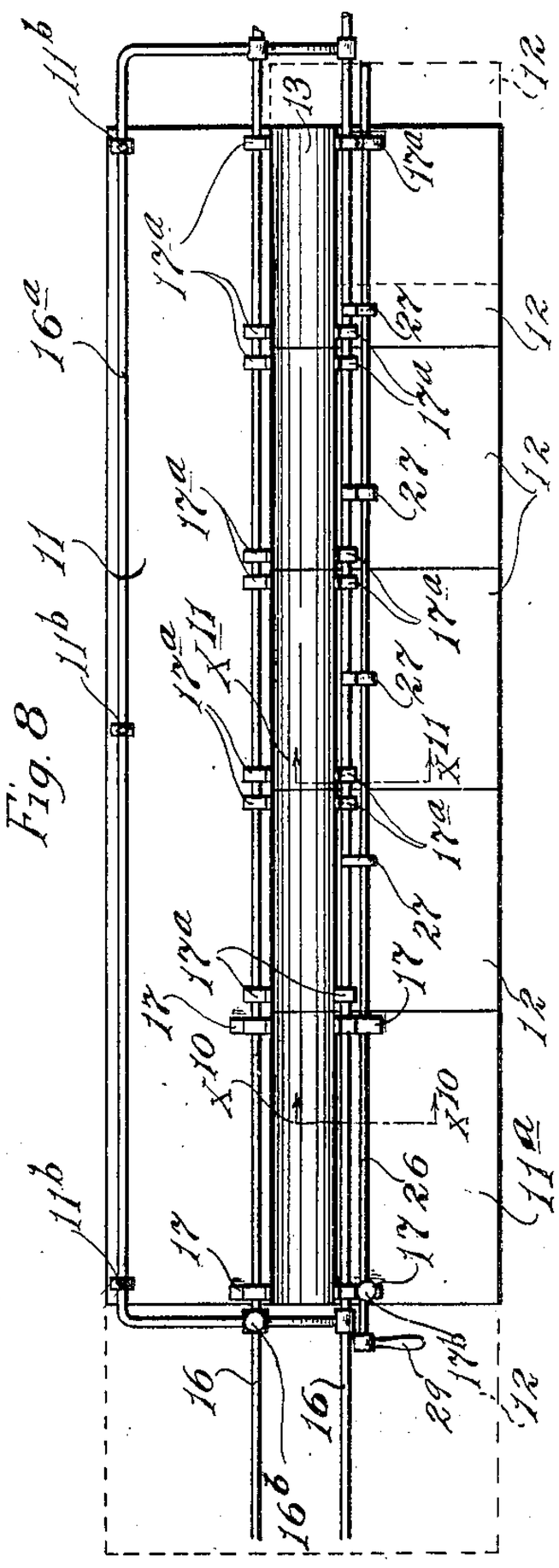

Fig. 13

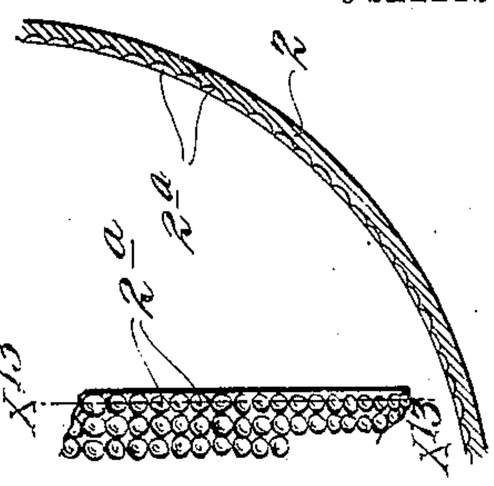

Fig. 12

Fig. 9

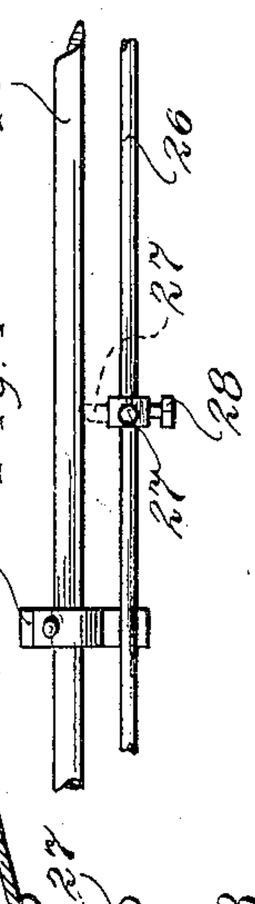

Fig. 11

Fig. 10

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UNITED STATES PATENT OFFICE.

