W. H. BUTTERWORTH.

THRESHING MACHINE.

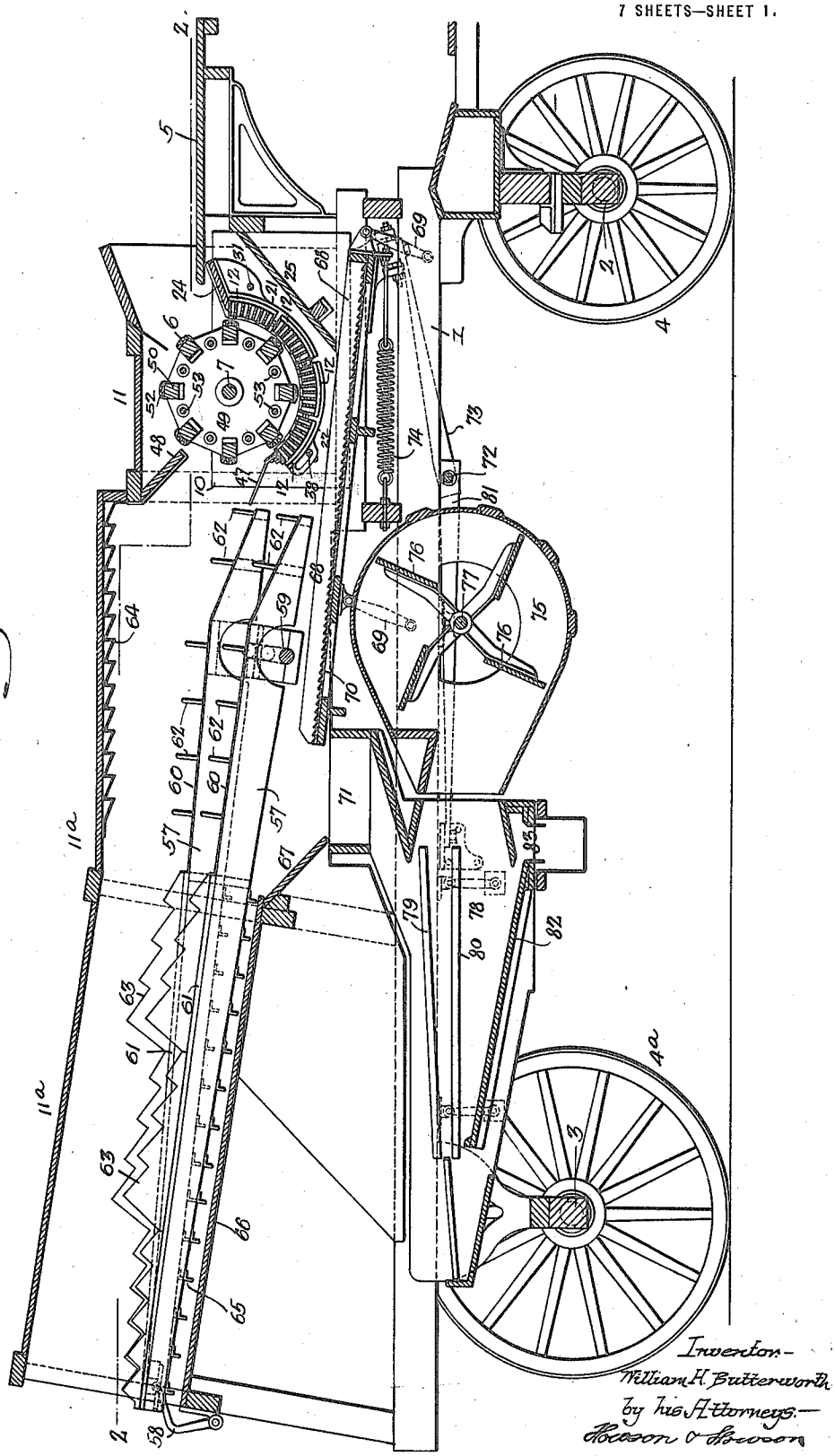
APPLICATION FILED JULY 7, 1916.

1,257,802.

Patented Feb. 26, 1918.

7 SHEETS—SHEET 1.

Fig. 1.



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by his Attorneys—
Dodson & Dodson

