No. 844,303. PATENTED FEB. 12, 1907.

J. DAIN, JR.

MILL.

APPLICATION FILED FEB. 26, 1902. 4 SHEETS—SHEET 1.

Fig. 1.

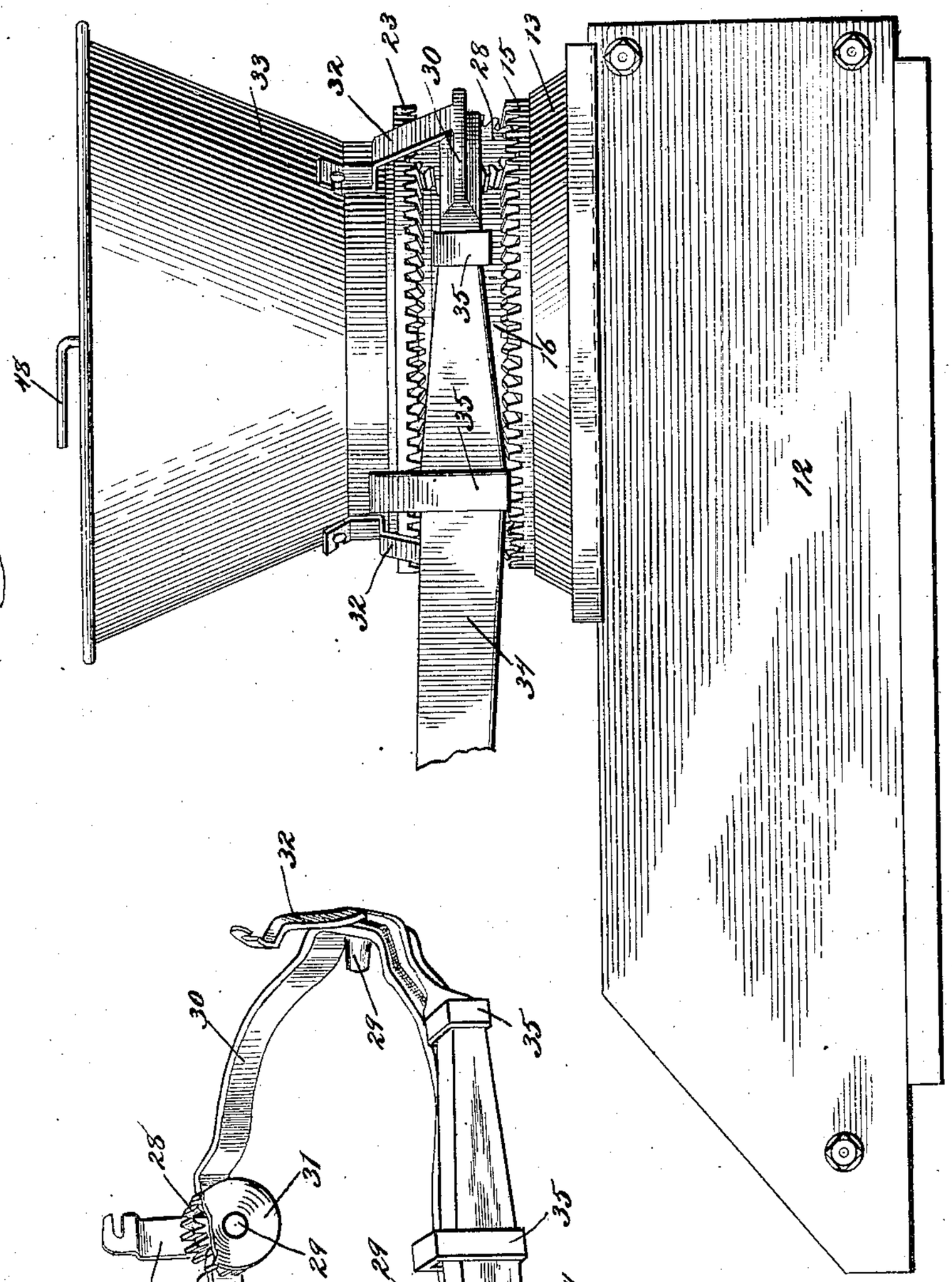

Fig. 2.

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4 SHEETS—SHEET 2.

Fig. 3.