HARRY A. CAMPBELL, OF RIVER FALLS, WISCONSIN.

GRAIN-SEPARATOR.

No. 896,891. Specification of Letters Patent. Patented Aug. 25, 1908.

Application filed April 18, 1907. Serial No. 368,862.

To all whom it may concern:

Be it known that I, HARRY A. CAMPBELL, a citizen of the United States, residing at River Falls, in the county of Pierce and State of Wisconsin, have invented certain new and useful Improvements in Grain-Separators; 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 a simple and efficient machine for the separation of grains, seeds, or other particles which vary in form, and to this end it consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

The improved machine was especially designed and particularly adapted for the separation of wheat and oats, which serials when commingled are commonly designated as succotash. Wheat kernels or berries are relatively short and thick as compared with the kernels or berries of oats, and, hence, are adapted to enter pockets or depressions which are of such diameter that they will not receive the kernels or berries of oats. With this fact in mind, I have designed a separator comprising a rotary drum or cylinder having pockets or depressions, of the character above indicated, upon its inner surface, and have combined therewith within said rotary drum a relatively fixed catch trough or hopper, and which parts are associated with other novel devices, all of which are hereinafter described and defined in the claims.

The improved machine is illustrated in the accompanying drawings, wherein like characters indicate like parts throughout the several views.

Referring to the drawings, Figure 1 shows the improved machine in side elevation. Fig. 2 is an approximately horizontal section taken on the line x^2 x^2 of Fig. 1. Fig. 3 is a front end elevation of the improved machine. Fig. 4 is a transverse vertical section taken on the line x^4 x^4 of Fig. 1. Fig. 5 is a detail view in plan showing a so-called automatic hammer for jarring or shaking the drum. Fig. 6 is an elevation of the parts shown in Fig. 5, showing also a portion of the drum in section, some parts being broken away. Fig. 7 is a vertical section taken on the line x^7 x^7 of Fig. 6. Fig. 8 is a bottom plan view of the catch trough or hopper removed from the drum. Fig. 9 is a fragmentary view showing a part of the means for adjustably supporting the catch trough or hopper within the rotary drum. Fig. 10 is a detail view in vertical section taken on the line x^{10} x^{10} of Fig. 8, some parts being broken away. Fig. 11 is a detail in vertical section taken on the line x^{11} x^{11}, some parts being broken away. Fig. 12 is a fragmentary view looking at a portion of the inner surface of the rotary drum; and Fig. 13 is a vertical section taken through a portion of the rotary drum on the line x^{13} x^{13} of Fig. 12.

All of the parts of the machine are shown as supported directly or indirectly from a rectangular skeleton framework 1.

The numeral 2 indicates the rotary open end drum or cylinder which is rotatably mounted within the framework 1, and is set on an inclined axis. To thus rotatively support the said drum, it is provided with peripheral annular flanges 3 that run in the grooves of supporting and driving wheels 4, which wheels are carried by inclined driving shafts 5 mounted in suitable bearings on the end portions of the framework 1. One of these supporting shafts 5 is provided, as shown at the upper or receiving end of the drum, with a pulley 6 over which a power driven belt 7 runs to impart rotary motion to the said shaft 5, and through the wheels 4 thereof to the said drum. This same driving shaft 5 is provided at the lower or delivery end of the drum with another pulley 8, the purpose of which will presently appear. The other driving shaft 5 is provided at the receiving end of the drum with a pulley 9.

The receiving trough or hopper extends longitudinally through the drum 2, and in its preferred form comprises sheet metal plates 11, 11^a and 12. These plates form a hopper with inclined sides and with a centrally and longitudinally extended trough 13. The plate 11 forms one side of the hopper and is formed integral or rigid with the plate 11^a and the adjacent end portion of the trough 13. The plates 12, together with the plate 11^a, also make up one side of the hopper. The said plates 12 are bent at their lower or inner edges to form supplemental sections of the trough 13. A spiral conveyer 15 works within the trough 13 and its shaft is journaled in suitable bearings 18 on the end brackets of the framework 1. Said conveyer extends beyond the receiving end of the drum a distance equal at least to the length

of the plate 11[a]. The purpose of thus extending said conveyer will be explained later. The receiving hopper must not, of course, rotate with the drum, but is preferably mounted for endwise adjustments, and to this end it is mounted directly upon a pair of parallel rods 16 passed through suitable bearings 17 on the hopper plate 11—11[a] and bearings 17[a] on the hopper plates 12. At their ends, the said guide rods 16 are rigidly secured to the end brackets of the framework 1. The shaft of the spiral conveyer 15, just outward of the delivery end of the drum, is provided with a pulley 19 over which and the pulley 8 of the power driven shaft 5, a belt 20 runs to impart rotary motion to the said conveyer.