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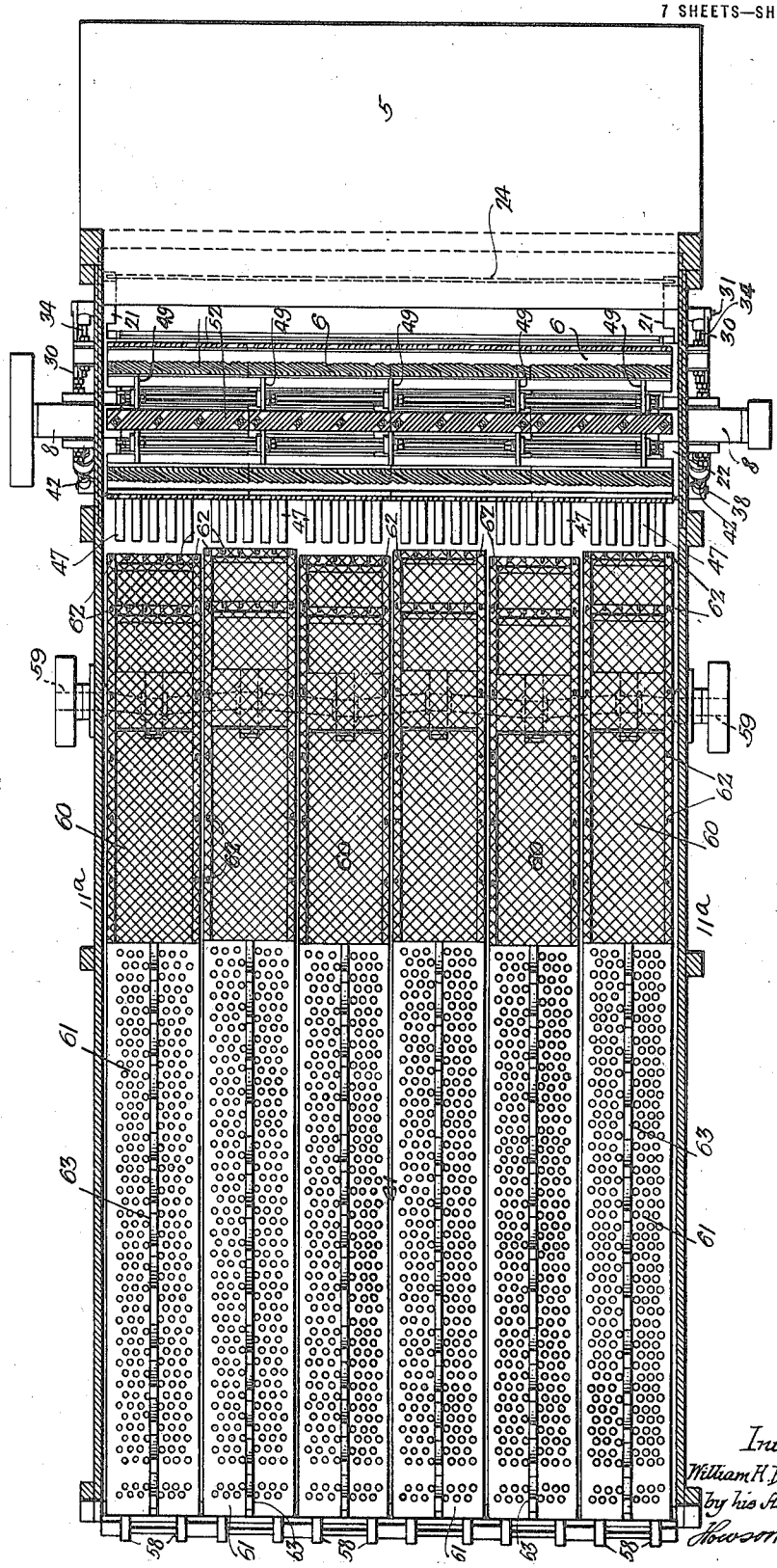

Fig. 2.

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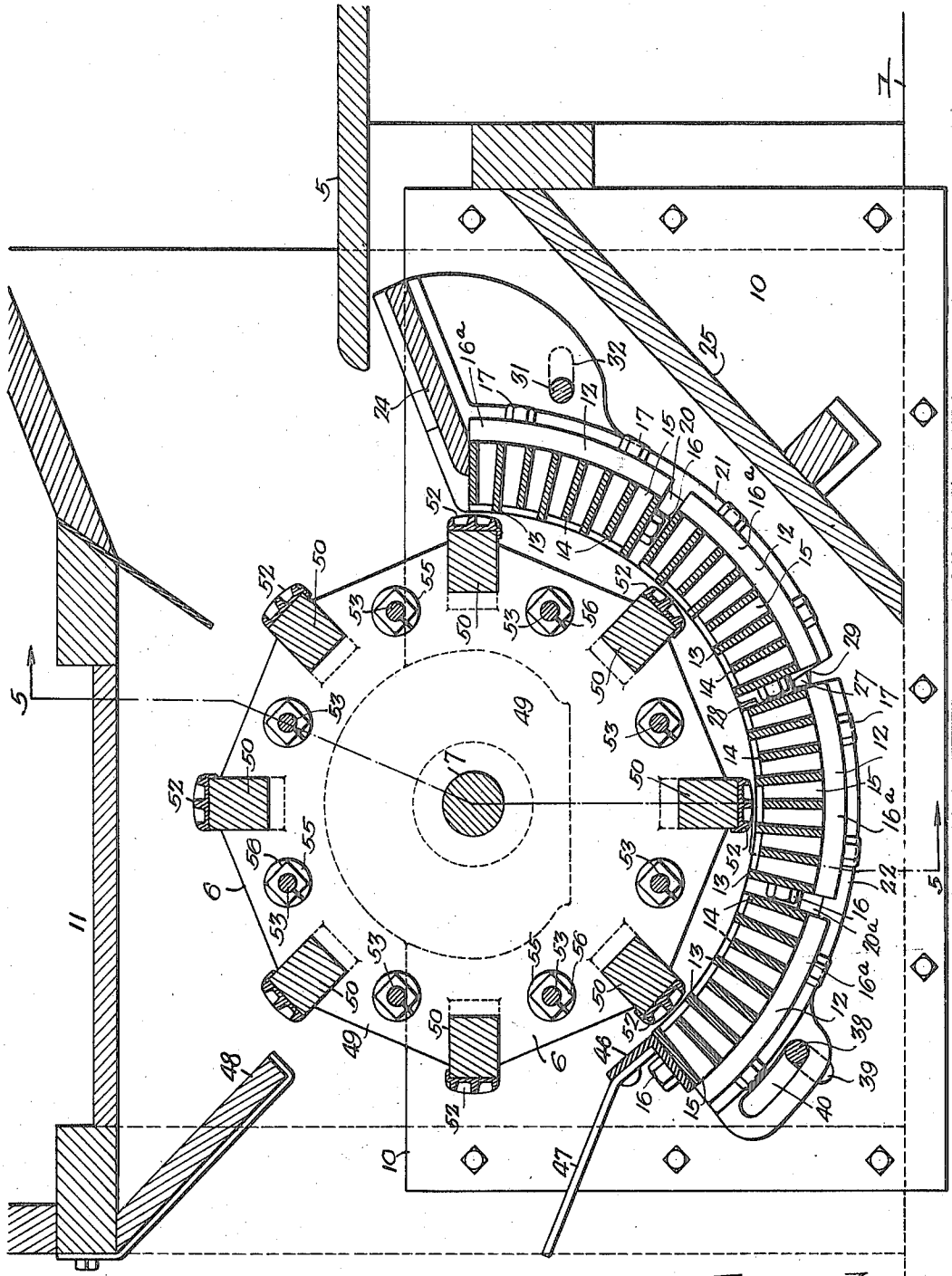

Fig. 3.

