

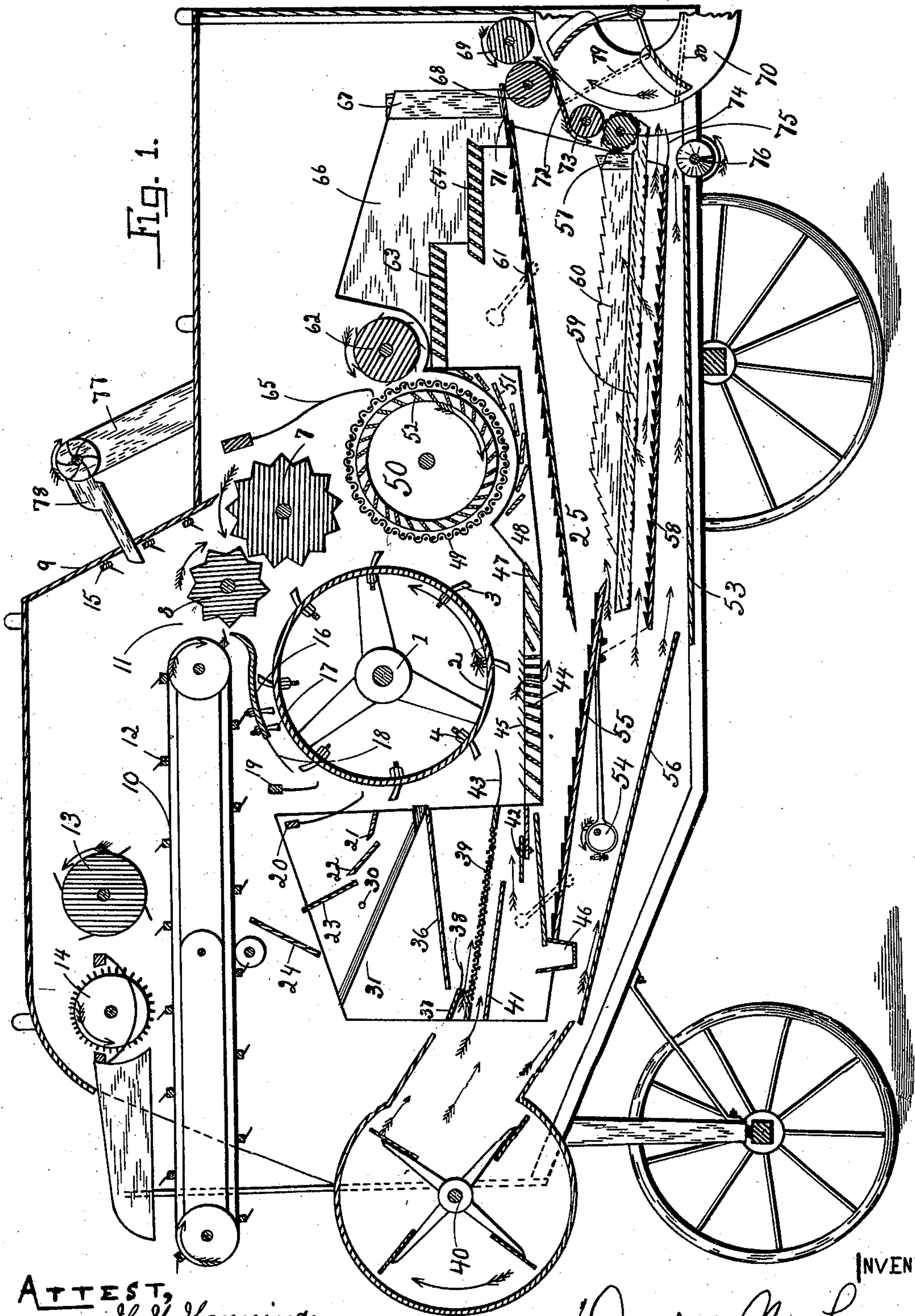
(No Model.)

7 Sheets—Sheet 1.

D. N. LONG.  
THRESHING MACHINE.

No. 580,980.

Patented Apr. 20, 1897.



L. E. Henning.  
L. E. Hoff.

INVENTOR.  
David N. Long.