Working within the drum, below the hopper sections 12, and having light contact with the inner surface of the said drum, is a rotary brush 21, the shaft of which is mounted in suitable bearings 22 on the end portions of the framework 1, and is provided at the receiving end of the drum with a pulley 23. A belt 24 runs over this pulley 23, and the pulley 9 of the underlying shaft 5, thereby imparting rotary motion to said brush under rotation of said drum.

The inner surface of the rotary drum 2 is formed with pockets or indentations 2[a] that are of such size and shape that they will receive the wheat kernels or berries, but will not entirely receive the oat kernels or berries, which latter are so long that they will extend out of or span across the said pockets or indentations.

The outer edge of the hopper plate 11 is shown as supported by a bail 16[a] slidably mounted at its ends on the two parallel guide rods 16, said bail 16[a] being adjustably secured to the plate 11 by means of the set screws 11[b].

The grain or other material which is to be separated is adapted to be delivered into the upper or receiving end of the drum in any suitable way, as, for instance, by means of a spout 25 suitably supported by the framework 1.

The entire receiving hopper may be adjusted longitudinally of the drum by taking hold of the bail 16[a] and pulling the hopper rearward. A forward adjustment of the hopper may be accomplished by a reverse or forward movement of the said bail 16[a]. As shown, one arm of the bail 16[a] is provided with a set screw 16[b] made to operate by hand for frequent adjustment, and by means of which it may be rigidly secured to one of the supporting rods 16.

For the purpose of adjusting the hopper sections 12 with respect to the rest of the hopper, an adjusting rod 26 is mounted for both sliding and oscillatory movements in the bearing brackets 17[a] that are on the right hand side of the trough 13 with respect to Fig. 4. This rod, as shown, is also passed through the bearings 17 of the hopper plate 11[a]. As shown, one of the bearings 17 of the plate 11[a] is provided with a set screw 17[b] made to operate by hand for frequent adjustment, said set screw 17[b] being used to secure the rod 26 at any desired point with relation to the plate 11[a]. On the rod 26 are radially projecting push lugs 27 which, as shown, are adjustably secured thereto by set screws 28. At its rearwardly projecting end, said rod 26 is provided with a hand piece 29, by means of which it may be oscillated and moved endwise. By means of the bail 16[a] and the adjusting rod 26 the hopper plates may be adjusted to form a gap in the hopper and in the trough 13 at any desired point within the length of the drum, and by the means just described adjustments in inches, or in fractions thereof, may be imparted to the receiving hopper or trough. In making this adjustment it may be necessary to move the deck section 11[a] to the left with respect to Fig. 8, as shown by dotted lines, hence the necessity of having the conveyer extend beyond the end of the drum so that it may at all times deliver beyond the end of the hopper.

For the purpose of jarring the drum as it is being rotated, an automatically actuated hammer mechanism is provided. This hammer mechanism includes a plunger 30, shown as mounted for vertical movements in a bearing 31 secured on the upper transverse portion of the framework 1. Said plunger, when released, is arranged to be thrown against the annular band 2[a] of the drum 2 by the tension spring 32, shown as attached to the bearing 31 and to the upper portion of said plunger. Said band tends to more nearly equalize the jar throughout the entire surface of the drum and to strengthen said drum against the wearing effects of said plunger. A yoke 33 attached to the ends of the plunger 30 works through a projection 34 of the bearing 31, and a tripping finger 25 is adjustably secured to said yoke 33. The plunger is adapted to be raised against the tension of its spring by a retracting device shown as in the form of a star wheel 36 carried by a countershaft 37 mounted in suitable bearings 38 on the upper transverse portion of the framework 1. As shown, this star wheel is provided with seven arms, but the number of these arms may be varied, and in practice it is probable that a much smaller number of arms may be employed. The countershaft 37, as shown, carries a pin wheel 39, the laterally projecting teeth of which are adapted to be engaged by peripheral teeth or projections 40 carried on the exterior of the drum 2.