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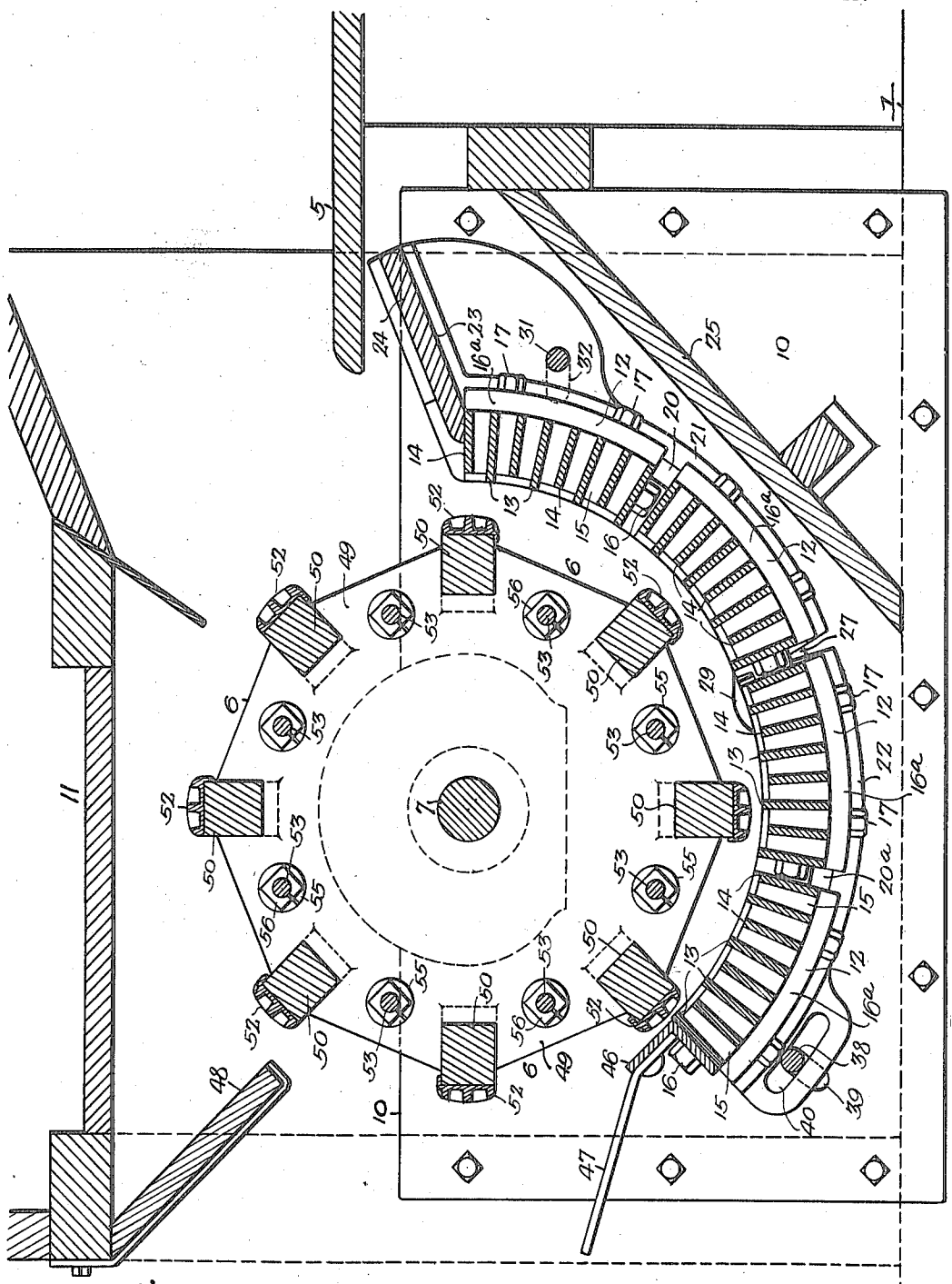

Fig. 4.

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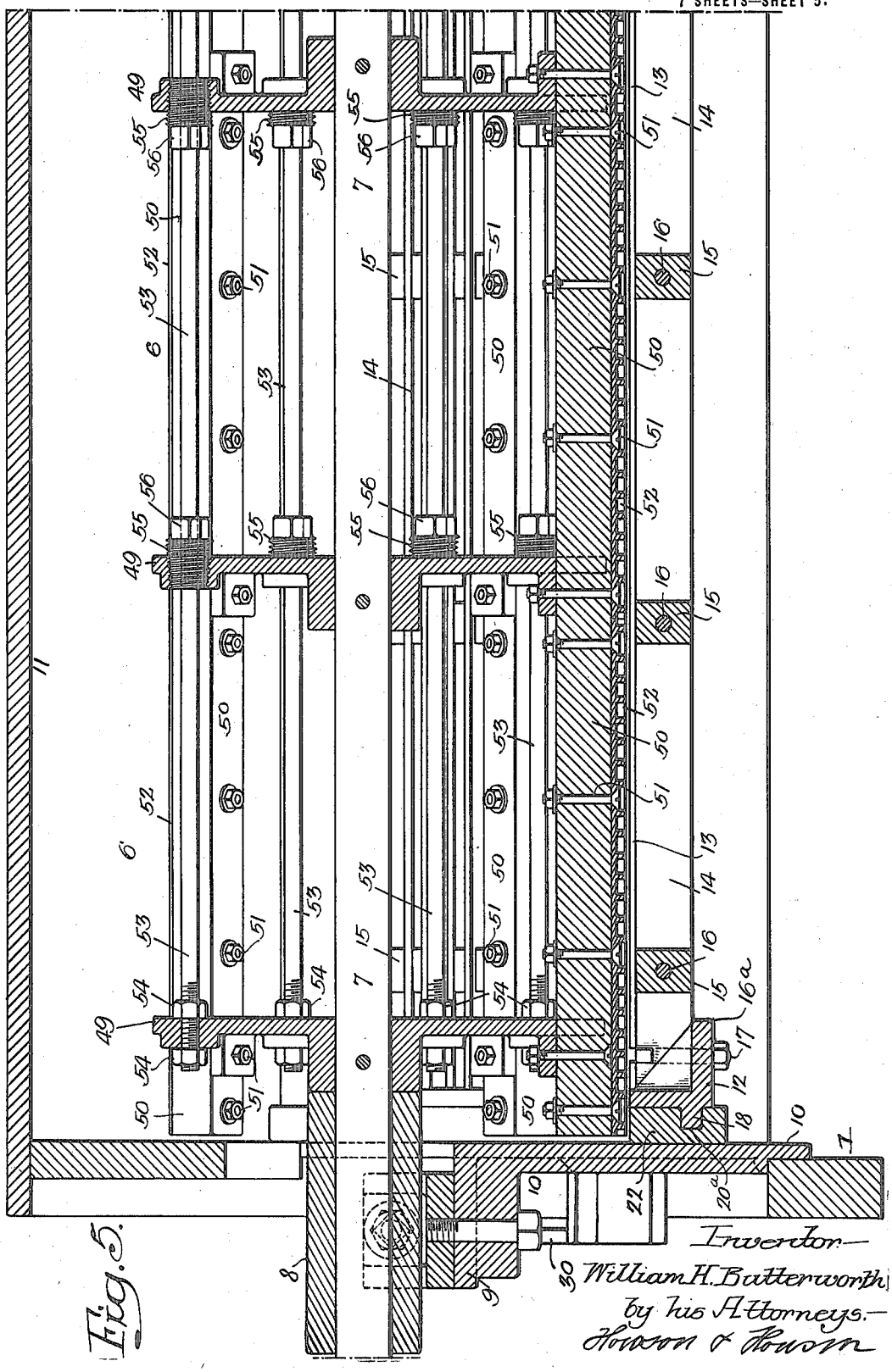

