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PATENTED FEB. 17, 1903.

A. E. HOFLAND.
GRAIN HULLING MACHINE.
APPLICATION FILED APR. 15, 1902.

NO MODEL.

4 SHEETS—SHEET 1.

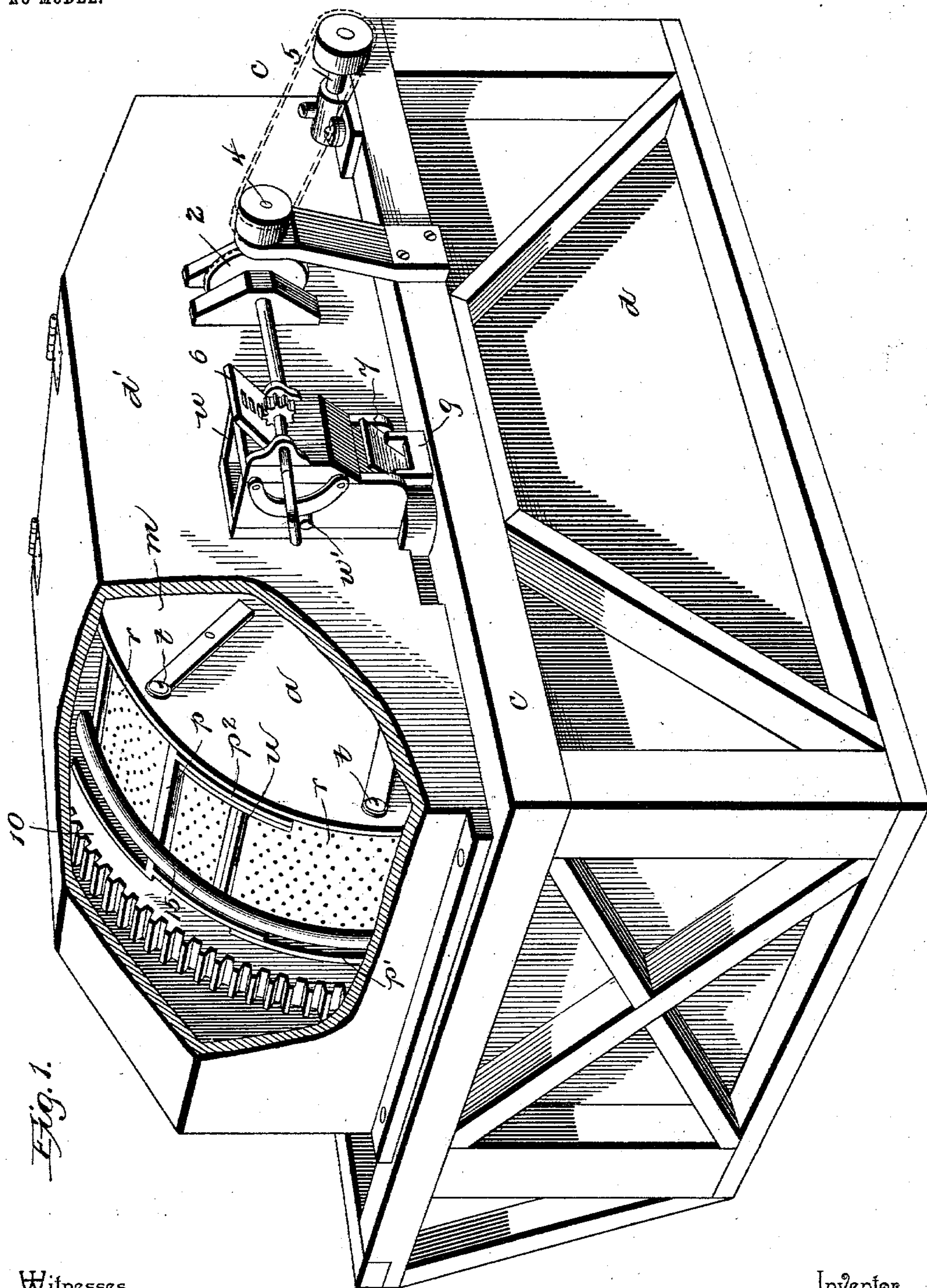


Fig. 1.