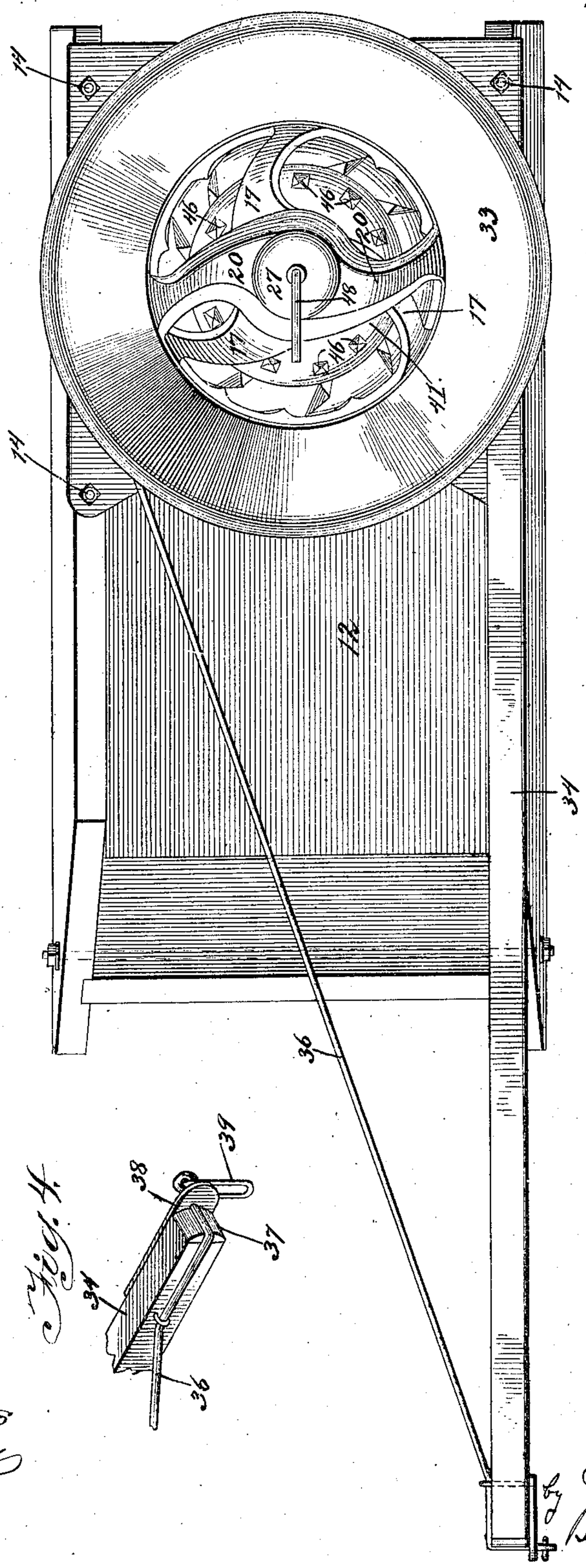

Fig. 4.

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4 SHEETS—SHEET 3.

Fig. 5.

