No. 656,809. Patented Aug. 28, 1900.

T. CASCADEN, JR.

GRINDING MILL.

(Application filed Sept. 2, 1899.)

(No Model.) 4 Sheets—Sheet 1.

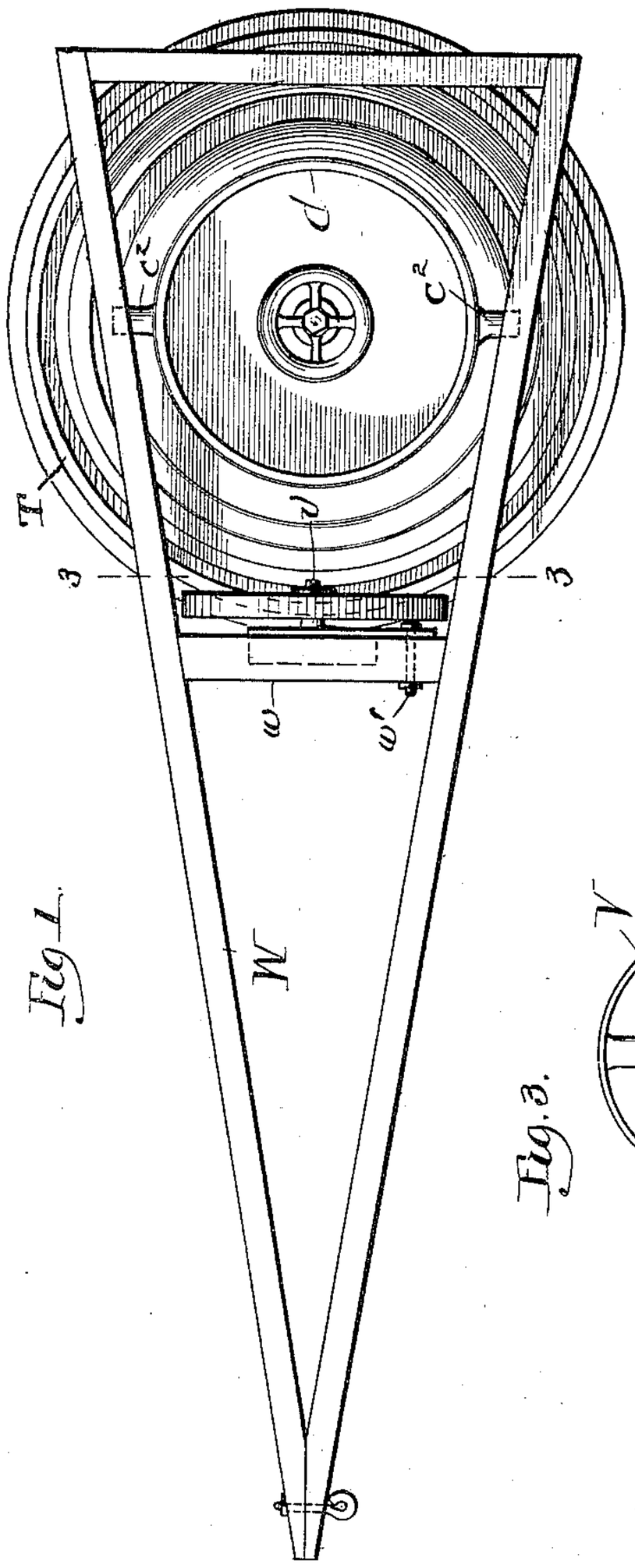

Fig. 1.