Fig. 5.

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7 SHEETS—SHEET 6.

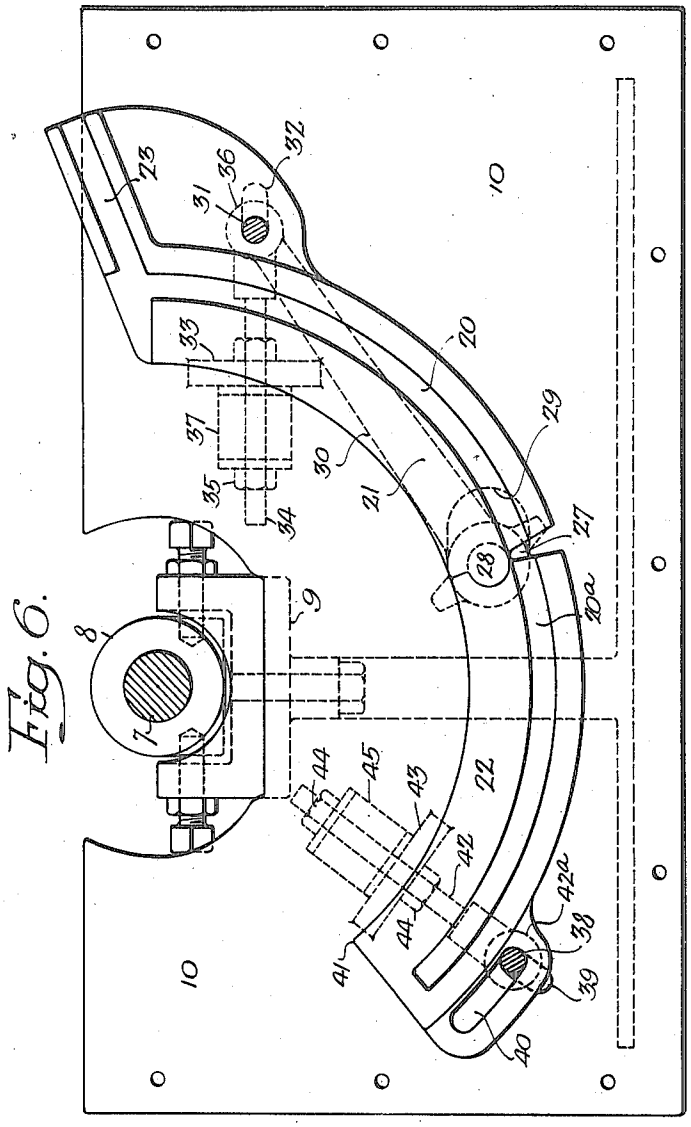

Fig. 6.

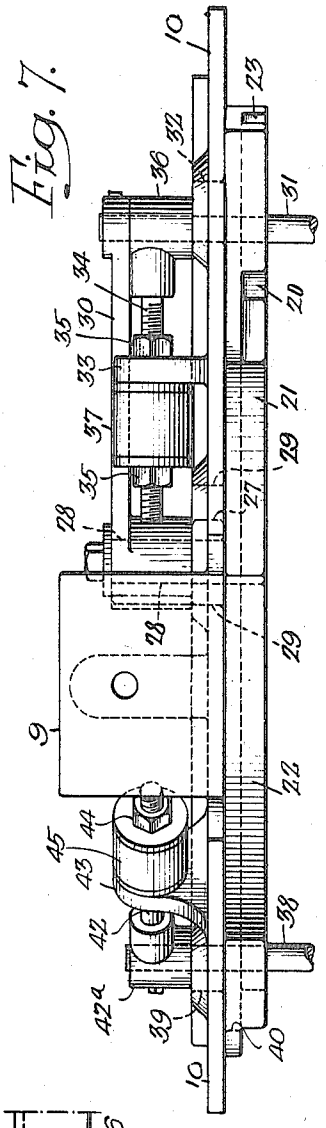

Fig. 7.

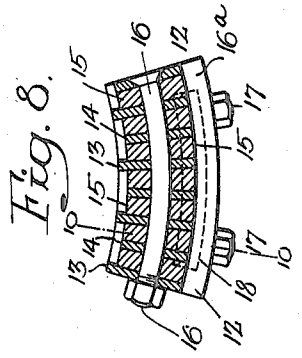

Fig. 8.