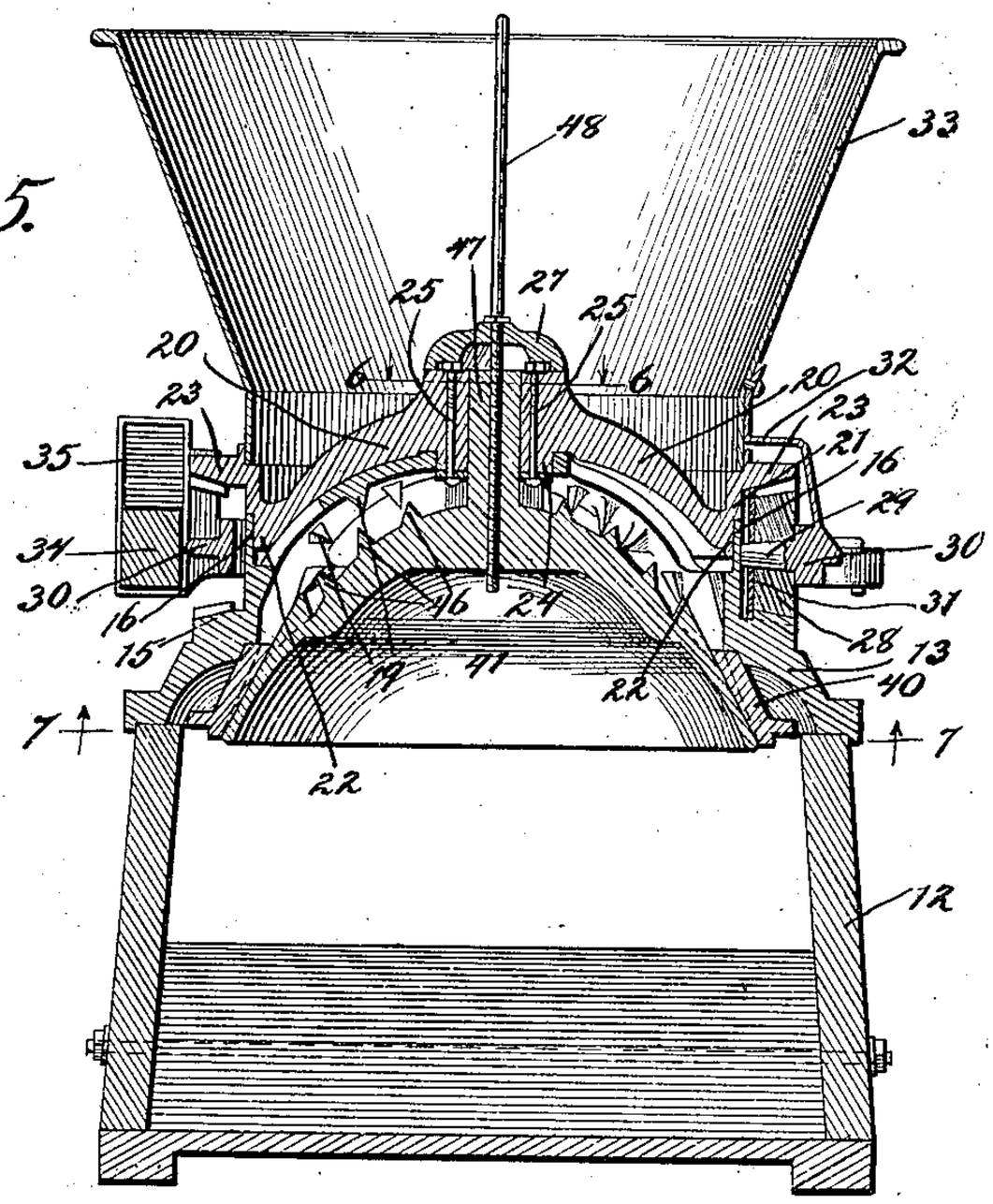
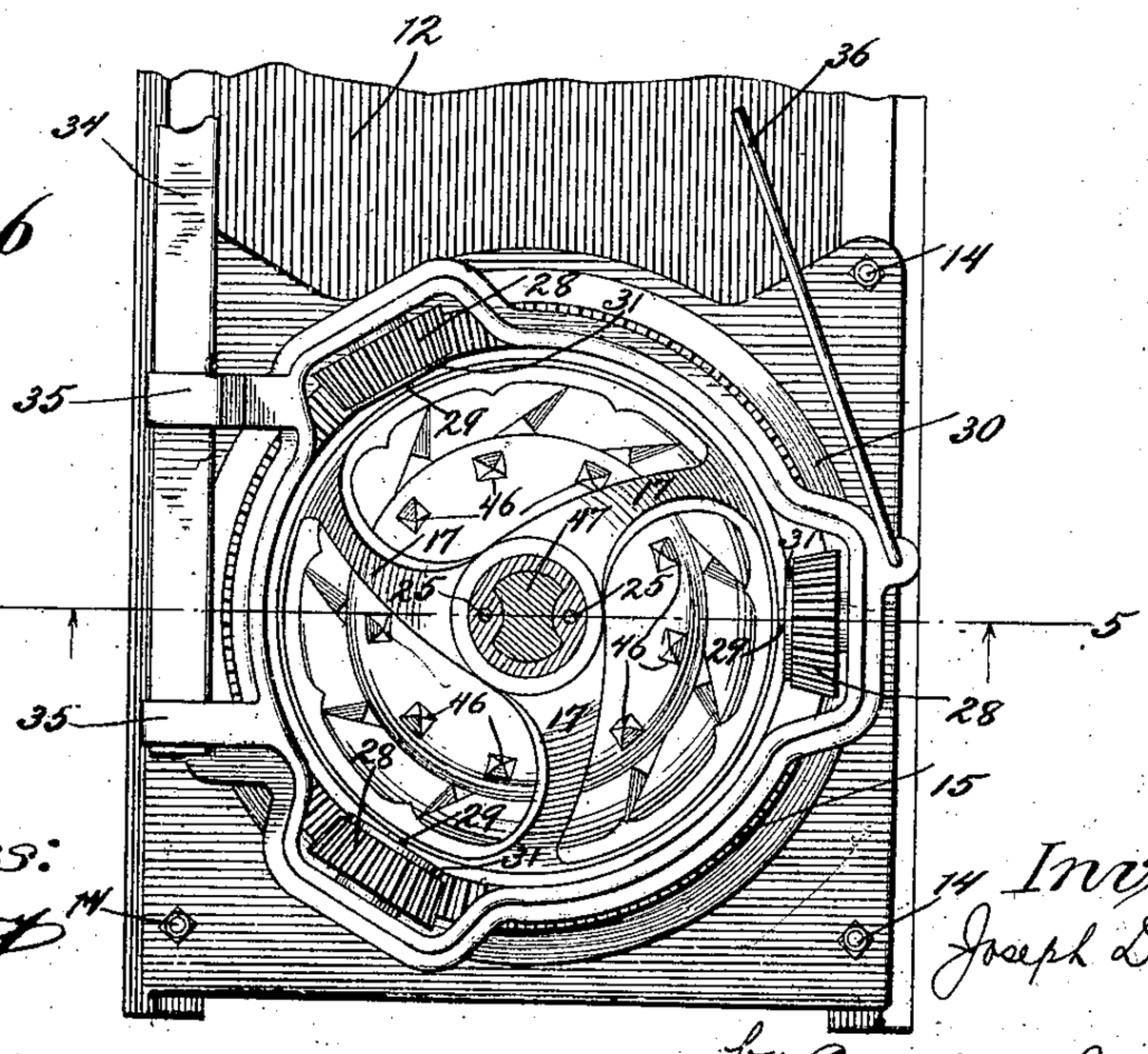