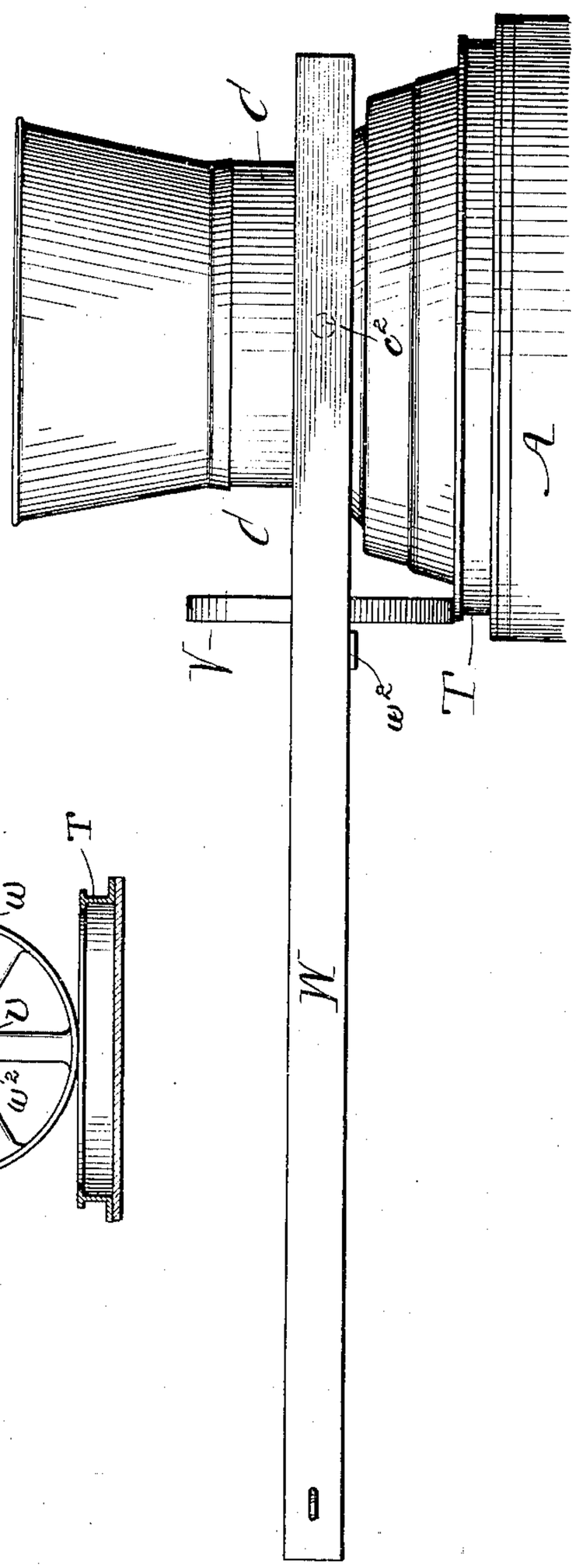

Fig. 2.

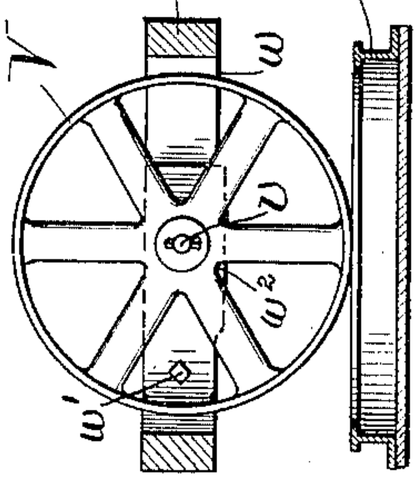

Fig. 3.