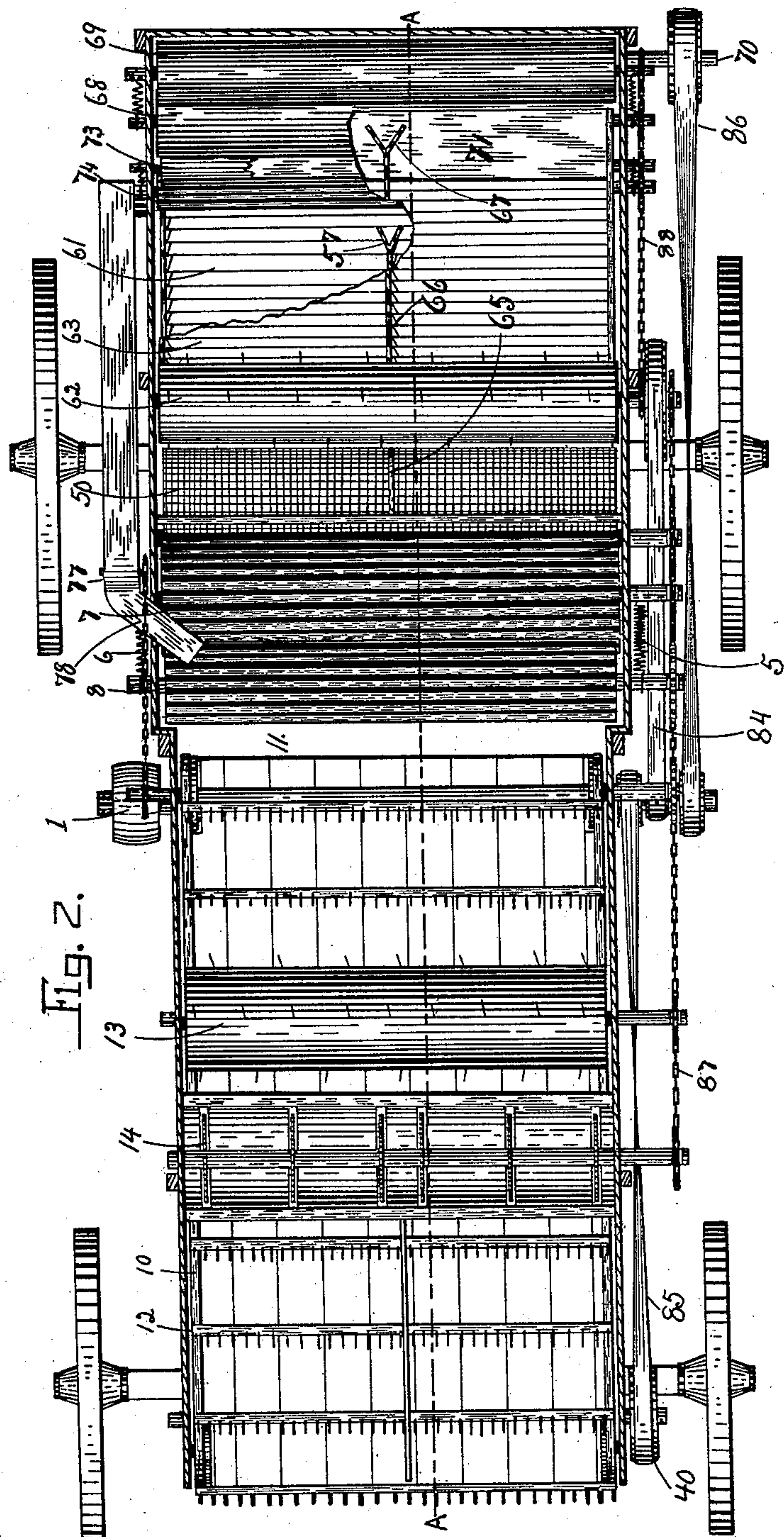
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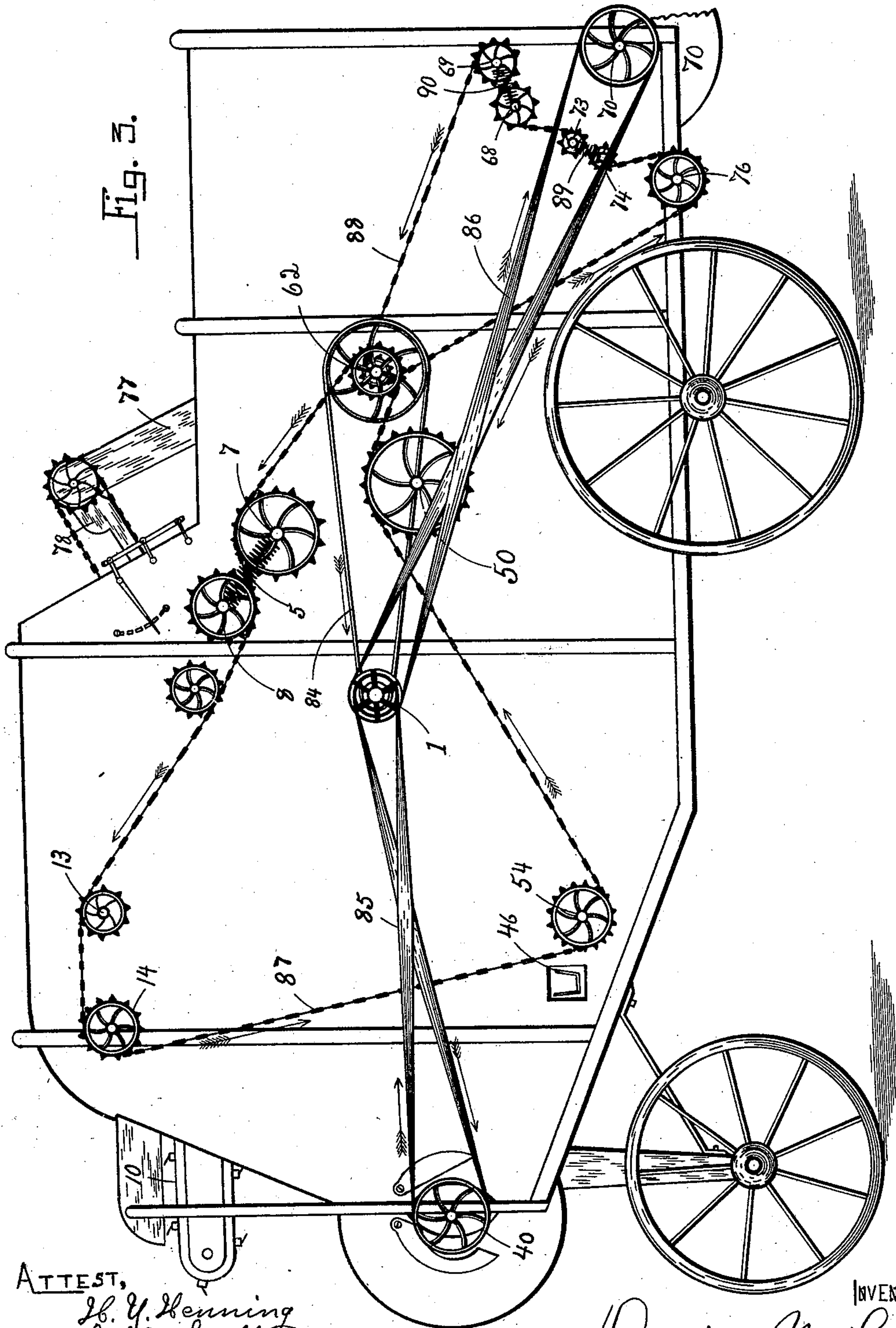