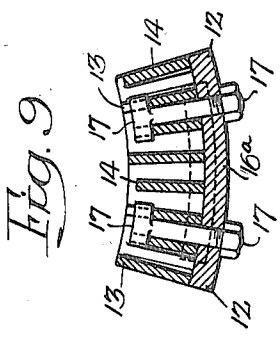

Fig. 9

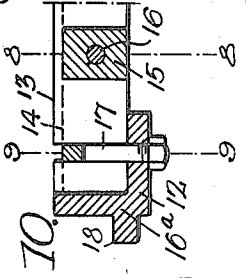

Fig. 10.

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7 SHEETS—SHEET 7.

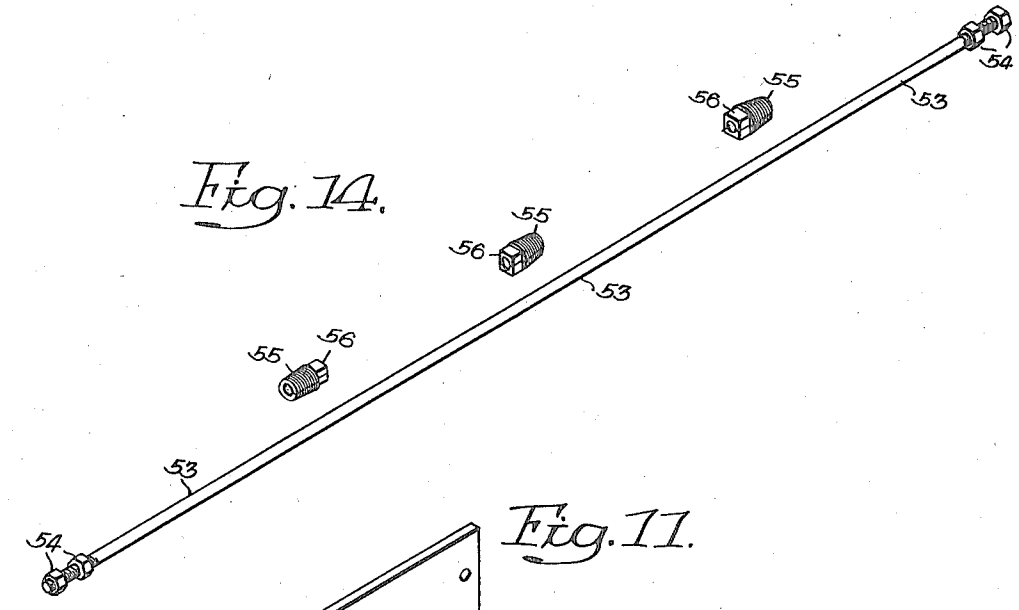

Fig. 14.

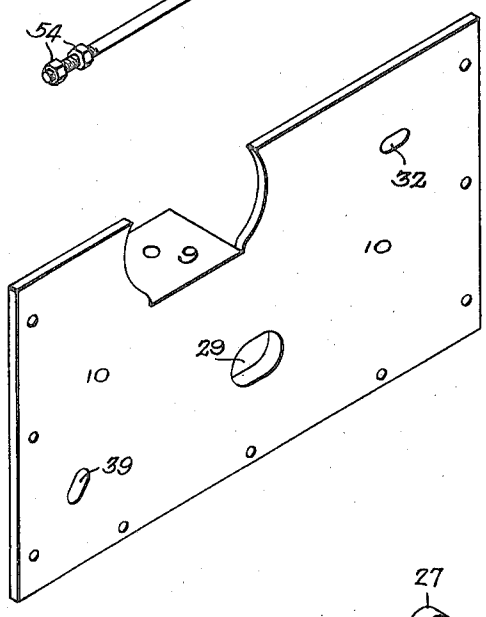

Fig. 11.

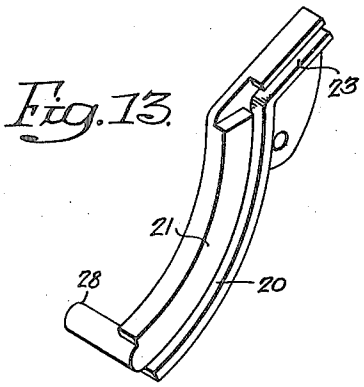

Fig. 13.

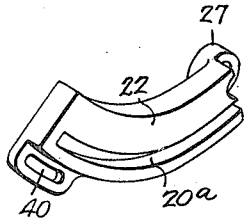

Fig. 12.

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UNITED STATES PATENT OFFICE.

WILLIAM H. BUTTERWORTH, OF TRENTON, NEW JERSEY.

THRESHING-MACHINE.

1,257,802. Specification of Letters Patent. Patented Feb. 26, 1918.

Application filed July 7, 1916. Serial No. 107,972.

To all whom it may concern:

Be it known that I, WILLIAM H. BUTTERWORTH, a citizen of the United States, and a resident of Trenton, county of Mercer, State of New Jersey, have invented certain Improvements in Threshing-Machines, of which the following is a specification.

My invention relates to certain improvements in threshing machines in which the grain is threshed from the head by a rubbing process and if straight straw is desired the sheaves are fed to the cylinder parallel thereto so as to reduce the breaking of the straw in the process of threshing to a minimum, but where a straight straw is not of value the sheaves may be fed to the cylinder endwise.

One object of my invention is to more thoroughly thresh the grain clear from the head and to separate it in a more complete manner from the straw when being threshed.

A further object of the invention is to provide means for adjusting the holders carrying the concaves.

A still further object of the invention is to improve the construction of the straw shakers.

The invention also relates to certain improvements in the means for preventing the glancing of the grain from the cylinder after being threshed so as to utilize the full length of the shaker.

Another object of the invention is to provide means for counterbalancing the movement of the grain pan, thus relieving the shock that would occur by the rapid movement of the pan.