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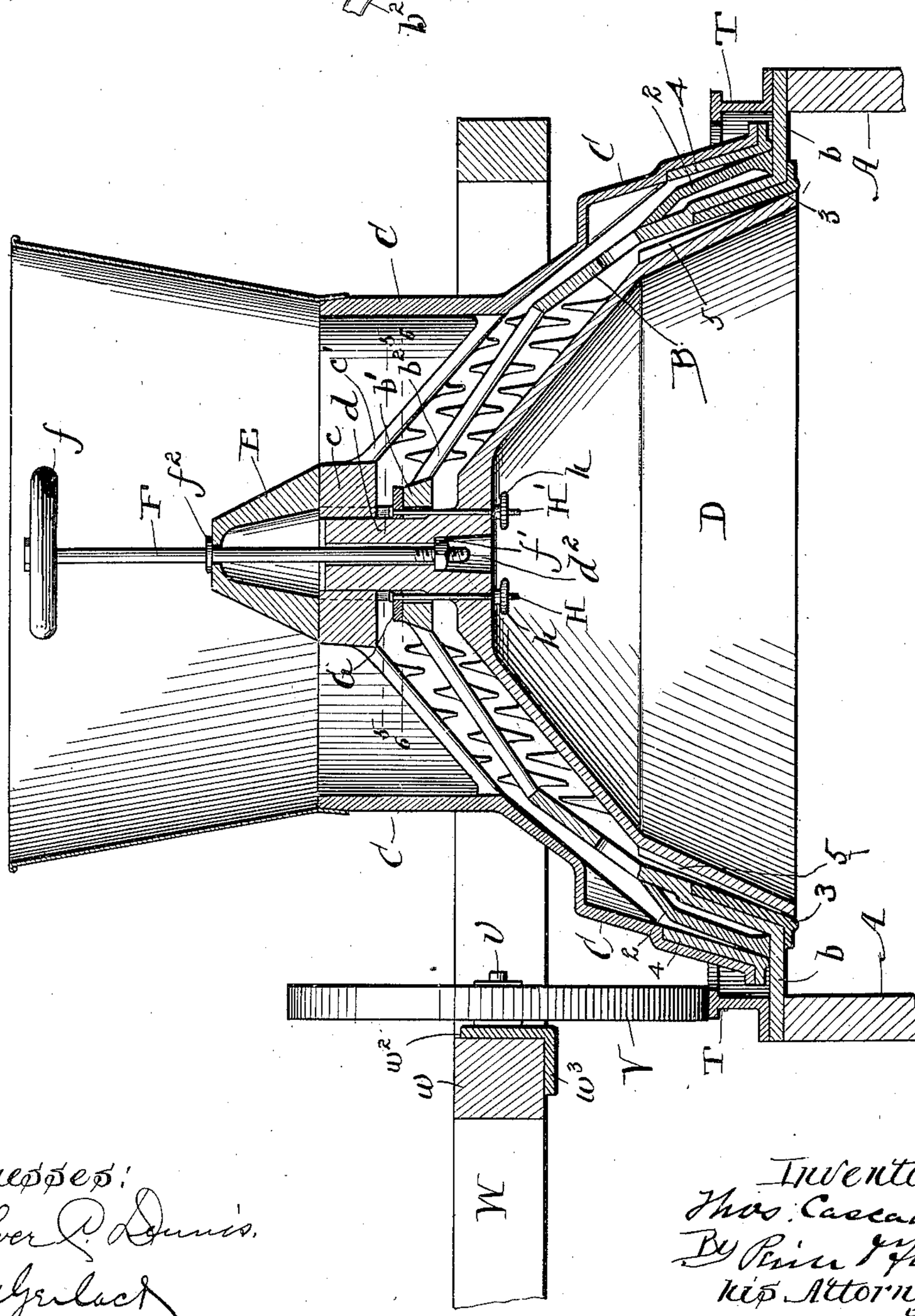
Fig. 5.

Fig. 6.

Fig. 7.

Fig. 4.



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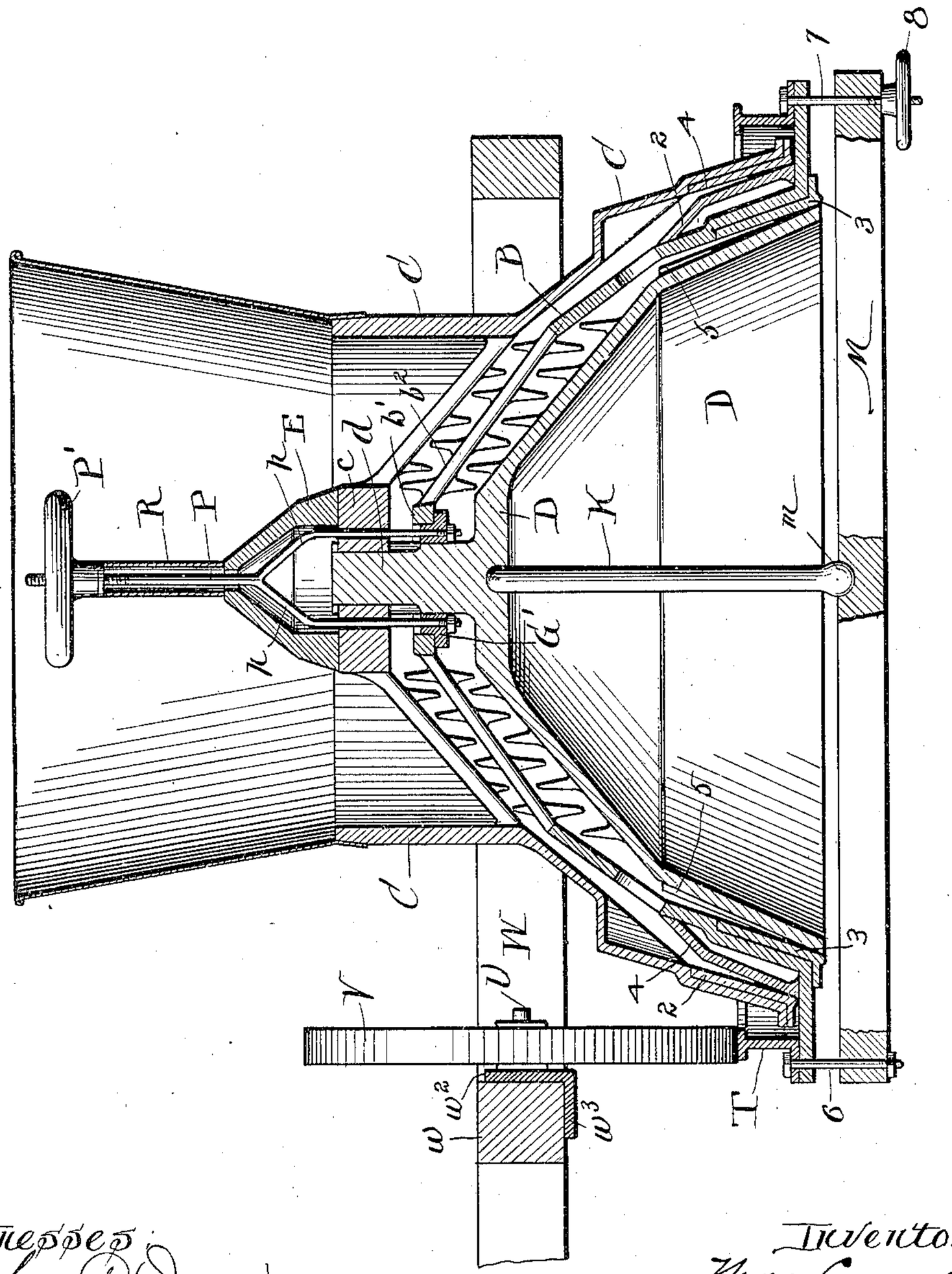
(Application filed Sept. 2, 1899.)