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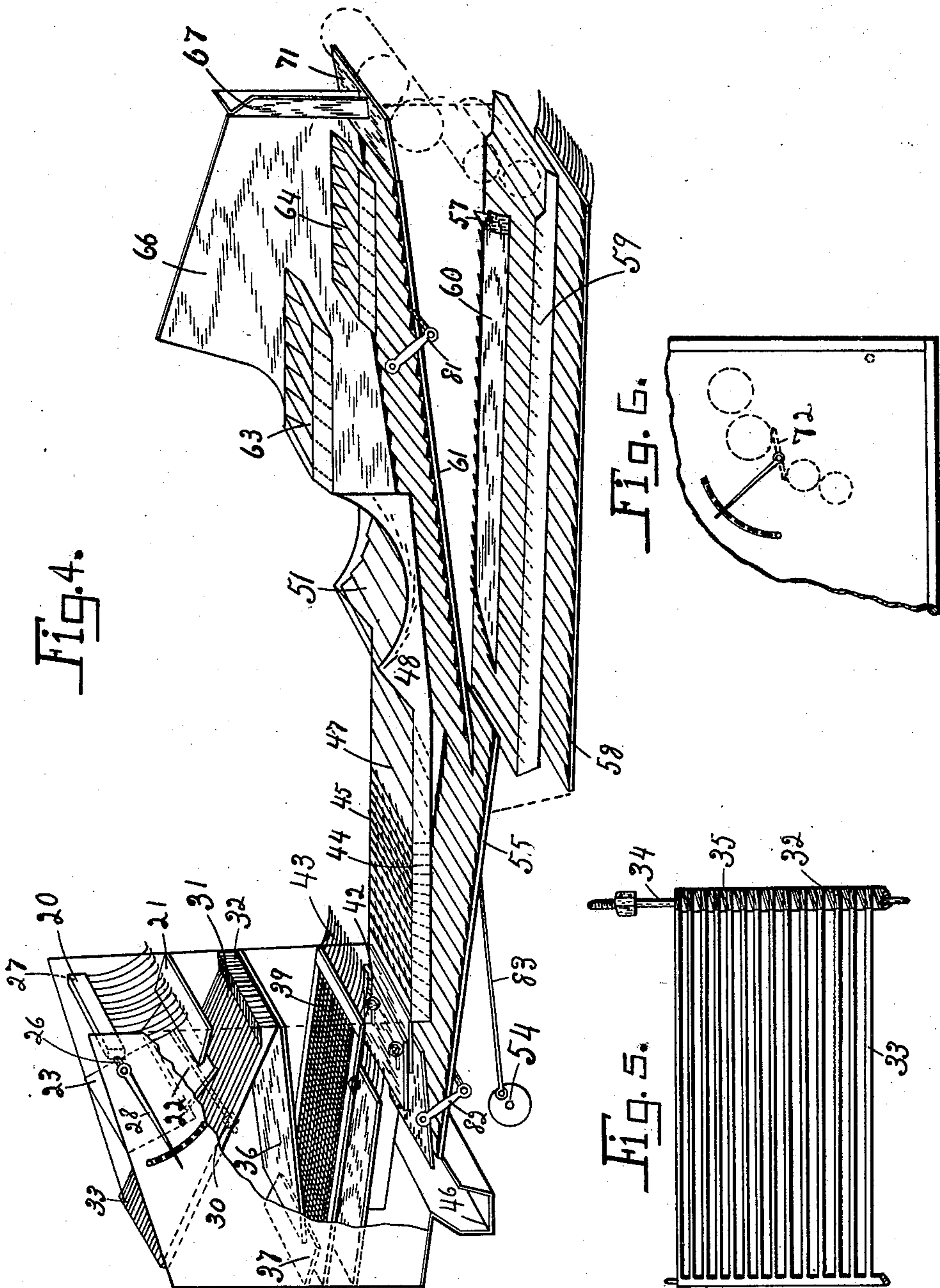
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