Fig. 6



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4 SHEETS—SHEET 4.

Fig. 7.

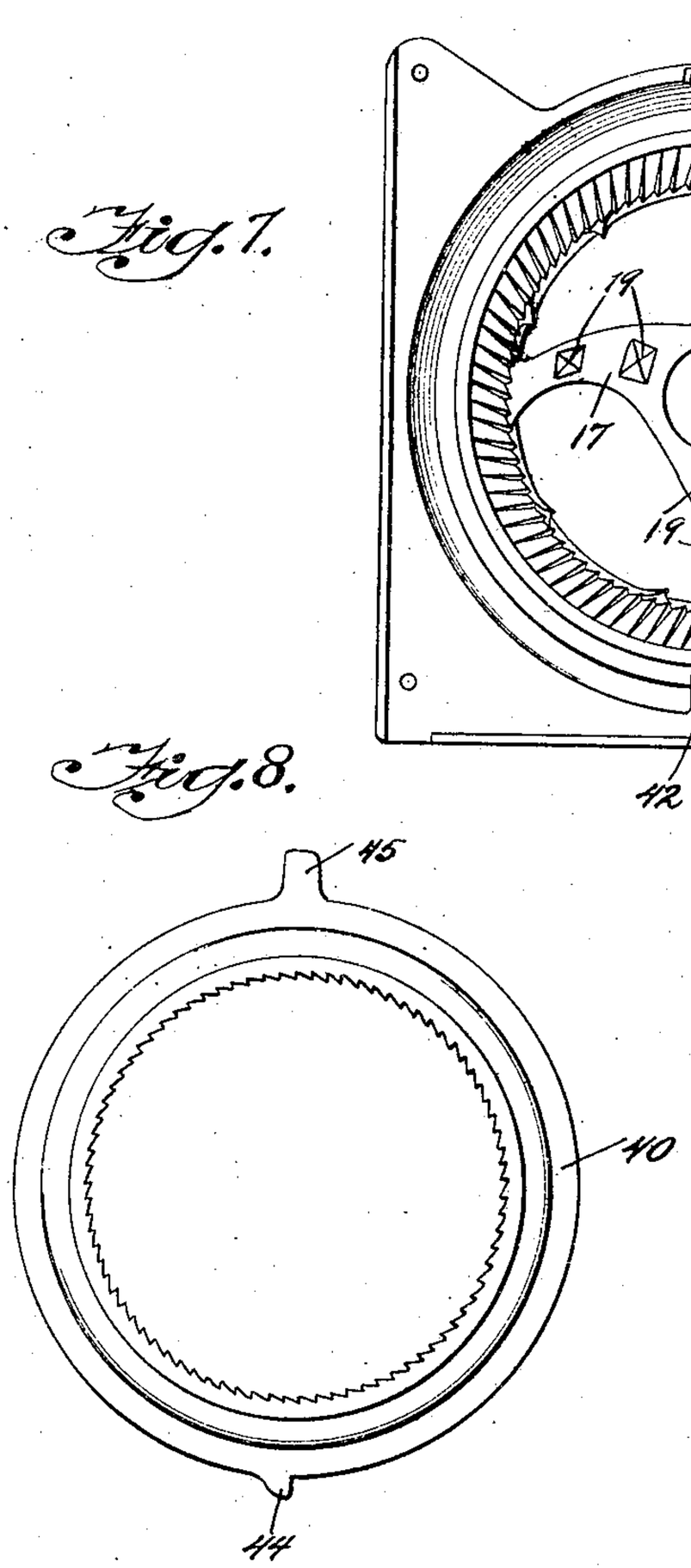


Fig. 8.