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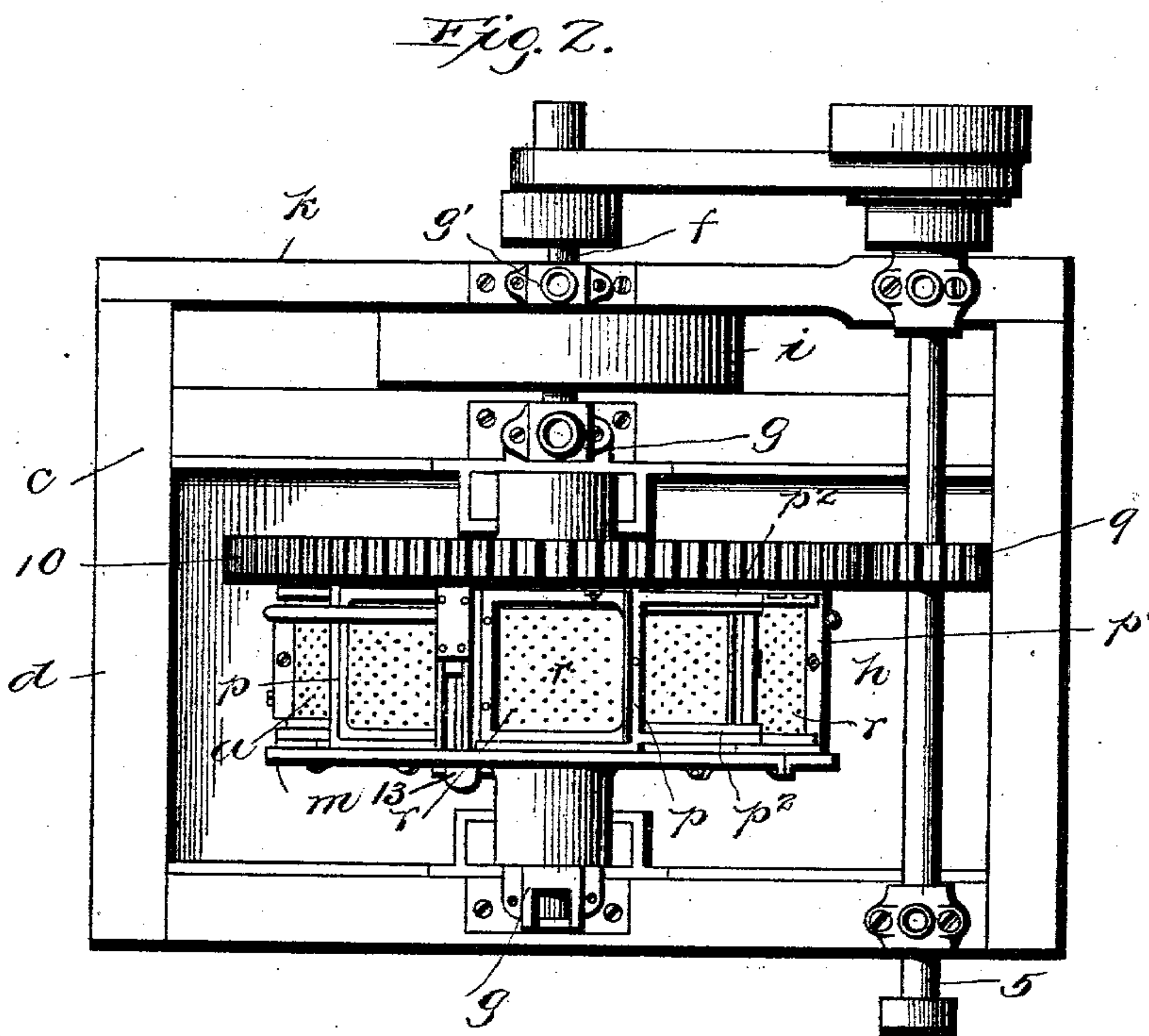
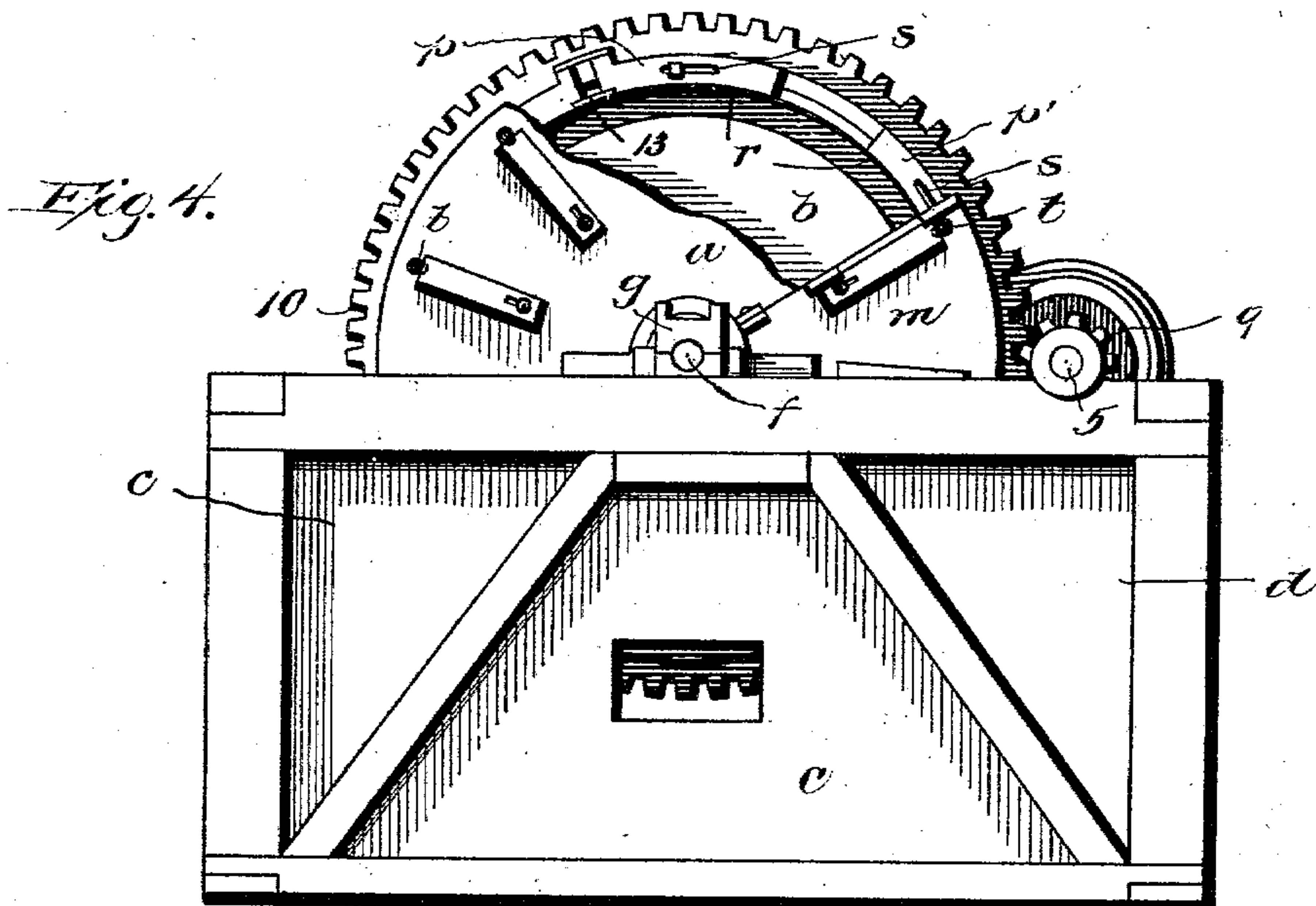
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4 SHEETS—SHEET 2.