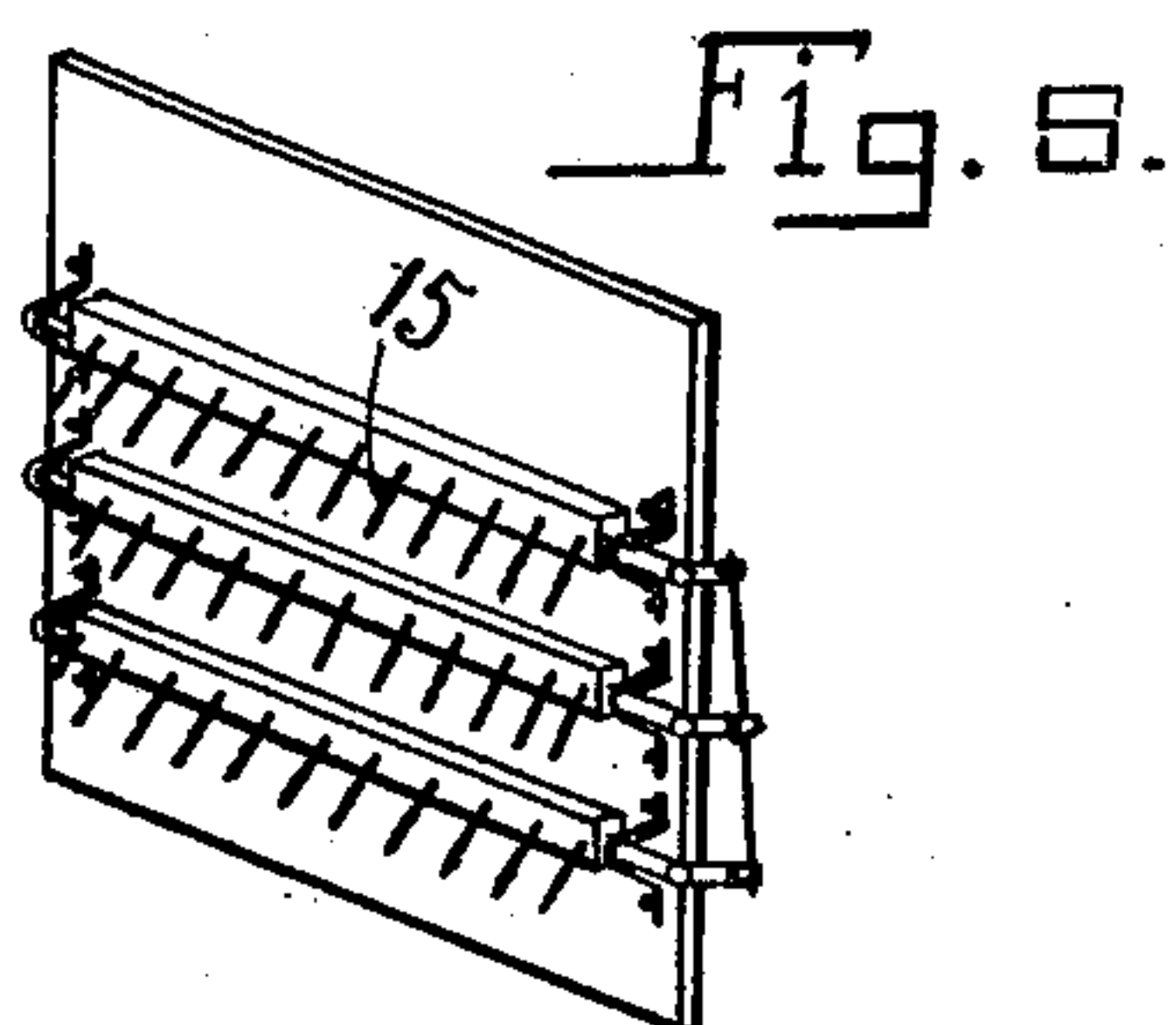
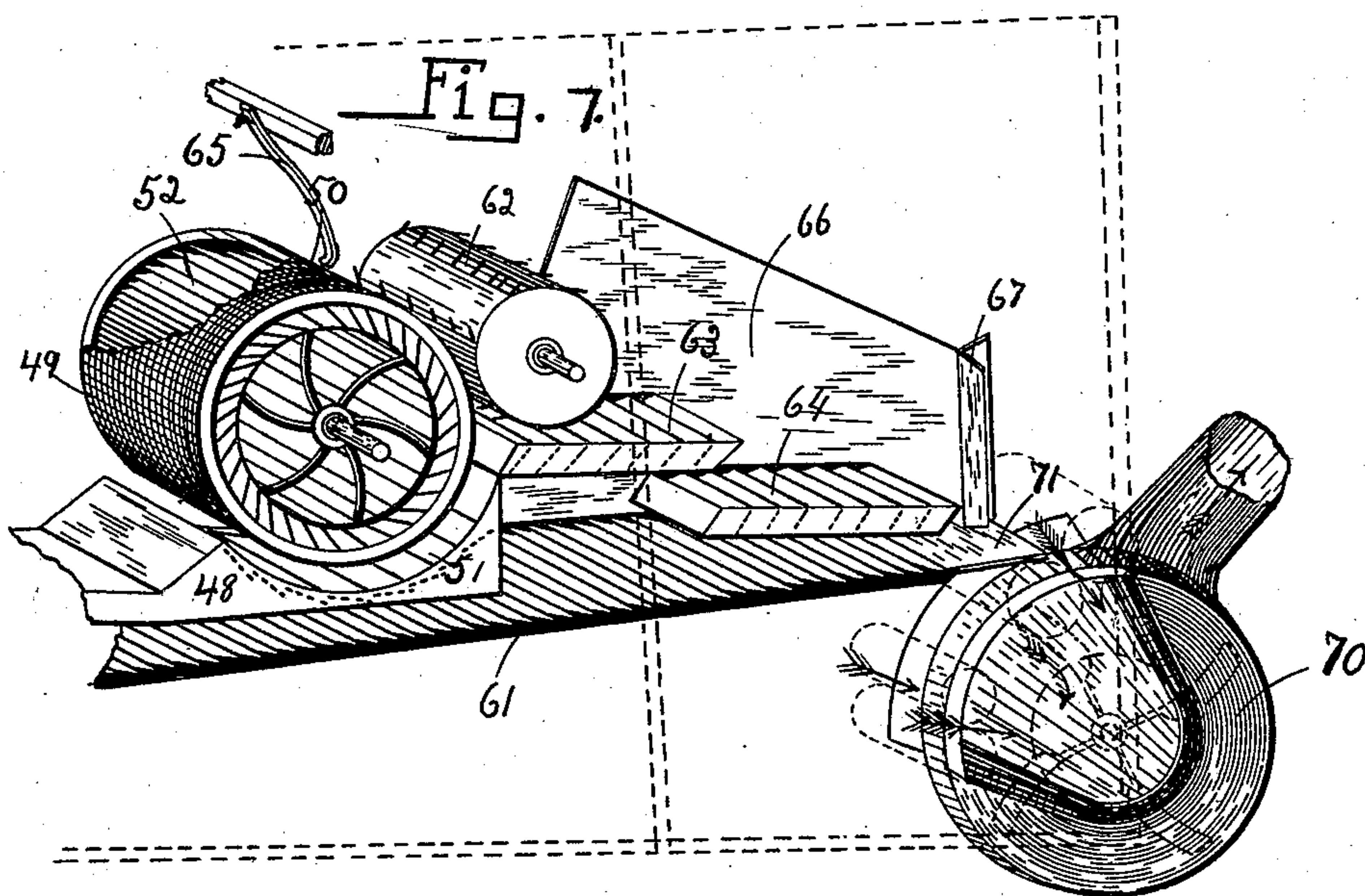
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