When the drum 2 is under rotation, the wheat kernels or berries which fall into the pockets 2[a] thereof will be carried upward and

above the receiving hopper, and as they are carried toward the top of the drum they will be dropped into said hopper, and upon rolling into the trough portion 13 thereof will be engaged by the spiral conveyer 15 and fed to the upper end of said hopper where they will be discharged into the delivery spout 15[a]. Said delivery spout, in its preferred form, is flared or funnel-shaped at the mouth to receive the grain when delivered at any point between the end of the drum and the end of the conveyer, as best shown in Fig. 1. The oat kernels or berries, which are relatively long as compared with the wheat kernels or berries, will not be carried by the drum above the receiving hopper, but will slide or roll backward. Any of the oats which should happen partially to enter or catch in a pocket 2[a] of the drum would be brushed backward by the rotating brush 21. The oats, under the continued rotation of the drum, are worked toward the lower end thereof where they will be discharged into a spout or other suitable receptacle, not shown. However, I have found by experience with the machine that when all of the wheat kernels have been separated from the oats the drum will then carry up past the brush and deposit on the hopper some of the oats. To prevent the oats thus carried up from being carried by the conveyer to the receiving end of the drum and commingled with the wheat kernels already separated I have arranged the hopper and trough in adjustable sections. By the proper manipulations of the bail 16[a] and the adjusting rod 26, a gap may be formed between any two of the hopper sections 12. By rotation of the said shaft 26 and by endwise movement thereof in a direction from the left toward the right with respect to Fig. 8, one of the push lugs 27 thereof may be engaged with one of the bearings 17[a] of any one of the sections 12, and that section may be pushed toward the right and separated from the adjacent hopper section, thereby leaving a gap between the two sections. In Fig. 8 the dotted lines at the right show the right hand section 12 separated from the adjacent section 12.

As is evident, when a gap is formed between any two of the deck sections 12, any grain or other material fed upward or toward the receiving end of the drum, by the screw 15, from that portion of the hopper which is below said gap, will be dropped through the gap back into the drum, thereby rendering inoperative, so far as separation of grain is concerned, those portions of the hopper and drum that are below the said gap or between the said gap and the delivery end of the drum. For the best separation, this gap in the deck and in the trough must be on the line of complete separation. Since this so-called line of complete separation for different kinds, conditions and proportions of grain or material to be separated varies with respect to the length of the drum, the position of said gap must be correspondingly varied, and for the accurate and convenient adjustment of said gap to said line of complete separation my machine is especially adapted.

Under the rotation of the drum, the hammer plunger 30 will be intermittently raised and thrown against the drum by the action of the drum carried teeth 40 on the pin wheel 39, and the action of the star wheel 36 on the lug or finger 35 of the hammer yoke 33, and, by the action of the spring 32, which latter, of course, when released imparts the operative stroke to said hammer plunger. The strokes of the hammer plunger against the drum serve to jar loose from the pockets of the drum any wheat grains or kernels that may tend to adhere therein. As shown in the drawings, the drum 2 is provided with five teeth 40, while the star wheel 36 is provided with seven arms, and the pin wheel is provided with six teeth. By thus varying the number of these teeth 40 with respect to the number of arms on the star wheel, and the number of teeth on the pin wheel, an arrangement is provided with which the hammer plunger 30 will strike different portions of the drum under successive rotations thereof, instead of striking the same in the same several different spots under successive rotations of the drum. This not only lessens the wear on the drum, but causes the hammer plunger in the course of time to engage practically all portions of the drum coming within its plane of action.

As already indicated, the machine above described is not limited in its use to the separation of wheat and oats or, in fact, to the separation of any particular kinds of grains, but is capable of use generally for effecting the separation of materials of different size or form.

What I claim is:—

1. In a machine of the kind described, the combination with an inclined rotary drum having pockets or indentations in its inner surface, of a hopper extending longitudinally through said drum and provided with adjustable sections capable of separation, substantially as described.

2. In a machine of the kind described, the combination with an inclined rotary drum having pockets or indentations in its inner surface, of a hopper within said drum supported independently thereof, and provided with adjustable sections capable of longitudinal separation, an adjusting rod with means for coupling the same to any one of the several adjustable hopper sections, and means for supporting and rotating said drum, substantially as described.

3. In a machine of the kind described, the combination with an inclined rotary drum having pockets or indentations in its inner

surface, of a hopper within said drum supported independently thereof, a spring pressed hammer engageable with the upper portion of said drum, and means for intermittently moving said hammer against the tension of its spring and releasing the same, comprising a star wheel operative on said hammer, and means for rotating said star wheel under the rotation of said drum, substantially as described.

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

HARRY A. CAMPBELL.

Witnesses:

R. L. WILLIAMS,

JAY H. GRIMM.