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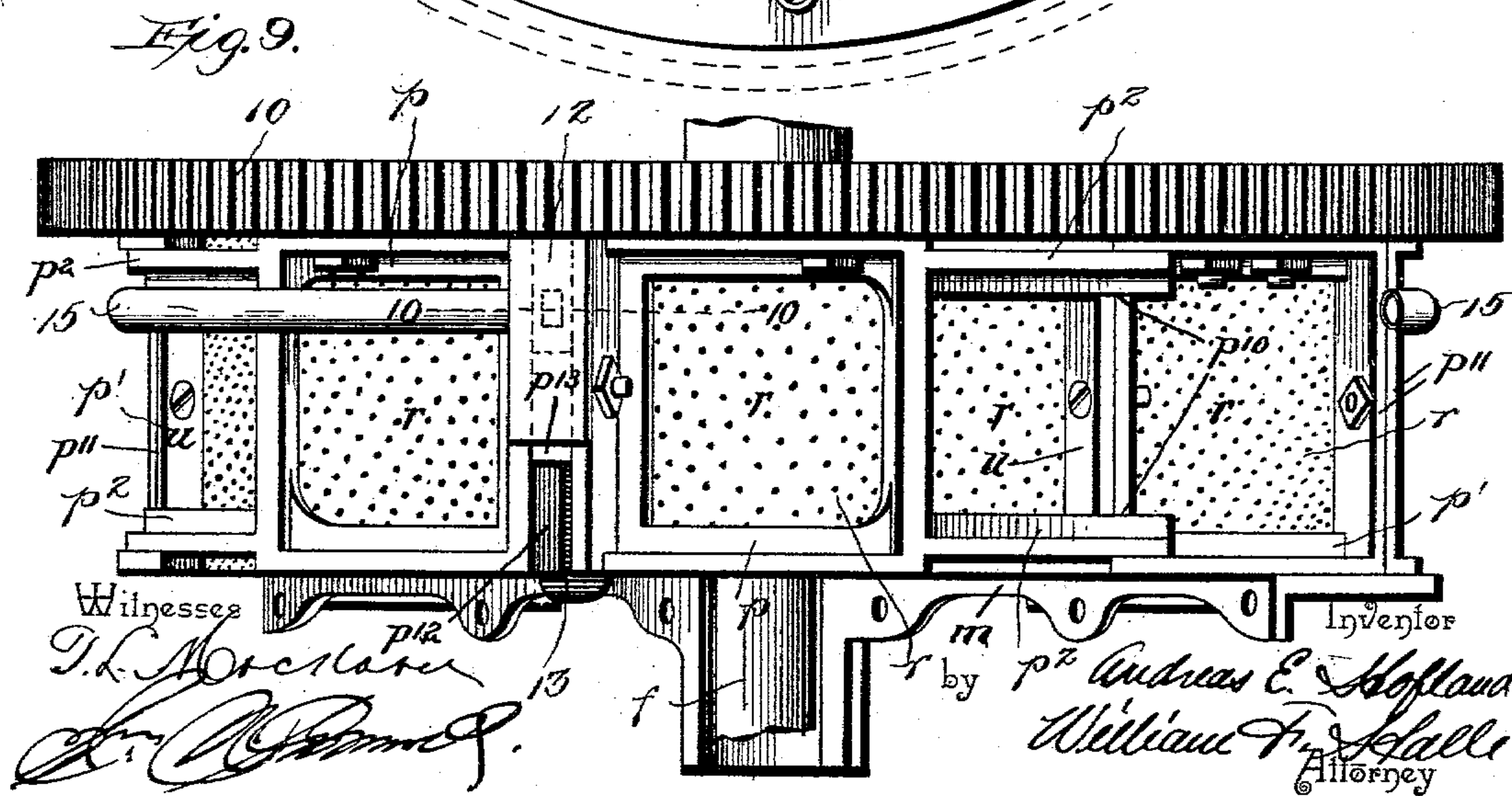