(No Model.) 4 Sheets—Sheet 3.

Fig. 8.



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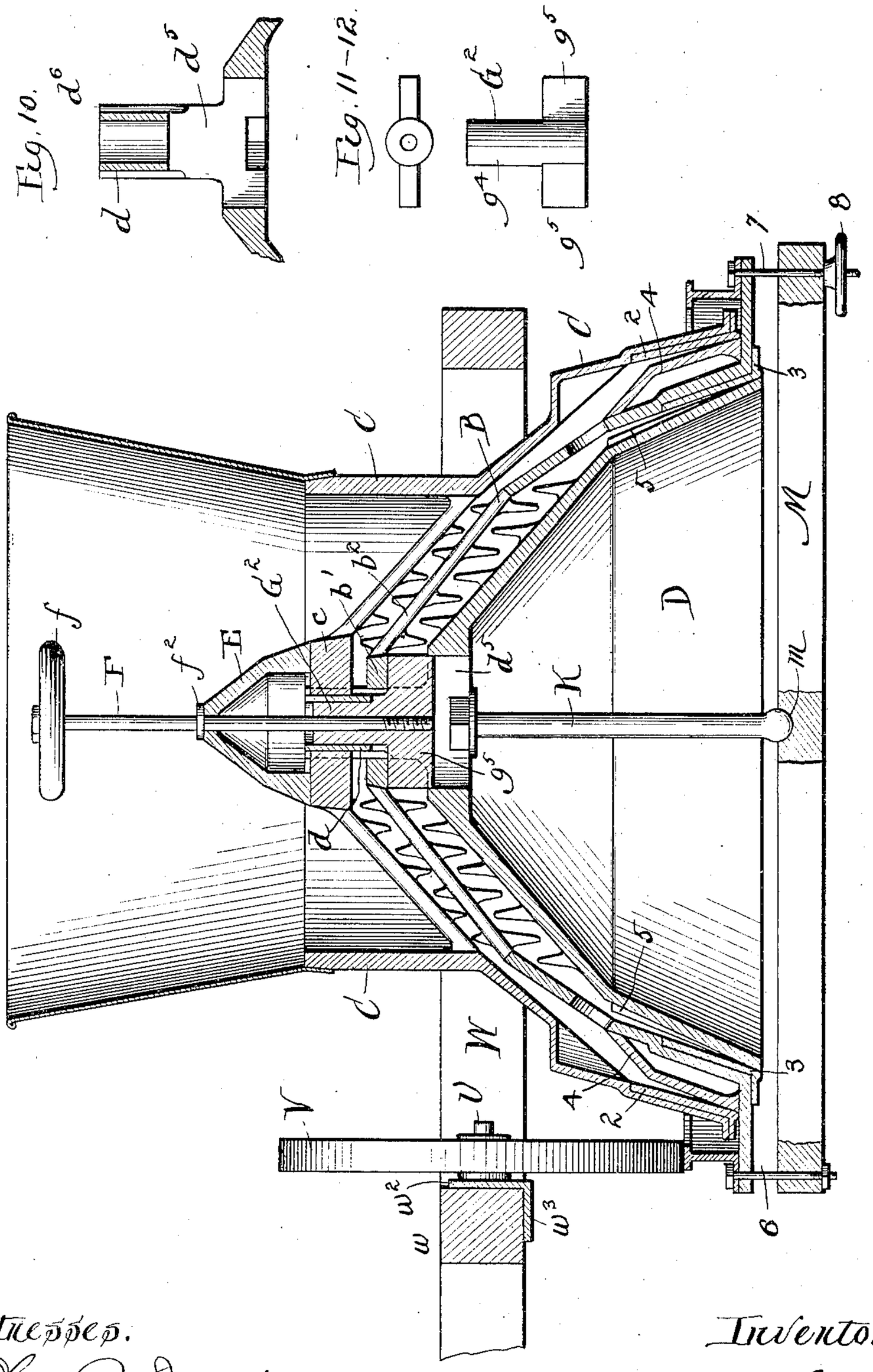
GRINDING MILL.