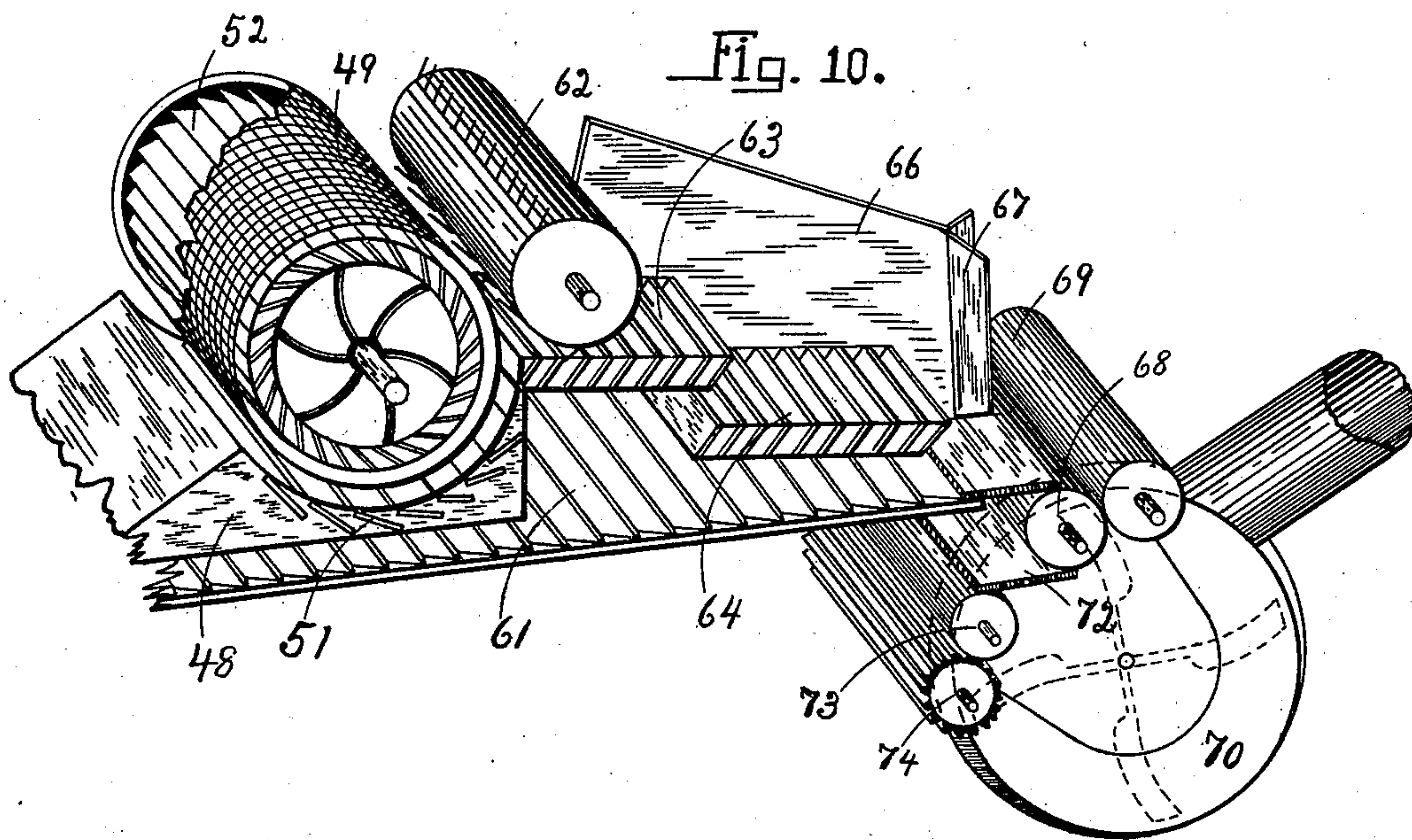
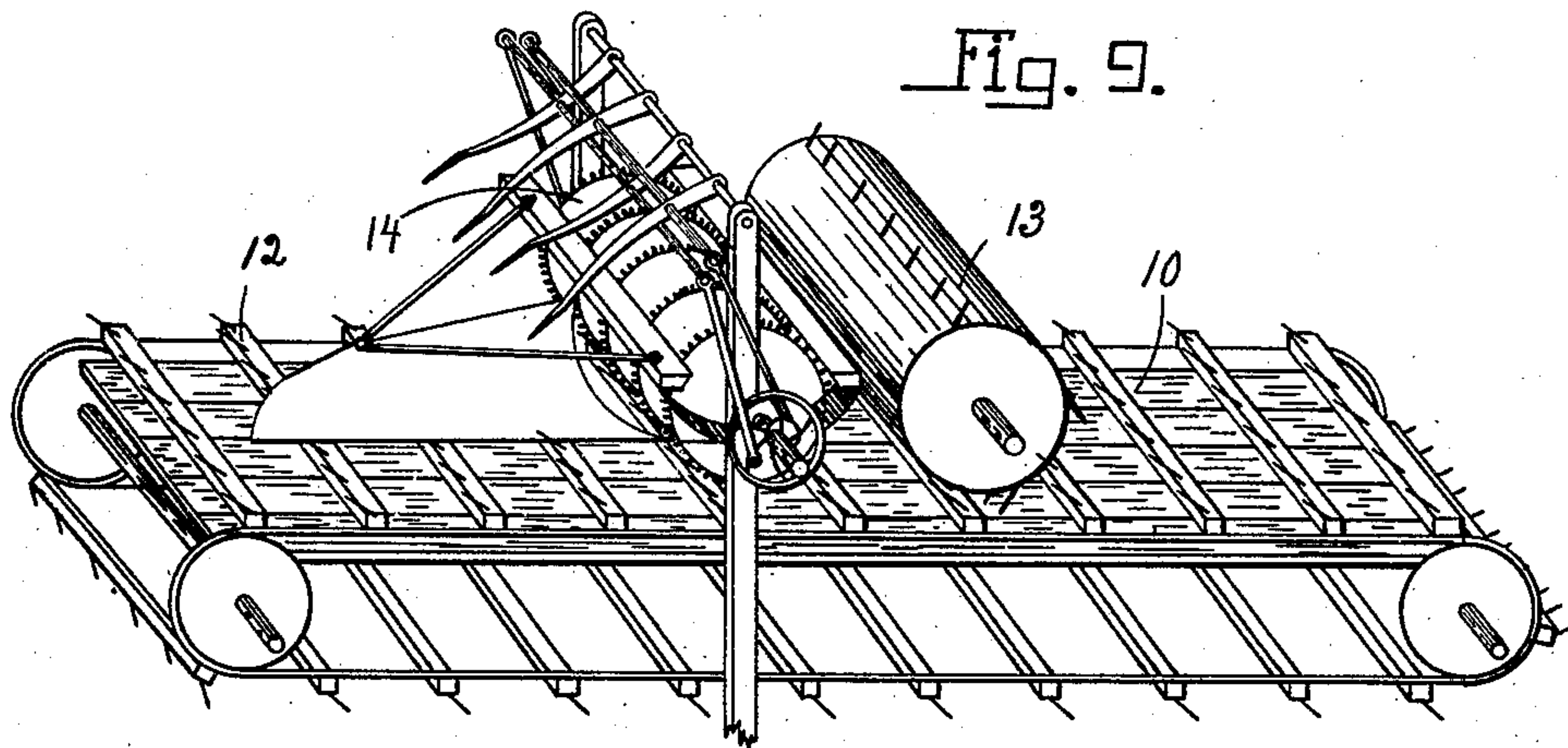
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