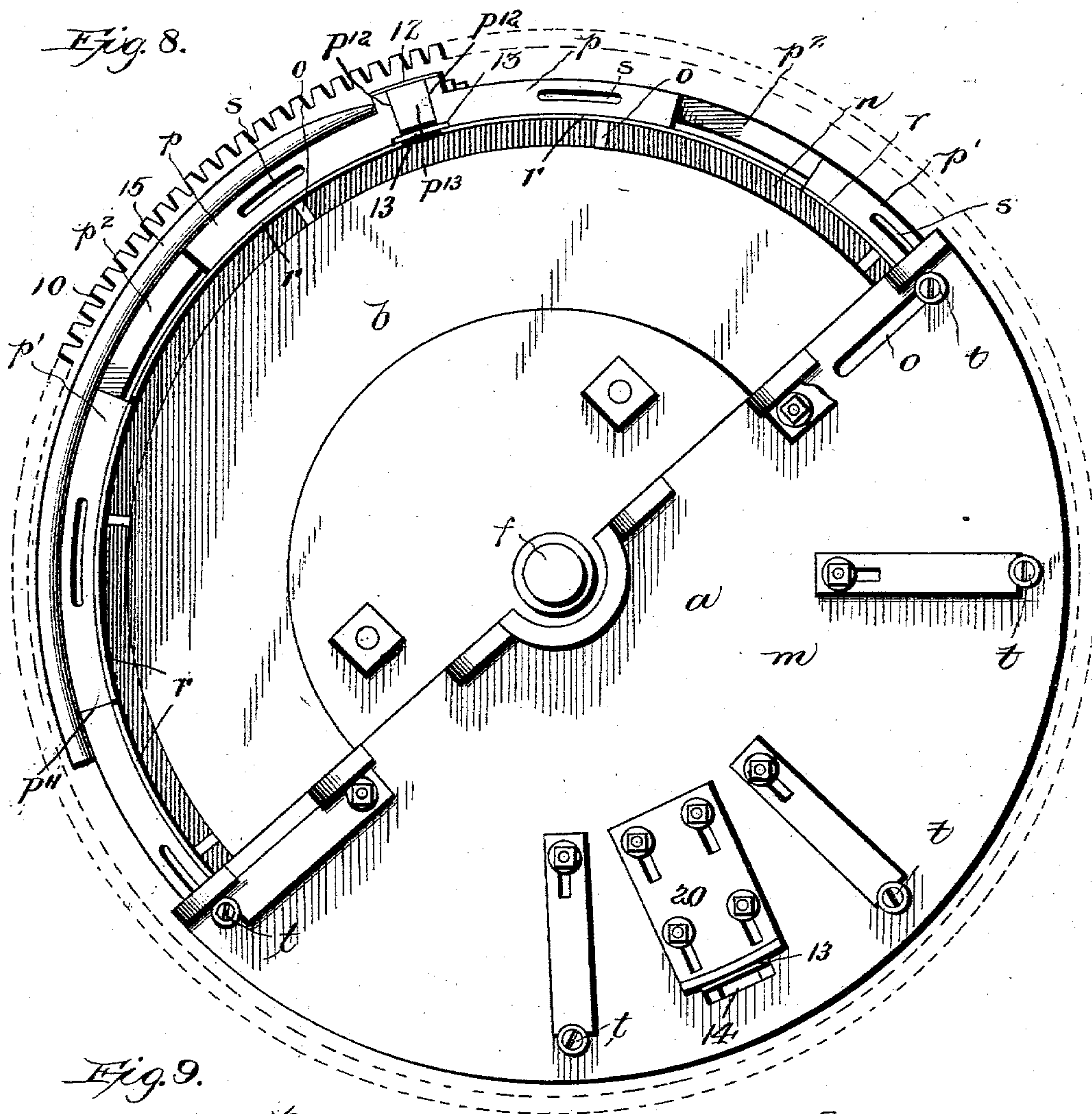
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4 SHEETS--SHEET 4.