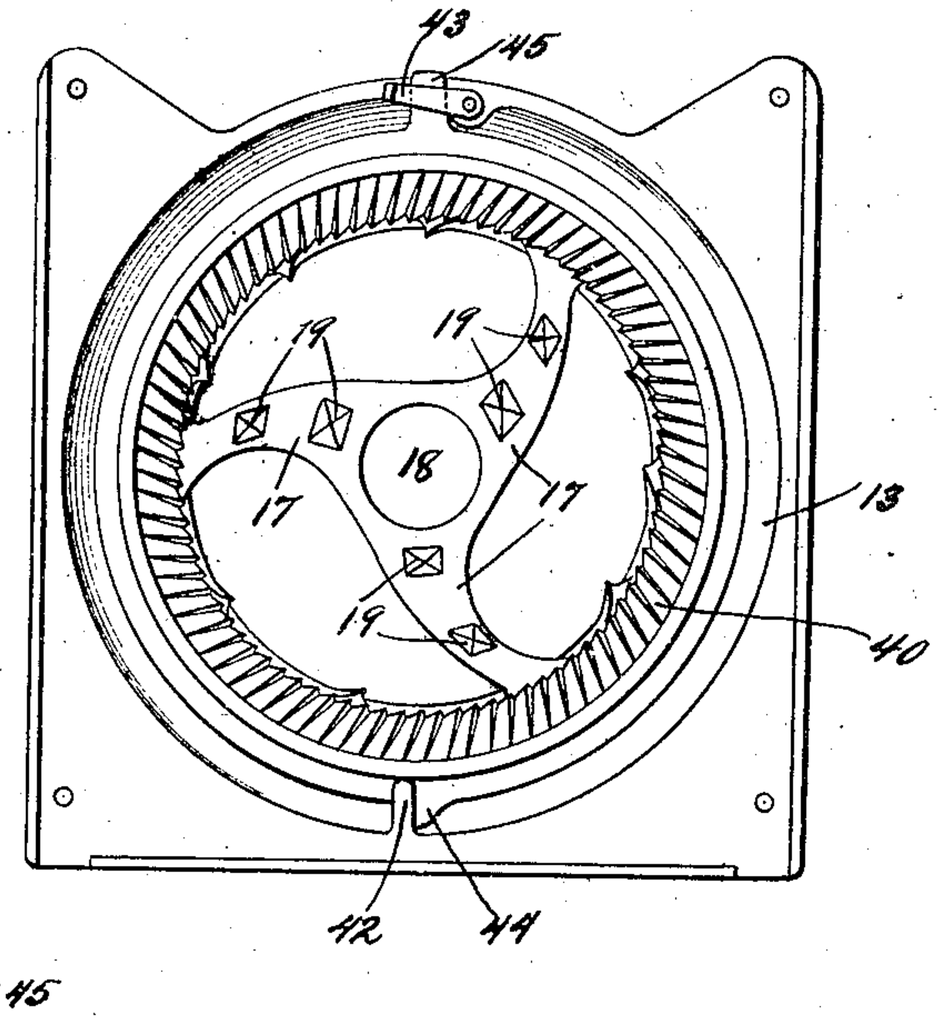


Fig. 9.

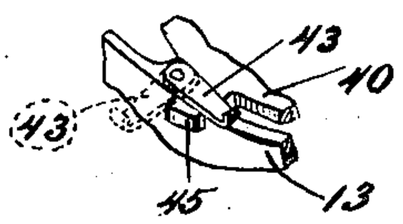


Fig. 10.

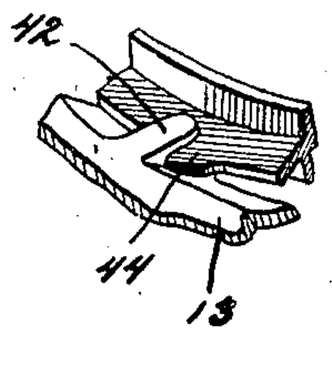
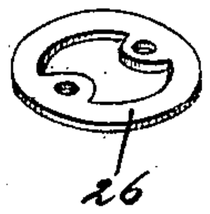


Fig. 11.