Still another object of the invention is to construct the cylinder so that it will not spring out of true while in operation.

The invention also relates to certain details of construction which will be fully described hereinafter, reference being had to the accompanying drawings, in which:

Figure 1 is a longitudinal sectional view of a threshing machine illustrating my improvements;

Fig. 2 is a sectional plan view on the line 2—2, Fig. 1;

Fig. 3 is an enlarged sectional view showing the relation of the threshing cylinder and the concaves and the adjustable means for supporting the concaves, the view illustrating the concaves adjusted in close proximity to the cylinder;

Fig. 4 is a view similar to Fig. 3 showing the concaves moved away from the cylinder, leaving a tapered throat;

Fig. 5 is a longitudinal sectional view on the line 5—5, Fig. 3;

Fig. 6 is a detached view of the plate and the concave holders mounted thereon;

Fig. 7 is a plan view of Fig. 6;

Fig. 8 is a sectional view on the line 8—8, Fig. 10;

Fig. 9 is a sectional view on the line 9—9, Fig. 10;

Fig. 10 is a sectional view on the line 10—10, Fig. 8, showing one end of a concave;

Fig. 11 is a perspective view of one of the side plates for supporting the concave holders;

Figs. 12 and 13 are perspective views of the concave holders adapted to the plate shown in Fig. 1, and

Fig. 14 is a detached perspective view of one of the cylinder rods and its attachments.

Referring, in the first instance, to Figs. 1 and 2, 1 is the frame of the machine. 2 is the front axle, 3 is the rear axle and 4 and 4^a are the wheels. 5 is the feed table supported in the ordinary manner on the frame. 6 is the threshing cylinder carried by a shaft 7 supported in journal boxes 8 carried by a bracket 9 on the outer side of the side plates 10 secured to the frame of the machine. The threshing cylinder is inclosed in a casing 11.

12, 12 are four concaves, in the present instance, consisting of a series of longitudinal blades 13 and 14, the blades 14 alternating with the blades 13 and being less in height than said blades 13, as clearly shown in Figs. 3, 8 and 9. The blades are spaced apart by blocks 15 arranged at intervals and curved bolts 16 secure the blades firmly together. 16^a, 16^a are end plates which have pockets for the reception of the ends of the blades and the blades are held rigidly to the end plates by bolts 17, Figs. 9 and 10. On the end plates 16^a are curved guide flanges 18, which are adapted to grooves 20, 20^a, in the two concave holders 21 and 22 respectively. The concave holders are adjustably mounted on the side plates 10 and can be adjusted to fit snugly the lower portion of the threshing cylinder, as shown in Fig. 3, or can be adjusted to the extreme position, as shown in Fig. 4, forming a tapered throat or in a mid position, as desired. These concave holders are adjusted according to the

character and condition of the grain to be threshed. The concave holder 21 has a channel 23 for an inclined board or plate 24, forming a continuation of the feed table 5. In the front of the machine is an inclined board 25, which extends under the forward concaves and which guides the grain that passes through the space between the plates of the concave to the grain pan 68. The concave holders are pivotally connected. The holder 22 has an offset perforated lug 27 through which a pin 28 on the holder 21 projects. Both the pin and the lug extend through an opening 29 in the plate 10. A rod 31 extends from one side of the machine to the other and is adapted to move in a slot 32 in each side plate 10. On the outside of each plate 10 is a perforated lug 33 through which extends an adjusting screw 34 on which are nuts 35. This adjusting screw is attached to a head 36 perforated for the passage of the rod 31. Between one of the nuts 35 and the lug 33 is a spring 37, in the present instance of rubber, reinforced at each end by a washer, but a coiled metallic spring may be substituted for the rubber, if desired. By turning the nuts 35 on the screw 34 the concave holders 21 and 22 may be adjusted. In some instances a link 30 may connect the pivot of the two concave holders outside of each plate with the rod 31 so as to relieve the rod of strain due to the overhang of the end of the rod. A rod 38 passes through a radial slot 39 in the plate 10 and extends from one end of the machine to the other, being adapted to move in a slot 40 in the concave holder 22. This slot is preferably concentric, the center being on the same line as the center of the shaft so that any movement of the adjusting screw 34 will not change the position of the rear end 41 of the concave holder 22 in respect to the threshing cylinder.

In order to adjust the outer end 41 of the concave holder 22, I mount the rod 38 on an adjusting screw 42 which passes through a lug 43 on the outside of the plate 10 and this screw has a head 42ª through which the rod 38 passes and is held to the head by a set screw. On the screw are nuts 44 and between one of these nuts and the lug 43 is a spring 45 of rubber, in the present instance, the same as the spring 37 on the screw 34, but a coiled spring may be substituted for the rubber ring, if found more desirable. This construction is duplicated at each side of the machine so that the rods can be adjusted as desired in order that the concaves may be properly adjusted in respect to the cylinder.

Secured to the outer end of the last concave of the series is a bracket 46 having fingers 47 which project upward at an angle so as to direct the straw as it leaves the concave onto the straw shaker hereinafter described, and above these fingers is a guide board 48 which prevents the straw from being carried over the cylinder.

The cylinder 6 is made as clearly shown in Figs. 3 and 5, and secured to the shaft 7 is a series of heads 49 spaced a given distance apart and having extended hubs through which passes the shaft 7 and these hubs are pinned to the shaft in the present instance. Extending throughout the length of the cylinder is a series of rectangular bars 50 made of wood in the present instance. Secured to these bars by bolts 51 are rubbing plates 52 having diagonal ribs, as shown in the plan view Fig. 2, which act in conjunction with the concaves to thresh the kernels from the straw.