UNITED STATES PATENT OFFICE.

ANDREAS E. HOFLAND, OF MENOMONIE, WISCONSIN, ASSIGNOR OF ONE-HALF TO F. J. MCLEAN, OF MENOMONIE, WISCONSIN.

GRAIN-HULLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 720,921, dated February 17, 1903.

Application filed April 15, 1902. Serial No. 102,957. (No model.)

To all whom it may concern:

Be it known that I, ANDREAS E. HOFLAND, a citizen of the United States, residing at Menomonie, in the county of Dunn and State of Wisconsin, have invented certain new and useful Improvements in Grain-Hulling Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to machines for decorating grain, particularly barley, for producing what is technically termed "pearl" barley, of that type which includes an attrition disk or bur carried by a horizontally-journaled shaft, a shell or cylinder, horizontally journaled, inclosing the disk, said shell having its inner periphery provided with cutting teeth or surfaces coacting with the periphery of the disk to remove the outer cuticle of the grain by attrition when the machine is operated, and means for simultaneously rotating the disk and the shell or cylinder inclosing the same in opposite directions.

One object of the invention is to provide an improved construction of adjustable cylinder which may be readily manipulated to adjust the diameter thereof to compensate for the wearing away of the attrition-disk incident to the operation of the machine and the trimming thereof.

Another object is to provide an improved mechanism for discharging the treated grain; and a further object is to simplify the entire construction of machines of the type described to increase the durability and effectiveness thereof and decrease the cost of construction and repair of the same.

To this end the invention includes an attrition-disk suitably mounted and a shell or cylinder inclosing the same comprising sides or heads having radial guides, a periphery composed of a series of arcuate plates having cutting interior surfaces, and a plurality of frame members secured to the heads and guided in the ways referred to, said frame members carrying said arcuate plates.

The invention further includes the grain-discharge mechanism, which includes one or more pockets formed in the periphery of said shell, having suitable controlling-gates and discharge-tubes leading therefrom extending

partly around the periphery of the same and conforming in shape thereto.

The invention also includes the details of construction, as will be hereinafter described, and particularly pointed out in the claims.