(Application filed Sept. 2, 1899.)

(No Model.) 4 Sheets—Sheet 4.

Fig. 9.



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UNITED STATES PATENT OFFICE.

THOMAS CASCADEN, JR., OF WATERLOO, IOWA, ASSIGNOR TO THE DAVIS GASOLINE ENGINE WORKS COMPANY, OF SAME PLACE.

GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 656,809, dated August 28, 1900.

Application filed September 2, 1899. Serial No. 729,292. (No model.)

To all whom it may concern:

Be it known that I, THOMAS CASCADEN, Jr., a resident of Waterloo, county of Black Hawk, State of Iowa, have invented certain new and useful Improvements in Grinding-Mills, of which the following is a full, clear, and exact description.

The invention relates to that class of grinding-mills commonly known as "feed-mills," such mills being more especially adapted for the grinding of corn or other grain to be used as food for stock. The invention is more particularly designed for the improvement of that class of feed-mills commonly termed "duplex" mills, an example of such type of mills being illustrated in Letters Patent No. 622,914, granted to the Davis Gasoline Engine Works Company as assignee April 11, 1899. Features of the invention are applicable to other styles of grinding-mills in which the power is applied by means of a sweep to which a team of horses is attached.

Figure 1 is a plan view of a mill embodying my invention. Fig. 2 is a view in elevation. Fig. 3 is a view in section on line 3 3 of Fig. 1. Fig. 4 is an enlarged view in central vertical section. Fig. 5 is a detail view in section on line 5 5 of Fig. 4. Fig. 6 is a view in section on line 6 6 of Fig. 4. Fig. 7 is a detail plan view of the hub of the outer cone. Fig. 8 is a view similar to Fig. 4, but showing a somewhat-modified form of the invention. Fig. 9 is a view similar to Fig. 4, but showing further modifications. Fig. 10 is a detail view in central vertical section through the hub and sleeve of the cone-shell. Figs. 11 and 12 are detail views in plan and elevation of the bearing-piece shown in Fig. 9.

A difficulty heretofore encountered in the operation of that class of grinding-mills in which a draft-sweep is employed for imparting revolution to the movable bur or burs of a mill is that the weight of the sweep and the vertical movement thereof are found to seriously interfere with the nice adjustment and successful action of the mill, the sweep being usually attached to lugs that project laterally from the outer shell of the mill. In order to overcome this objection, it has been heretofore proposed to provide the outer end of the draft-sweep with a carrying-wheel; but while such arrangement was a decided advantage when working upon level ground it has been found that where the ground was muddy and rough or frozen the irregular movements of the wheel caused like irregular movements of the sweep, thereby tilting the shell of the mill and causing the burs to grind unevenly, so that at times whole grain would pass through the mill.

The object of the present invention is to overcome the above objection, and this object I have accomplished by providing the sweep with a carrying-wheel and by providing around the base of the mill a track whereon this wheel shall travel, so that regardless of the condition of the ground an even and uniform movement of the sweep will be had, while at the same time the shell of the mill is relieved in great measure from the weight of the sweep.