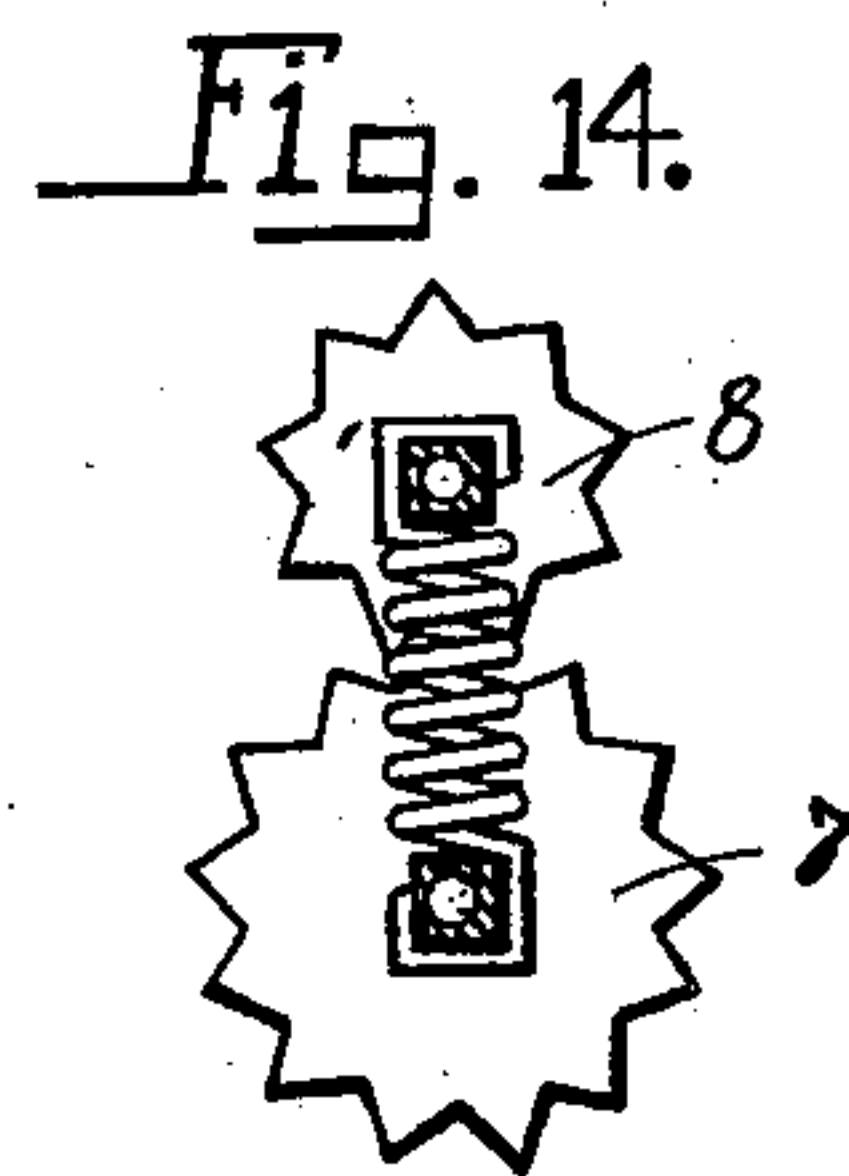
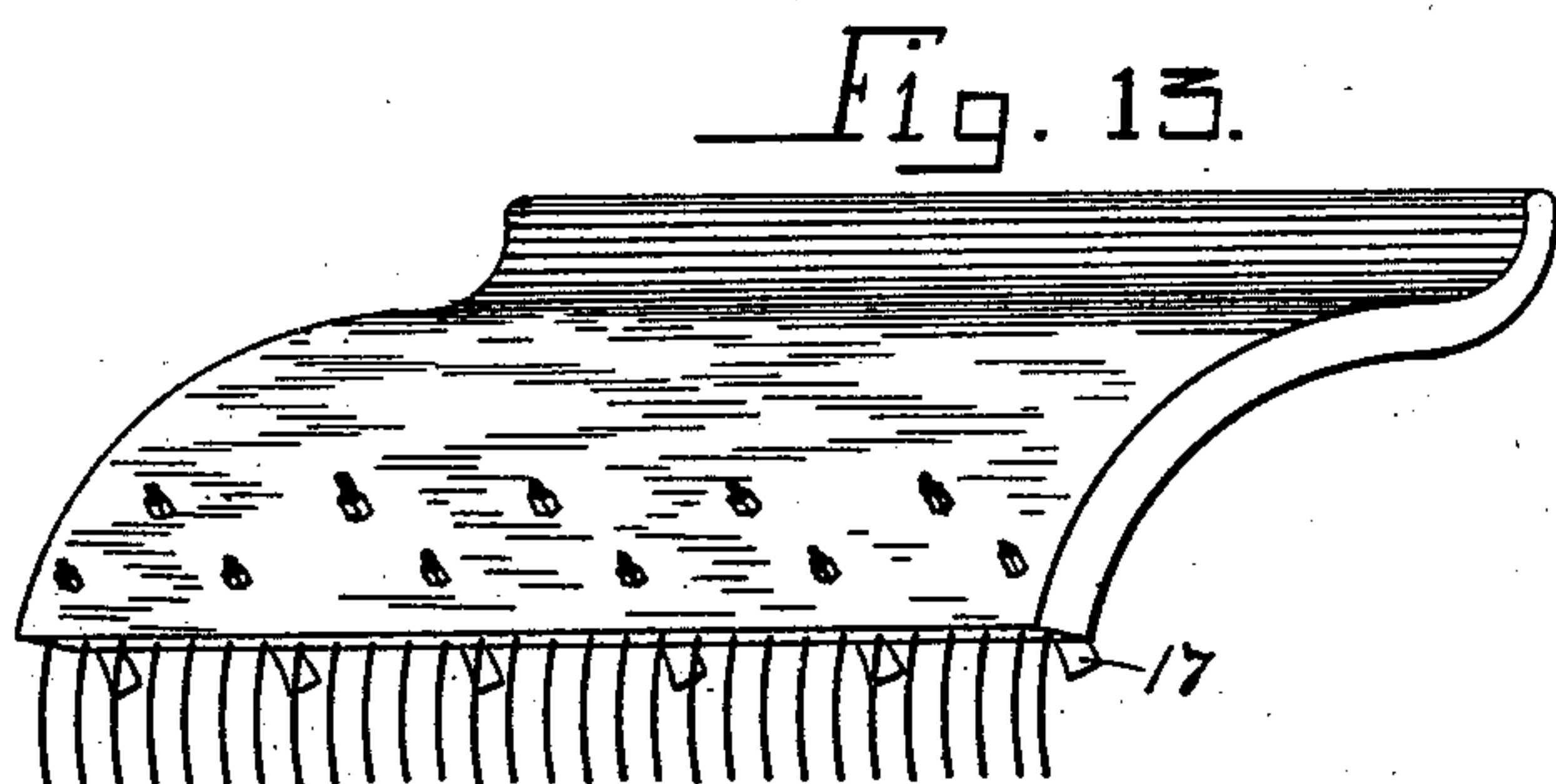
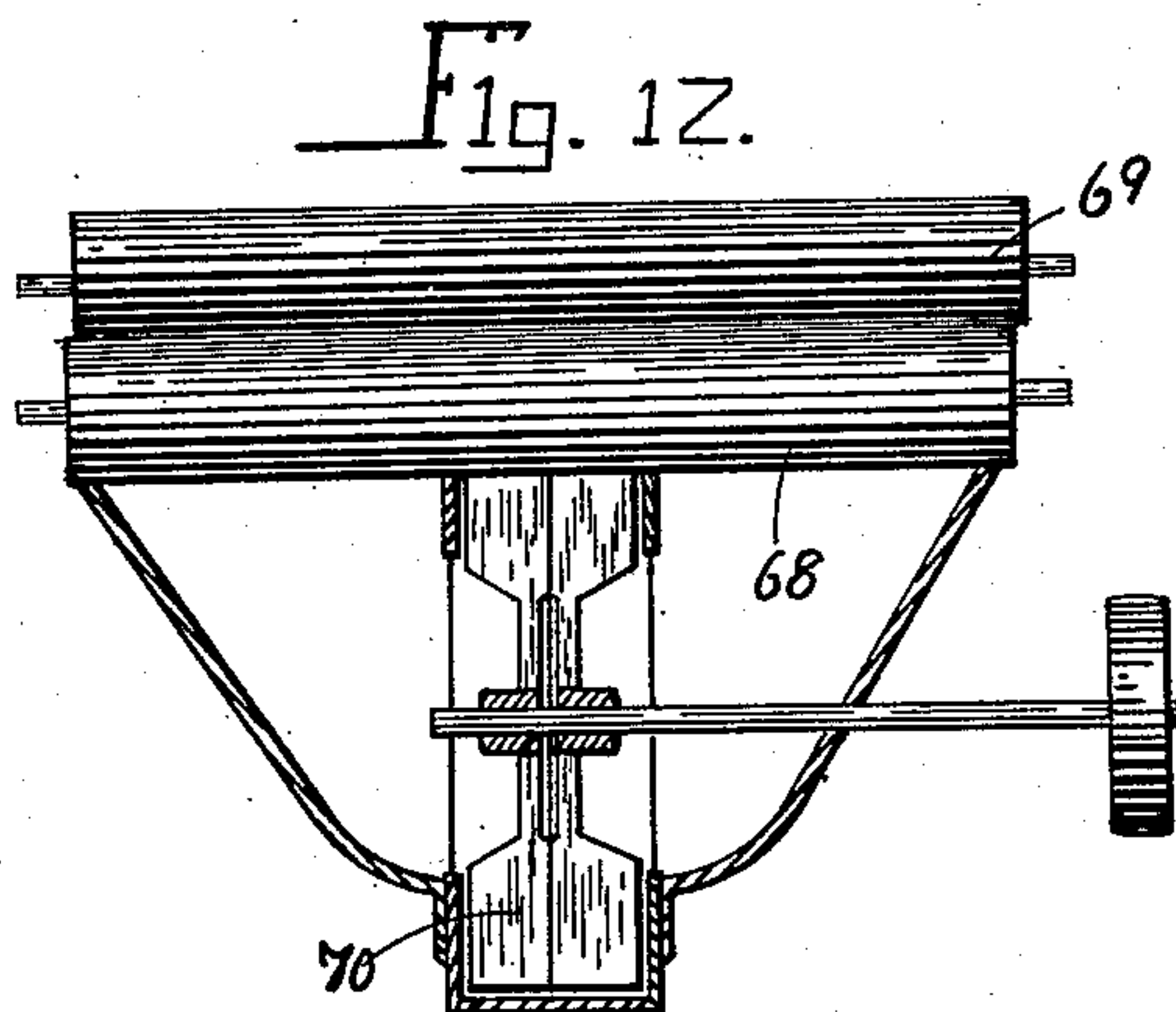