While the invention is susceptible of many changes and modifications, as will readily suggest themselves, I have disclosed in the accompanying drawings what I now conceive to be the preferable embodiment of the same.

In the drawings, comprising four sheets, Figure 1 is a perspective view of the machine, parts being broken away. Fig. 2 is a plan view with the upper part of the casing removed. Fig. 3 is a vertical cross-sectional view. Fig. 4 is a side elevation of the upper part of the casing with a part of one of the heads of the shell broken away. Fig. 5 is a detail view of one of the receiving-pockets of the discharge mechanism. Fig. 6 is a detail perspective of one of the frame members for carrying the arcuate peripheral plates. Fig. 7 is a similar view of one of the frame members of the other set. Fig. 8 is an enlarged view of the shell with one-half of one of the heads thereof removed, and Fig. 9 is a plan view of the same. Fig. 10 is a detail sectional view on the line 10 of Fig. 9, showing the pipe 15 in elevation.

As disclosed in the accompanying drawings, the cylinder or shell *a*, inclosing the attrition-disk *b*, is contained within a casing *c*, comprising a bottom portion *d* and a cap portion *d'*, removably seated thereon. The disk *b* is fixed to a horizontally-arranged shaft *f*, journaled in bearing-boxes *g*, secured to the upper edges of bottom portion *d* on opposite sides of the casing, the shaft being driven through a main drive-pulley *i*, secured thereon between one side of the casing and a bracket *k*, secured thereto, forming a support for a supplemental bearing-box *g'*. Inclosing the disk is the shell or cylinder *a*, also horizontally journaled in bearings secured to the bottom of the casing, said bearings extending inwardly from the sides thereof concentric to the shaft *f* and providing seats to receive the hubs, which project axially from the heads of the cylinder or shell. The latter is provided with a periphery having cutting projections on the inner face thereof,

which coact with the disk *b* in the treatment of the grain fed between said surfaces to remove the cuticles of the same. These cutting-surfaces are preferably provided by forming a plurality of indentations in the periphery of the shell or by punching a plurality of perforations therein, the metal being forced inward and presenting a ragged cutting edge to the periphery of the disk.

- 10 The grain to be treated is fed between the periphery of the disk and the periphery of the shell, as before premised, in a manner which will be hereinafter described, and the attrition to which it is subjected through the revolution of the two surfaces in opposite directions, as will be later referred to, removes the outer cuticles from the grain, and thus produces, if the grain treated is barley, what is termed commercially "pearl" barley. The surface of the attrition-disk wears comparatively rapidly, which necessitates the frequent trimming thereof, and as a consequence the diameter of said disk is constantly reduced. As it is necessary in properly treating the grain to maintain the width of the space between the periphery of the disk and that of the shell substantially uniform to compensate for the wear of said disk, means must be provided which will permit of the adjustment of the periphery of the shell to reduce the diameter of the latter, and the present invention presents a simple construction of shell comprising parts which can be easily and quickly manipulated to secure this desideratum. For this purpose the shell is composed of head-sections and a plurality of independent arcuate plates and a plurality of frame members carrying the plates and adjustably connected to the head-sections.
- 40 The heads *m n* each preferably comprise two sections suitably bolted together, having radial slots *o* extending through the same near the peripheries thereof.

- 45 Associated with the head-sections and extending between the same are a plurality of skeleton frame members *p p'*, each carrying an arcuate plate *r*, forming one section of the periphery of the shell. Each frame member is rectangular in plan view and provided with angular side walls, centrally of which arcuate slots *s* are located. When the parts of the shell are assembled, these slots are registered with the slots *o* and bolts *t* passed through the same to secure said members adj-
55 justably to the heads. From one end of each of the members *p* curved arms or fingers *p²* extend, which are guided through recesses *p¹⁰*, Fig. 7, formed in the ends of the adjacent members *p'* and upon the angle-bars forming the sides of the latter. The abutting ends *p''* of the frame members *p'* are bolted together, while the ends *p¹²* of the members *p*, which are arranged in juxtaposition, are increased in height and bolted together, with an interposed space-block *p¹³*, thus forming a space between said ends, which is utilized as a receiving-pocket for the grain, as will be