In the operation of duplex feed-mills—such for example, as that illustrated in Letters Patent No. 622,914—great difficulty has been encountered in obtaining a uniform grinding action of both sets of burs. This has been due to the fact that while the inside bur carried by the inner cone was hanging down free to respond to the adjusting-screw, the outermost bur being at all times pressed toward its companion bur on the cone-shell by the weight of the heavy outside shell and of the cone, and as well, also, by the weight of the sweep, had a tendency to grind too fine. A further object of my present invention is to provide means whereby an independent adjustment of the inner and outer burs can be effected, so that a uniform grinding action of both sets of burs shall result.

The invention consists in the features of improvement hereinafter described, illustrated in the accompanying drawings, and particularly pointed out in the claims at the end of this specification.

A designates any usual or suitable form of box or base whereby the mill will be supported, and to this box or base A are bolted the lugs *b*, that extend radially outward from the bottom of the cone-shell B of the mill. To the lower part of the cone-shell B are attached the burs 2 and 3 of any suitable construction, the bur 2 being adapted to coöp-

erate with a corresponding bur 4, that is carried by the bottom part of the outer shell C while the bur 3 coöperates with a corresponding bur 5 of suitable construction, formed upon or attached to the lower part of the cone D. Outer shell C is provided with the usual hopper, by means of which and the outer shell and inner cone the material to be ground is delivered to both sets of grinding-surfaces. In the construction shown the intermediate cone-shell B is stationary, while the outer shell C and the inner cone D revolve, and the connection between these several parts will be hereinafter more fully described. Extending around the bottom of the mill and preferably supported by the base A is a circular track T, upon which will travel a carrying-wheel V, that is connected with a draft-sweep W. The side bars of the draft-sweep W will be attached in the usual way to lugs c^2, that project from the outer shell C. Between the side bars of the sweep W extends a cross-bar w, to which is pivotally connected, as by bolt w', the bracket w^2, from which projects the journal-stud v of the carrying-wheel V. The journal-bracket w^2 is shown as formed with a horizontal flange w^3, (see Fig. 4,) which when in normal position extends beneath and supports the cross-bar w of the sweep-frame. From this construction it will be seen that as the sweep-frame is carried around the mill by the draft-team the weight of this sweep-frame will be sustained in great part by the carrying-wheel V, and inasmuch as the wheel travels close to the base of the mill the weight of the outer end of the sweep has a tendency to lift or counterbalance the outer shell C, so that the outer burs can better clear themselves, and thus enable a more uniform action of such burs to be had, while at the same time preventing unnecessary wear upon the burs, as was the case in the old-style mills in which the entire weight of the sweep and the outer shell were carried by the burs. Moreover, by connecting the carrying-wheel to the sweep-frame by the pivoted bracket, as I prefer to do, it will be observed that when the sweep-frame rises for any reason the wheel still continues to travel upon the track and the bracket receives the weight of the sweep-frame as it returns to normal position.

It will be understood that while the improved means above described are particularly applicable to duplex mills still they may be employed with advantage in connection with other types of feed-mills.

The improved means whereby an independent adjustment of the inner and outer grinding-burs of the mill is effected will be understood by reference to Figs. 4 to 7 of the drawings and to the modifications shown in Figs. 8 to 12. The upper part of the cone D is shown as provided with a post d, around which sets the hub b' of the cone-shell B, the body of the cone-shell B being connected with its hub b' by the usual toothed arms b^2. Around the upper part of the cone-post d fits the hub c of the outer shell C, the hub c being connected with the shell C by the usual or suitable toothed arms c'. The hub c is suitably keyed to the upper end of the cone-post d, so that the cone D shall be driven in unison with the outer shell, and this keying of the cone-post d to the hub c can be effected either by forming the upper part of the cone-post and the interior of the hub c of polygonal shape or by forming the cone-post with grooves to receive ribs projecting inwardly from the hub c. On top of the hub c is a cap E, through which extends the temper-screw F, that carries at its top a suitable hand-wheel or turning device f, whereby the screw may be operated. The temper-screw F passes down through the cone-post d and its lower threaded end is provided with a nut f', that sets within a polygonal recess d^2 at the base of the cone-post. The screw F has fixed thereon a collar f^2, that bears against the top of the cap E, (or upon a washer resting thereon.) Hence it will be seen that when the temper-screw F is turned it will draw the outer bur 4, carried by the shell C, toward the stationary bur 2 at the base of the cone-shell B and will limit the upward movement of the outermost bur 4 and of the shell during the grinding action. This turning of the temper-screw F will also raise the inner cone D, and in practice the initial adjustment of both sets of burs 2 and 4 and 3 and 5 may be effected by the temper-screw F until the outside burs 2 and 4 are at the point for grinding to the desired degree of fineness, while the independent adjustment of the inner set of burs 3 and 5 will be accomplished, preferably, by the means next to be described.