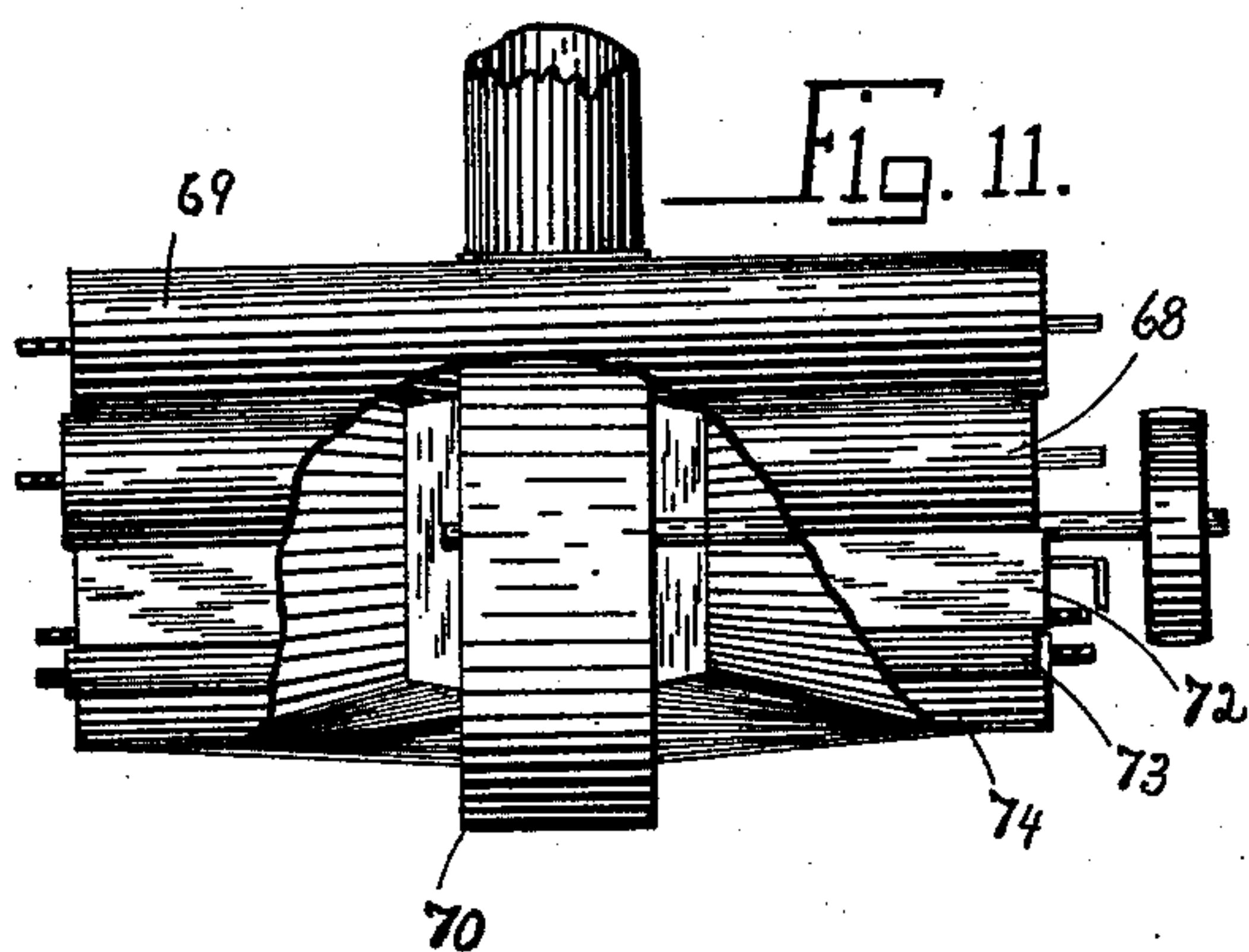
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# UNITED STATES PATENT OFFICE.