hereinafter described. The frame members thus form a complete circular skeleton frame, and the overlapping fingers provide for the expansion or outward adjustment thereof without breaking the continuity of the same. Each frame member, as before premised, carries one arcuate plate *r*, and as it is desirable to have the periphery of the shell present a continuous unbroken surface except at the pockets before alluded to it is desirable to provide means whereby the ends of said sections may abut against one another irrespective of the diameter or the adjustment of the shell. For this purpose the plates secured to the members *p'* are maintained the exact lengths of the same, and their edges are secured to and coincident with the ends thereof, while the plates secured to the members *p* are arranged with one of their edges coincident with the ends thereof which form the side walls of the pockets referred to, while their opposite ends are free and trimmed to abut against the plates carried by members *p'*. As will be apparent, as the diameter of the shell is decreased it is necessary, as the fingers *p²* overlap the member *p*, to trim off these free edges, and as they are not secured to the fingers it is found desirable to provide means for rigidly securing said ends to the skeleton frame. This is accomplished by bars *u*, which extend transversely between said fingers, but are independent of the same, which are bolted to the recessed ends of members *p'*. The free ends of the plates *r*, carried by members *p*, are secured to said bars.

As will be appreciated, to adjust the diameter of the shell the skeleton frame members are unbolted from one another and the bolts *t* unloosened and moved to the desired position in the radial slots. When the desired position is attained, the bolts are tightened up and the skeleton frame members again bolted to one another. As will be understood, the shell is constantly decreased in diameter as the disk wears away, and the plates *r*, secured to members *p*, are consequently gradually trimmed down. When the disk is worn down to its core and a new one of full diameter is substituted therefor, the plates *r* are also renewed.

To feed the grain to the attrition-surfaces, the bore of the hub of one of the heads *m n*, through which passes the shaft *f*, is made of greater diameter than the latter to provide a passage through which the grain may pass to the interior of the shell, and as the disk is of less width than the latter the grain passing through said hub will fall down between the side of the disk and the adjacent side of the shell and enter the space between the coacting attrition-surfaces. The grain is fed in regulated quantities to and through said hub from a hopper *w*, secured to one side of the cap *d'*, having a discharge-spout provided with means for directing the grain through an opening in the side of said cap in register with the bore of said hub. In the

bottom of the hopper a corrugated feed-wheel is located, fixed upon a shaft w' , journaled to the side of the cap d' and driven by a gear-wheel 2, which is in turn driven from a counter-shaft 4, connected by a belt to a second counter-shaft 5, driven from the main shaft, as will be described. The quantity of grain admitted to the wheel is controlled by a suitable gate 6, guided through the front wall of the hopper, which exposes more or less of the wheel, according to the adjustment of said gate. This adjustment is secured by means of a gear-wheel in mesh with a rack on said gate, said wheel being operated by a suitable hand-lever. As the grain falls or is fed from the hopper it drops upon an inclined deflecting-plate 7, located in the feed-spout, which directs the grain through an opening 8 in the side wall of the cap coincident with the bore of the hub. For discharging the grain from the shell mechanism for giving a continuous action is provided.

As before premised, the adjacent ends p^{12} of skeleton frame members p are separated by space-blocks p^{13} , and the spaces so formed are utilized as receiving-pockets. To this end cover-plates 12 are provided for bridging the outer ends p^{12} of the adjacent ends of said member p to close the space between the same, said plates being secured to the space-blocks. Each of the pockets thus formed has its inlet into the interior of the shell regulated by a sliding gate 13, which has an end extending through a radial slot 14 in one of the heads, that may be grasped in adjusting the size of said inlet. These gates are supported in a similar manner to bolts t by plates 20, secured to the heads and provided with tongues extending into said slots 14. The grain passes from between the friction-surfaces into said pockets, and to discharge the same therefrom discharge pipes or spouts 15 are provided, each curved to conform to the periphery of the shell and extending partly around the same and having one end opening into one of said pockets, the opposite end of the pipe being free and unobstructed. As the shell is rotated, as will be described, the grain will pass continuously through the pockets and out through said spouts, falling upon the bottom of casing c , which is provided with an inclined hopper-shaped interior.

As before premised, the cylinder or shell is rotated simultaneously with, but in an opposite direction to, the disk. This reverse rotation is attained through the medium of the counter-shaft 5, journaled in bearings secured to the upper edge of the bottom portion d of the casing, which is driven from the main shaft and is provided with a pinion 9, meshing with a peripheral gear 10 on the shell. The latter gear is preferably cast integral with the sections forming one of the heads of the shell; but this is not essential.

From the foregoing it is thought the construction and operation of the machine will be fully understood and that it will be real-

ized that the invention presents a simple, durable, and effective means for attaining the purposes set forth.