Around the cone-post d extends a bearing-piece or collar G, that bears against the hub b' of the inner or stationary cone-shell B. With the collar G engage the upper ends of adjusting bolts H and H', that extend around through the upper part of the cone D and have their lower threaded ends fitted with adjusting nuts or wheels h. Hence it will be seen that by turning the adjusting-nuts h the cone D can be raised so as to bring the bur 5 into such proper position with respect to the companion bur 3 that this inside set of burs shall grind to the desired degree of fineness. Inasmuch as the collar G is loose upon the cone-post d, so as to move in vertical direction, it will be seen that the cone D can be freely raised or lowered, while the collar G maintains its bearing upon the hub g' of the cone-shell B.

So far as I am aware my invention presents the first instance of a duplex mill in which there is employed a stationary part, such as a cone-shell carrying inner and outer grinding-burs that coöperate with corresponding burs upon an outer shell and an inner cone, in combination with a bearing-piece that engages this stationary part or cone-shell and

is connected by adjusting devices with a part carrying one of the burs to be adjusted.

In carrying out the invention it is manifest that the details of construction may be varied widely by the skilled mechanic, and in Figs. 7 to 12 of the drawings I have illustrated one modified form whereby the independent adjustment of the burs can be effected. In these embodiments of the invention, as in that already described, the cone-shell B is stationary, while the cone D and outer shell C are revoluble. The cone D is supported by a pillar K, the upper end of which engages a recess at the base of the cone-post *d*, while its lower end sets in a seat *m*, that is formed in the bridge-tree M. This bridge-tree M is shown as suspended by through-bolts 6 and 7 from the arms *b* at the base of the cone-shell B, and the through-bolt 7 has its lower threaded end provided with an adjusting hand-wheel 8, by means of which the cone D can be raised in order to bring its bur 3 into proper relation with respect to the companion bur 5 on the cone-shell B. In the modified form of the invention shown in Fig. 8 the bearing-piece or collar G′, that encircles the cone-post *d*, extends beneath the hub *b′* of the cone-shell B, and through this collar pass the arms *p* of the temper-screw P. The upper threaded end of this temper-screw P is engaged by a hand-wheel P′, that bears upon the upper end of a sleeve R, that rises from the top of the cap E, this cap E resting upon the hub *c* of the outer shell C. From the foregoing description it will be seen that by turning the hand-wheel P′ the temper-screw P will draw downward the outer shell C until the bur 4 at the base of this shell is brought into proper relation with respect to the companion bur 2 for effecting the grinding of the grain to the desired degree of fineness.

With previous constructions in which the adjustments of both sets of grinding-surfaces have not been independent there is a tendency, as already pointed out, for the outer burs to grind finer than the inner burs, since the construction is such that the weight of the parts tends to force the outer burs together and the inner burs apart; but by means of the independent adjustments of my improved device the outer set of burs may be first adjusted to grind at the proper degree of fineness, which adjustment will serve as an indicator by which the inner set of burs may be properly adjusted to grind to the same degree of fineness.

In the form of the invention shown in Figs. 9 to 12 of the drawings the central part or apex of the cone D is formed not only with a seat to receive the upper end of the pillar K, but is also recessed or cored out, as at d^5 and d^6, to receive the bearing-piece G^2, which in this form of the invention is shown as an inverted T-shaped plug having a threaded hole to receive the lower threaded end of the temper-screw F. The shank g^4 of the bearing-piece G^2 is inserted in the circular recess d^6 of the extended upper part of the cone D, while the arms g^5 of this bearing-piece project through the sides of the recess d^5 of the cone D, and upon these arms g^5 rests the hub *b′* of the cone-shell B. The hub *c* of the outer shell is keyed to the hub of the cone, as in the constructions hereinbefore described. From the foregoing description it will be seen that the adjustment of the inner cone D will be effected by the hand-wheel 8, the bridge-tree M, and pillar K, while the adjustment of the shell C will be effected by means of the temper-screw F and the bearing-piece G^2, since manifestly by turning the temper-screw F the shell C and its bur can be drawn downward toward the cone-shell.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a grinding-mill the combination with the revoluble bur and with the sweep-frame connected therewith, of a carrying-wheel attached to the sweep-frame at a point adjacent the base of the mill and acting as a fulcrum by which the sweep partly counterbalances the revoluble bur.