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UNITED STATES PATENT OFFICE.

JOSEPH DAIN, JR., OF OTTUMWA, IOWA.

MILL.

No. 844,303. Specification of Letters Patent. Patented Feb. 12, 1907.

Application filed February 26, 1902. Serial No. 95,727.

To all whom it may concern:

Be it known that I, JOSEPH DAIN, Jr., a citizen of the United States, residing at Ottumwa, in the county of Wapello and State of Iowa, have invented certain new and useful Improvements in Mills, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to mills, and has for its object to provide certain improvements in mills of the character described in Patent No. 639,717, granted to me December 26, 1899. The mill described in my said patent provides for causing the movable bur to rotate at a greater speed than that of the team or other operating power, thereby increasing the grinding effect, and also for rotating the hopper at a slower rate of speed than the movable bur for preventing hanging up or clogging of the ears of corn or other articles being ground.

My present invention involves a general construction similar to that set forth in my former patent, but provides various improvements in the construction of the working parts of the mill by which objectionable outward thrust on the driving-gears is avoided, the strength of the machine is increased, and its operation generally improved.

My invention further consists in certain improvements in the construction and arrangement of the operating sweep or lever, in a removable stationary bur and the devices for holding it in place, and in various other improvements, which will be hereinafter set forth.

In the accompanying drawings, Figure 1 is a side elevation illustrating my improved mill, part of the sweep being removed. Fig. 2 is a perspective view illustrating the frame which carries the driving-pinions. Fig. 3 is a plan view of the mill. Fig. 4 is a perspective view illustrating the outer end of the sweep and the connecting devices therefor. Fig. 5 is a vertical cross-section on line 5 5 of Fig. 6. Fig. 6 is a horizontal section on line 6 6 of Fig. 5. Fig. 7 is an under side view taken on line 7 7 of Fig. 5. Fig. 8 is an under side view of the stationary bur. Figs. 9 and 10 are perspective views illustrating the devices for securing the stationary bur in place, and Fig. 11 is a perspective view of the ring employed in securing the parts of the driving mechanism together.

Referring to the drawings, 12 indicates a box or receiver which is adapted to receive the ground material from the grinding devices. It also forms a support on which the mill proper is mounted, as shown in Fig. 1.

13 indicates a base-plate which is adapted to fit upon the upper edges of the box 12 and to be secured thereto by bolts 14 or other suitable means. The construction of the base 13 is best shown in Figs. 1, 5, and 7. The base 13 is provided on its outer surface with an annular rack 15, which may be cast integral therewith or be formed separately therefrom and fixedly secured thereto. Within the rack 15 and adjacent to the inner margin thereof is an annular flange 16, as best shown in Figs. 1 and 5. Within the flange 16 is a skeleton frame or tripod 17, which not only serves to strengthen the base, but also as a means of supporting other parts of the apparatus. The skeleton frame, as shown in Fig. 5, is conical in form, and, as illustrated in Fig. 7, is provided with a central passage 18, the object of which will be hereinafter set forth. On its under side the skeleton frame 17 is provided with downwardly-extending projections or teeth 19, which coact with the movable bur in grinding, as will hereinafter appear.

20 indicates a rotary grinding-frame, which is also conical in form and is adapted to fit upon the skeleton frame 17, as shown in Fig. 5. Said grinding-frame is provided with an annular band 21, which forms its outer margin and is adapted to rest upon the flange 16 of the base, the lower portion 22 of said band 21 being of less diameter than the upper portion, as shown in Fig. 5, to adapt it to fit inside of the flange 16, as shown. The grinding-frame 20 is thereby prevented from becoming accidentally displaced. The band 21 is further provided with an inverted annular rack 23, wihch projects downwardly from the upper margin thereof, lying over the rack 15, as shown in Figs. 1 and 5. The rack 23 is either formed with or fixedly secured to the grinding-frame 20, so that by rotating said rack 23 the grinding-frame also is rotated.