In a machine of this character it is desirable after the parts have rotated in one relative direction for a period of time and the cutting-surfaces have consequently become worn upon certain lines to change the direction of or the relative rotation of the parts. For this purpose the skeleton-frame members of the shell or casing herein presented are adapted to be reversed in positions, and this may be done by simply unbolting the sections comprising said skeleton frame and reversing the individual members thereof.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is—

1. In a machine of the class described, the combination with an attrition-disk, of an adjustable shell or cylinder inclosing the same comprising heads, a plurality of arcuate plates having abutting ends, and a frame member associated with each plate, said frame members being coupled to one another whereby an unbroken support is provided for said plates, said members being radially adjustable between said heads, substantially as described.

2. In a machine of the class described, the combination with an attrition-disk, of an adjustable shell or cylinder inclosing the same comprising heads having radial slots therein, a plurality of perforated arcuate plates having abutting ends forming the entire periphery of the shell, a frame member associated with each plate, said members being coupled to one another to provide a continuous support for the plates, and bolts extending through said frame members and through said radial slots for adjustably connecting the plates to said heads, substantially as described.

3. In a machine of the class described, the combination with an attrition-disk, of an adjustable shell or cylinder inclosing the same comprising heads having radial slots therein, a plurality of arcuate plates forming the entire periphery of the shell, a frame member associated with each plate, said members being coupled to one another to provide a continuous supporting-frame, bolts extending through the same and through said radial slots for adjustably connecting the plates to said heads, and a locking-plate associated with each slot, substantially as described.

4. In a machine of the class described, the combination with an attrition-disk, of an adjustable shell or cylinder inclosing the same comprising heads having radial slots therein, a plurality of arcuate plates having abutting ends forming the entire periphery of the shell, a frame member associated with each plate, bolt extending through the same and through said radial slots for adjustably connecting the plates to said heads, and a locking-plate associated with each slot, said plate being secured to the head and provided with a tongue

projecting into the slot and coacting with the bolt extending therethrough, substantially as described.

5. In a machine of the class described, the combination with an attrition-disk, of an adjustable shell or cylinder inclosing the same comprising heads having radial slots, a plurality of arcuate plates having abutting ends, a skeleton frame member associated with each plate having elongated slots in the sides thereof designed to register with said radial slots, and bolts extending through said registering slots for securing said plates to said heads, substantially as described.

6. In a machine of the class described, the combination with an attrition-disk, of an adjustable shell or cylinder inclosing the same comprising heads, a plurality of arcuate plates, and two sets of skeleton frame members carrying the same adapted to be adjustably secured to said head, one set of said plates having overlapping arms extending from one of their ends, and the other set having recessed ends and angular sides to receive and guide said arms, substantially as described.

7. In a machine of the class described, an attrition-disk with means for rotating the same, a shell inclosing said disk and having a periphery coacting therewith, means for rotating said shell, a discharge-pocket in the periphery of the shell, and a section of pipe forming a discharge-spout carried by and rotating with said shell, said pipe being curved to conform to the periphery of the shell and having one end entering said pocket, substantially as described.

8. In a machine of the class described, the combination with an attrition-disk, of an adjustable shell or cylinder inclosing the same comprising heads, a plurality of plates form-

ing the periphery of said shell, a frame member associated with each plate, two of said members having ends forming the side walls of a discharge-pocket, means associated therewith bridging said ends to close said space, and a regulating-gate for said pocket, substantially as described.

9. In a machine of the class described, the combination with an attrition-disk, of an adjustable shell or cylinder inclosing the same comprising heads, a plurality of plates forming the periphery of said shell, a frame member associated with each plate, two of said members having ends forming the side walls of a discharge-pocket, means associated therewith bridging said ends to close said space, a regulating-gate for said pocket projecting through one head of the shell, and a supporting-plate therefor secured to said head, substantially as described.

10. In a machine of the class described, the combination with an attrition-disk, of an adjustable shell or cylinder inclosing the same comprising heads, a plurality of arcuate plates, and two sets of skeleton frame members carrying the same adapted to be adjustably secured to said head, one set of said plates having overlapping arms extending from one of their ends, a space-block located between the opposite end of the plate of said set, a plate secured to said block forming with the latter ends a receiving-pocket, discharge-spouts leading therefrom and a gate for regulating the same, substantially as described.

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

ANDREAS E. HOFLAND.

Witnesses:

HENRY E. COOPER,
CHAS. L. WALLACE.