In order to stiffen the cylinder and to prevent it from springing or vibrating when revolving at a high speed and also to prevent the cylinder from being forced out of true by bunches of straw passing between the cylinder and the concaves, I provide parallel stiffening rods 53, which extend from one end of the cylinder to the other and are threaded at each end, being secured to the end heads 49 by nuts 54. In order to secure the intermediate heads to the rods, these heads have tapered openings for the passage of the rods and the openings are threaded for the reception of tapered screw plugs 55, each having a head 56. Each plug is split, as clearly shown in Fig. 14, being made to fit the rod so that, when the plugs are placed on the rod and screwed into the heads, they clamp the rod and securely fasten it to the head. Thus, when all of the rods are in position and the plugs are properly located, the cylinder is not only rigidly held from end to end but each section also between the heads is rigidly held, making an exceedingly substantial, yet comparatively light structure. In some instances, the tapered openings for the passage of the rods may have plain walls and plain plugs may be driven into the openings so as to confine the heads to the rods.

At the rear of the cylinder are the straw shakers 57 which extend from the fingers 47 to the rear of the machine, being supported at the rear by pivoted arms 58 and at the forward end of the machine by the cranks of a crank shaft 59. By this construction, the end of the straw shaker nearest the cylinder practically describes a circle, while at the extreme end it simply has a longitudinal movement.

The straw shakers are designed to separate the grain from the straw and to allow the grain to pass from the straw as it is carried to the rear of the machine from the cylinder. The first section of the bed of each shaker is made of wire gauze 60, while the section of the bed at the rear end is made of perforated plates or boards 61. On the

first mentioned section are projecting pins 62, which tend to carry the straw to the rear while on the second section there is a series of toothed boards arranged on edge, as at 63, which feed the straw to the rear. By the use of shakers of this construction, the grain can freely escape from the straw as it is agitated and owing to the extended vertical movement of the shaker there is no tendency of the straw to enter end on through the meshes of the wire screening, but at the rear of the shaker there is an extended longitudinal movement with a corresponding vertical movement. I use perforated plates or boards as the ends of the straw will not enter these perforations so readily as the meshes of the wire, and, as there is a reduced amount of grain freed at this portion of the machine, the perforations are sufficient to allow the grain to pass freely away. Directly above the straw shakers is a continuation of the casing 11ª and secured to the upper side of the under portion of the casing 11ª is a crimped metal plate 64 shaped in such a manner as to form abutments which arrest the flying grain as it is shot out by the cylinder so that it will fall onto the portions 60 of the straw shakers. Directly under the rear portions of each of the shakers are angle plates 65 which form scrapers to feed the grain that is passed through the rear portion of the shakers and onto the board 66 to a point where it discharges onto the inclined board 67 and into the shoe hopper 71.

68 is a grain pan, which is arranged on an incline and supported in position by rocking arms 69. The bottom of the grain pan is provided with crimped metal sheets so shaped that on the longitudinal movement of the grain pan the grain and chaff are caused to travel rearward over the grain pan bottom and are delivered into the hopper 71 of the inclined shoe of the machine.

72 is a shaft having a cam thereon and 73 is a connecting rod secured to the grain pan by which the pan is reciprocated. A spring 74 attached to the pan and to a fixed point on the machine places the pan under tension. The spring is of sufficient tension to carry the grain pan to its extreme upward stroke, thereby counterbalancing the pan in its downward movement and in its rearward movement. 75 is the cleaning fan casing in which is mounted the cleaning fan 76 mounted on a shaft 77. The mouth of this fan communicates with the forward end 78 of the shoe. In this shoe are cleaning sieves 79 and 80 pivotally mounted and actuated by a cam on the cam shaft 72 through a rod 81 so that as the grain passes down onto the cleaning sieves the blast of air from the fan strikes it and separates the chaff and dirt from the grain. The clean grain then drops onto the inclined bottom 82 of the shoe and is shaken down into the delivery spout or chute 83. This delivery spout has a longitudinal shaker arranged transversely to the shoe, which causes the cleaned grain to travel out of the mouth of the shoe at one side of the machine into any suitable receptacle, while the chaff and dirt pass to the rear of the machine.

The concaves are adjusted according to the character of the grain to be threshed and after these parts are adjusted the machine is set in motion. If long straight straws are desired the sheaves are fed parallel to the cylinder, passing between the cylinder and the concaves at which point the grain is threshed from the head. The major portion of the grain which has been freed from the hulls passes through the open spaces between the bars in the concaves and down onto the grain pan, which is located directly under the concaves. The threshed straw and the particles of grain which still adhere to the heads are, by the action of the cylinder, deposited on the straw shakers, which receive their peculiar agitating motion from the crank shaft 59 and carry the straw through the machine. This agitation causes the remaining grains to be freed from the straw and they pass through the wire netting or the perforated boards and onto the bottom board 66.

At the forward end of the shakers are projecting pins and at the rear portion are the toothed boards arranged on edge. The straw is agitated and is carried to the rear of the machine by the peculiar action of the shakers. The grain deposited on the bottom board 66 travels by gravity or is conveyed by the action of the blades to the bottom of the shakers to the shoe hopper. The grain pan 68 has a reciprocating movement, causing the grains and chaff to travel up over the crimped metal sheets at the bottom of the grain pan and to be discharged at the end of the grain pan into the shoe hopper and onto the cleaning sieves in the shoe where a blast from the cleaning fan separates the chaff and dirt from the grain, the clean grain dropping into the inclined bottom of the shoe and finally into the delivery spout, and means is provided for longitudinally shaking this spout which causes the clean grain to travel to the mouth of the spout and into the receptacle that is placed to receive it while the chaff and dirt pass out at the rear of the machine.

It will be seen by the above description that I make the concave holders adjustable and flexible so that while the concave at the delivery end is substantially the same distance from the cylinder at all times, other concaves can be adjusted so as to regulate the throat between the concaves and the cylinder according to the character of the grain being threshed. The cylinders are

made in such a manner that they are absolutely rigid and will not yield when the straw is fed to the machine; consequently, a much more perfect threshing results when these machines are used.

I claim:

1. In a threshing machine of the rubbing type, the combination of a cylinder and concaves acting in conjunction therewith to thresh the grain, holders for the concaves, said holders being flexibly connected; means for adjusting the feed end of the holders and the concaves toward and from the cylinder; and means for retaining the delivery end of the holders and concaves in a substantially fixed relation to the cylinder so that the concaves can be adjusted to increase or diminish the throat at the feed end without interfering with the adjustment at the discharge end.