As shown at 24 in Fig. 5, the central portion of the grinding-frame 20 projects down into the passage 18 in the skeleton frame 17, thereby forming a center bearing for the grinding-frame. The grinding-frame 20 and skeleton frame are secured together without, however, interfering with the freedom of rotation of the grinding-frame by means of

bolts 25, which pass through the central portion of said grinding-frame, and a locking-ring 26, which by means of said bolts is secured to the under surface of said grinding-frame, as best shown in Fig. 5. The shape of said ring is best shown in Fig. 11. As shown in Fig. 5, said ring 26 is of somewhat greater diameter than the passage 18 through the skeleton frame 17, so that when said ring is secured in place by the bolts 25 the grinding and skeleton frames cannot separate. 27 indicates a cap fitted on the grinding-frame and extending over the upper ends of the bolts 25 for protecting them from the material being ground. The grinding-frame 20 is rotated by means of pinions 28, three of which are preferably employed, said pinions being adapted to mesh with the annular racks 15 and 23, as best shown in Figs. 1 and 5. The pinions 28 are conical in form and are carried upon trunnions 29, which project inwardly from an external frame 30, as best shown in Fig. 2. Said trunnions 29, as shown, are also conical, their greatest diameter being nearest the frame 30, and the pinions 28 are bored to correspond to the shape of the trunnions. The advantages secured by providing the pinions 28 with conical bores and mounting them upon conical pivots carried by an external frame, as described, are that the effect of outward thrust on the pinions, due to centritugal force and to the fact that the weight of the superimposed parts is carried on inclined surfaces, is resisted by the taper bearings of the pinions and does not all come upon the outer surfaces of the pinions, as would otherwise be the case, and, further, that the wear on the bearings is not only centralized and the conical form of the bearing-surfaces maintained, but also wear is immediately taken up, so that the pinions always properly fit the taper of the pivots and accordingly always run true. This form of trunnion is made possible by employing an outer frame, from which the trunnions project inwardly. The frame 30 further provides for holding the pinions in place, avoiding the possibility of their becoming accidentally displaced. Instead of using toothed beveled pinions and annular racks meshing therewith smooth pinions and annular ways may in some situations be employed, and the claims hereinafter made are to be construed broadly enough to include any such variation of my invention.

31 indicates washers placed between the pinions 28 and the opposite surface of the flange 16. As shown in Fig. 5, the length of the trunnions 29 is such that they just clear the flange 16, so that when the parts are assembled the washers 31 cannot escape. In assembling the parts the frame 30, carrying the pinions 28 and washers 31, is put in place before the grinding-frame is placed upon the base-plate, since after the grinding-frame is secured in place it serves to prevent the removal of the external frame 30.

32 indicates standards which rise from the external frame 30 and carry the hopper 33, as best shown in Figs. 1 and 5.

34 indicates a sweep or lever for rotating the external frame, and through it the grinding-frame. The inner end of the sweep 34 is secured in clips 35, carried by the frame 30, as shown in Fig. 2. Its outer end is also connected to the frame 30 by a brace-rod 36, the outer end of which is bent in the form shown in Figs. 3 and 4, extending parallel for a short distance with the side of the sweep 34 and being then bent at right angles across the outer end of said sweep.

37 indicates a bearing-block placed between the outer end of the sweep and the brace-rod 36, said block having a groove to receive the brace-rod, as shown in Fig. 4.

38 indicates a plate secured to the side of the sweep 34 opposite the brace-rod 36 and extending a short distance beyond the outer end of the sweep. As shown in Fig. 4, the outer end of the brace-rod 36 after passing over the bearing-block 37 extends through a hole in the plate 38 and carries a link 39 or other device, by which the team may be hitched to it. In operation the frame 30 is rotated in the direction indicated by the arrow in Fig. 3, so that the strain being applied to the link 39 is transmitted to a great extent in the direction of the length of the sweep 34, thereby greatly increasing the strength and efficiency of the sweep.

40 indicates the stationary bur, and 41 the movable bur. As best shown in Figs. 5, 7, and 8, the stationary bur 40 consists of a conical ring adapted to fit into the lower portion of the base 13, the inner surface of said bur being adapted to coact with the outer surface of the movable bur in grinding in the usual way. The bur 40 is removably secured in place, so that it may be readily removed or replaced, as may be necessary. To this end the base-plate 13 is provided on its under side with an inwardly-projecting lug 42 and also with a movable catch or fastening device 43, which is preferably placed diametrically opposite the lug 42, as best shown in Fig. 7. The stationary bur 40 is provided on its periphery with lugs 44 45, as shown in Fig. 8. The arrangement of the parts is such that when the bur 40 is fitted into the base 13 the lug 42, carried by the base, projects a short distance beyond the outer margin of the bur 40, lying under said bur, as shown in Fig. 7. Also the lug 45, carried by the bur 40, is adapted to project over the catch 43, which may be swung under it after the bur has been put in place, thereby holding it in position. When in place, the lug 45 rests in a notch in the margin of the base 13, as shown in Fig. 9, being thereby held against rotation. The lug 44 engages