2. In a grinding-mill the combination with the revoluble bur and with the sweep-frame connected therewith, of a track extending around the base of the mill and a carrying-wheel attached to the sweep-frame adjacent the mill and adapted to travel on said track.

3. In a grinding-mill the combination with the revoluble bur and with the sweep-frame connected therewith, of a track extending around the base of the mill, a carrying-wheel attached to the sweep-frame and adapted to travel on said track and a journal-bracket for said carrying-wheel pivotally connected to the sweep-frame and having a part to support the sweep-frame and limit its downward movement.

4. In a duplex grinding-mill, the combination with a vertically-disposed stationary cone-shell, an inner revoluble cone, an outer revoluble shell, said several parts being provided with grinding-burs and means common to both sets of grinding-burs for delivering thereto the material to be ground, of means whereby one of said revoluble parts may be adjusted with respect to said stationary cone-shell, and means whereby the other of said revoluble parts may be independently adjusted with respect to said stationary cone-shell and with respect to said first-mentioned revoluble part.

5. In a duplex grinding-mill comprising an outer revoluble shell, an inner revoluble cone and an intermediate stationary cone-shell having a central hub encircling the post of the inner cone, by which parts the grinding-burs are carried, the combination with the stationary cone-shell and its central hub, of a bearing-piece engaging said hub and ad-

justing mechanism between said bearing-piece and one of the revoluble bur-carrying parts, whereby the bur carried by said revoluble part can be adjusted toward its companion stationary bur.

6. In a duplex grinding-mill comprising an outer revoluble shell, an inner revoluble cone, an intermediate stationary cone-shell by which parts the grinding-burs are carried and means common to both sets of grinding-burs for delivering thereto the material to be ground, the combination with the stationary cone-shell, of a bearing-piece connected therewith and adjusting mechanism between said bearing-piece and one of the revoluble bur-carrying parts, whereby the bur carried by said revoluble part can be adjusted toward its companion stationary bur, and independent adjusting mechanism whereby the other revoluble bur-carrying part may be adjusted toward said stationary cone-shell.

7. In a duplex grinding-mill comprising an outer revoluble shell, an inner revoluble cone and an intermediate stationary cone-shell by which parts the grinding-burs are carried, the combination with the stationary cone-shell, of a non-revoluble bearing-piece and adjusting mechanism between said bearing-piece and one of the revoluble bur-carrying parts, whereby the bur carried by said revoluble part can be adjusted toward its companion stationary bur.

8. In a duplex grinding-mill comprising an inner cone, an outer shell and a stationary intermediate cone-shell by which parts the grinding-burs are carried, the combination with the cone-shell, of a bearing-piece engaging its hub, adjusting-screw mechanism connected to said bearing-piece and extending through one of the adjacent revoluble parts and means whereby said screw mechanism may be adjusted to bring the part through which it passes in closer proximity to the cone-shell.

9. In a duplex grinding-mill the combination with an inner revoluble cone having a cone-post, an outer revoluble shell, an intermediate stationary cone-shell by which parts the grinding-burs are carried and means common to both sets of grinding-burs for delivering thereto the material to be ground, said cone-shell having a hub encircling said cone-post, of a bearing-piece encircling said cone-post and engaging the hub of the cone-shell, adjusting-screw mechanism connected to said bearing-piece and leading through one of the adjacent bur-carrying parts whereby said bur-carrying part can be adjusted toward the cone-shell, and means whereby the other of said bur-carrying parts can be independently adjusted toward and from the stationary cone-shell.

10. In a duplex grinding-mill the combination with an inner revoluble cone having a cone-post, an outer revoluble shell, an intermediate stationary cone-shell by which parts the grinding-burs are carried and means common to both sets of grinding-burs for delivering thereto the material to be ground, said cone-shell having a hub encircling said cone-post, of a bearing-piece encircling said cone-post and engaging the hub of the cone-shell, adjusting-screw mechanism connected to said bearing-piece and leading through the top of the cone whereby said cone may be adjusted toward the cone-shell, and a temper-screw having a bearing on the hub of the outer shell and adjustably connected to the cone-post whereby the outer shell may be forced toward the cone-shell.

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