2. The combination in a threshing machine of the rubbing type, of a cylinder and concaves, holders for the concaves, said holders being pivotally connected; means for independently adjusting the delivery end of the concave holders toward and from the cylinder; means for independently adjusting the opposite end of the concave holders toward and from the cylinders without altering the position of the delivery end of the concave holders so as to make the throat through which the grain passes more or less tapered; and means for allowing the discharge end of the concave holders to move circumferentially as the feed end of the concave is moved toward and from the cylinder.

3. The combination in a threshing machine of the rubbing type, of a cylinder and concaves; two segmental holders at each side of the machine, said holders being pivotally connected; a concentric slot in each of the rear holders at the delivery end of the concaves; a horizontal slot at each side of the casing of the machine; means carried by the concave holders adapted to the slots; and means for holding the feed end of the concave holders in the position to which it is adjusted, whereby the feed end of the concave holders can be adjusted to increase or diminish the throat without materially altering the position of the delivery end of the concave in respect to the cylinder.

4. The combination in a threshing machine, of a cylinder and concaves; concave holders at each side of the machine; plates on which the holders are mounted, the forward concave holders each having a perforation therein; a rod extending from one side plate to the other and through the perforations in the forward concave holders, said plates being slotted for the reception of the rod, the rear concave holders having concentric slots; a rod extending through radial slots in the side plates and through the concentric slots in the rear concave holders, the two concave holders in each side of the machine being pivotally connected, the plates being slotted to receive the pivots; and means for independently adjusting the forward end of the concave holders so that the space between the concaves and the cylinder may be varied without materially affecting the position of the rear of the concaves in respect to the cylinder.

5. The combination in a threshing machine, of a frame; a cylinder mounted in bearings in the frame, side plates secured to the frame at each side of the cylinder; two parallel horizontal slots in each plate forward of the center of the cylinder and a radial slot in each plate at the rear of the center of the cylinder; concave holders pivotally connected and located at each side plate; a rod for supporting the holders extending through one of the forward horizontal slots; a pivot for the concave holders extending through the other horizontal slot; a support for the rear of the concave holders extending through the radial slot; means for flexibly holding the concave holders in position; and concaves mounted in the concave holders.

6. A side bearing plate for a cylinder threshing machine having two parallel horizontal slots forward of the center line of the cylinder and one radial slot at the rear of the cylinder; concave holders at each plate; means for adjusting the holders; concaves carried by the holders; and a cylinder adapted to bearings in the frame of the machine and acting in conjunction with the concaves to thresh the grain passing through the machine.

7. The combination in a threshing machine, of a frame recessed at each side and having bearings; a shaft mounted in the bearings; a cylinder mounted on the shaft; side bearing plates closing the recesses in the sides of the frame, each plate having two parallel horizontal slots forward of the bearings and one radial slot at the rear of the bearings; two rods extending from one side of the machine to the other, one rod extending through one of the parallel slots and the other rod extending through the radial slots in the side plates; adjusting screws adapted to receive the ends of the said rods; lugs on the exterior of the plates through which the adjusting screws extend; pivotally connected concave holders supported by the said transverse rods, the pivots of the holders extending through the other horizontal slot in each side plate; and elastic cushions carried by the adjusting screws for yieldingly connecting the rods to the plates.

8. The combination in a threshing machine, of a frame; bearings mounted on the frame; a cylinder mounted in the bearings; a side plate at each side of the machine, said plates having two horizontal parallel

slots at one side of the center of the cylinder and a radial slot at the rear of the cylinder; a rod extending through the upper horizontal slot and a rod extending through the radial slot in each plate; means for supporting the rods; two concave holders at each side of the machine at the plates, the two holders at each side being pivotally connected, the pivot extending through the lower horizontal slot in each plate, the rear concave holder having a concentric slot through which the rear rod extends; and concaves mounted on the holders.

9. A concave for a threshing machine of the rubbing type consisting of a series of parallel blades spaced apart and extending uninterruptedly from one end of the concave to the other, some of the blades projecting beyond the others at the concave surface thereof; and heads at each end of the concaves and to which the blades are secured, said heads having curved projections adapted to extend into slots in the concave holders.

10. The combination in a cylinder for a threshing machine, of a shaft; an end head mounted at each end of the shaft and intermediate heads mounted between the end heads spaced apart and secured to the shaft; a series of bars secured to the heads and forming the cylinder; straight, parallel stiffening rods rigidly attached to each end head of the cylinder and extending through openings in the intermediate heads; and means for clamping the rods to the said intermediate heads, the parallel rods on one side of the cylinder resisting the strains on the rods at the opposite side of the cylinder, thus keeping the cylinder true throughout its length.

11. The combination in a cylinder for a threshing machine, of a shaft; a series of heads spaced apart and secured to the shaft; bars extending the full length of the cylinder and also spaced apart and secured to the heads; straight parallel rods alternating with the bars and connecting the two end heads to which they are rigidly attached, said rods extending through openings in the intermediate plates, said openings being tapered and threaded; tapered, threaded split plugs adapted to the threaded openings in the intermediate heads and arranged to clamp the rods rigidly to the intermediate heads; and rubbing plates carried by the bars.

12. The combination in a threshing machine, of a cylinder and concaves; a straw shaker located directly back of the cylinder; a series of abrupt abutments located above the forward end of the straw shaker and back of the cylinder so that as the straw, with the entrapped grain, is discharged from the cylinder, the grain will be projected against the abutments and will be stopped in its forward movement and will fall by gravity onto the forward end of the straw shaker.

13. The combination in a threshing machine, of a cylinder and concaves; a straw shaker located directly back of the cylinder; a crimped metal plate located directly above the forward end of the straw shaker and directly back of the cylinder, said plate having a series of short transverse abutments arranged close together, the front wall of the abutments being vertical so that the grain, as it leaves the cylinder, will be stopped in its forward movement and will fall by gravity onto the forward end of the straw shaker.

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