the lug 42, as shown in Figs. 7 and 10, and assists in preventing rotation of the stationary bur. To remove the bur 40, it is necessary first to remove the movable bur, when the stationary bur may be removed by simply moving the catch 43 to release the lug 45. The movable bur 41 is conical in form and is adapted to fit into the stationary bur 40 and to lie under and adjacent to the skeleton frame 17, as shown in Fig. 5. It is provided on its upper surface with a series of teeth 46, adapted to coact with the teeth 19, and is also corrugated similarly to the stationary bur. At the center the movable bur 41 is provided with an inwardly-projecting stem 47, which passes through the center of the grinding-frame 20 and is secured thereto by a rod 48, which projects through the cap 27 and through said stem. The rod 48 is screw-threaded in the stem 47, so that by rotating it the movable bur may be readily adjusted and the fineness of the grinding regulated.

The operation is as follows: The rotation of the outer ring by the operation of the team causes the pinions 28 to rotate by reason of their engagement with the annular rack 15, and the rotation of said pinions imparts rotation to the grinding-frame through the annular rack 23. The result is that each complete rotation of the sweep carries the pinions 28 once around with it and also effects their rotation upon their axes, so as to give an additional rotation to the grinding-frame, as set forth in my former patent. The action of the hopper 33 is also the same as set forth in said patent. The object of mounting the pinions 28 on the conical trunnions 29 has already been set forth.

It should be understood that my invention is not restricted to the specific details of the construction illustrated, except in so far as such details are particularly claimed.

That which I claim as my invention, and desire to secure by Letters Patent, is—

1. In a grinding-mill, the combination of grinding devices, two annular racks spaced apart, one of said racks being connected with a movable member of the grinding devices, supporting-pinions between said racks, external supporting means and inwardly-projecting conical pivots carried by said supporting means and fitting in taper bearings in said pinions.

2. The combination of a pair of annular racks oppositely arranged, conical pinions between said racks and meshing therewith, and an external frame extending around said pinions and having conical pivots therefor, said pivots projecting inwardly from the inner face of said frame, substantially as described.

3. In a grinding-mill, the combination of grinding devices, two beveled annular racks spaced apart, one of said racks being connected with a movable member of the grinding devices, beveled pinions between and meshing with said racks, inwardly-projecting conical pivots fitting in taper bearings in said pinions, and means supporting said pinions.

4. In a grinding-mill, the combination of grinding devices, two beveled annular racks spaced apart, one of said racks being connected with a movable member of the grinding devices, beveled pinions between and meshing with said racks, an external frame extending around said pinions, and conical pivots fitting in taper bearings in said pinions, said pivots projecting inwardly from said frame.

5. A sweep, comprising a lever, a brace having its outer end extended across the outer end of said lever, and a plate secured to the lever, the brace extending through said plate.

6. A sweep, comprising a lever, a brace having its outer end bent and extending across the end of said lever, and a plate secured to the lever, the brace extending through said plate, substantially as described.

7. A sweep, comprising a lever, a brace having its outer end bent and extending across the end of the lever, means securing the brace to the lever, means for attaching the draft devices to said brace, and a bearing-block between said brace and the outer end of said lever, substantially as described.

8. In a grinding-mill, the combination of grinding devices, two annular beveled ways spaced apart, one of said ways being connected with a movable member of the grinding devices, beveled supporting-pinions between said ways, the inner portions of said ways being closer together than the outer portions thereof, and external means having inwardly-projecting conical pivots fitted in taper bearings in said pinions.

9. In a grinding-mill, the combination of grinding devices, two beveled annular racks spaced apart, the inner portions of said racks being closer together than the outer portions thereof, one of said racks being connected with a movable member of the grinding devices, beveled pinions between said racks, and external supporting means for said pinions, said supporting means having inwardly-projecting conical pivots fitted in taper bearings in said pinions, the outer portions of said pivots being of greater diameter than the inner end portions thereof.

10. In a grinding-mill, the combination of a base having a notch and a lug 42, a removable bur adapted to be fitted to said base, said bur having a lug 45 adapted to fit into said notch and to be engaged by said lug 42, and a swinging catch for holding said bur in place, substantially as described.

11. The combination of a pair of annular racks oppositely arranged, conical pinions between said racks and meshing therewith,

an external frame extending around said pinions and having inwardly-projecting conical pivots upon which said pinions are mounted, and a hopper carried by said frame. substantially as described.

12. An encircling frame having one or more inwardly-projecting conical pivots having their greatest diameters outward, conical pinions mounted upon said pivots and also having their greatest diameters outward, and beveled annular racks with which said pinions mesh, substantially as described.

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