DAVID N. LONG, OF LA SALLE, NEW YORK.

## THRESHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 580,980, dated April 20, 1897.

Application filed December 16, 1895. Serial No. 572,296. (No model.)

*To all whom it may concern:*

Be it known that I, DAVID N. LONG, of La Salle, Niagara county, State of New York, have invented new and useful Improvements in Threshing Machinery, of which the following is a specification.

This invention relates to improvements in threshing-machines which render the machine more simple and effective in threshing and separating grain, as well as being less expensive to build and requiring less power and labor to operate it.

In the accompanying drawings, consisting of five sheets, Figure 1 is a longitudinal sectional elevation of the machine on dotted line A A of Fig. 2. Fig. 2 is a top plan view having the cover and the deflector 9 removed. Fig. 3 is a side view of the machine, showing how the different parts are driven. Fig. 4 is a side rear view of the entire shaking mechanism, consisting of the deflectors 21 22 23, comb 20, slatted screen 31, grain-board 36, grain-board 37, screen 39, comb 43, grain-spout 46, adjustable grain-bottom 42, the shaker-grates 44, located directly under the cylinder 1, showing the teeth 45, the series of grates 47, extending toward the screen-roller 50, the raised portion 48, the series of grates 51 below the screen-roller 50, the division-board 66, the flaring portion 67, the grates 63 and 64, the dividing-board 60 and flaring portion 57, the grain-bottoms 61, 55, and 58, the chaffer 59, and the sliding board 71, with the arms 81 and 82, on which the shaking mechanism swings, and the crank-shaft 54. Fig. 5 is a top plan view of the slatted screen 31. Fig. 6 shows the adjustment of the blast-board 72. Fig. 7 shows the screen-roller 50 with the screen partly removed to show the slatted drum inside, the picker 62, shaker-slats 63 and 64, dividing-board 66, with flaring rear portion 67, compression-rollers 68 and 69, adjustable blast-board 72, compression-rollers 73 and 74, and the blast-fan 70, showing its tight case. Fig. 8 is a front view of the adjustable rakes 15. Fig. 9 shows a top side view of the feeder, showing carrier 10, roller 13, and disks 14. Fig. 10 shows a top side view of screen-roller 50, picker 62, dividing-board 66, flaring portion 67, shaker-slats 63 and 64, grain-bottom 61, rollers 68, 69, 73, and 74, blast-board 72, and stacker-fan 70. Fig. 11 is

a top view of stacker-fan 70 with the outside casing, compression-rollers 68, 69, 73, and 74, and adjustable blast-board 72. Fig. 12 is an end sectional view of stacker-fan 70 with outside casing and compression-rollers 68 and 69. Fig. 13 is a front view of concave. Fig. 14 shows the compression-rollers 7 and 8 and construction of the compression-springs.

Like numerals refer to like parts in the several figures.

The cylinder 1 is constructed of a single tubular section 2, through which holes are made to secure the teeth 3, leaving the outside in the form of a solid cylinder with no holes or openings to catch the grain or into which it can bound and thereby be carried past the separating devices.

The heads of the cylinder 1 are made with openings, so the nuts can be tightened from either end of the cylinder. Above the horizontal line of the shaft of the cylinder 1 and back of its perpendicular line are located two rollers 7 and 8, which revolve toward each other in opposite directions and which carry the grain to the cylinder 1. The speed of the circumference of the rollers 7 and 8, respectively, is the same, but said speed is only about one-tenth to one-fifteenth of the speed of the cylinder-teeth 3. The rollers 7 and 8 are provided with corrugations and depressions which mesh into each other and are held toward each other with an adjustable yielding force by means of the springs 5 and 6. By this arrangement the said rollers 7 and 8 feed the grain into the cylinder 1 in a positive and uniform manner, and by means of their corrugations and compressions they securely hold the straw of the grain back from the cylinder at their own speed until the entire length of the straw has passed through between them, by which means an average of over one hundred cylinder-teeth strike each head of grain before the straw is relieved from the slow motion of the feed-rollers. It will be seen that this arrangement is very effective in causing the cylinder-teeth (which have a velocity of about a mile in a minute) to beat the grain from the heads without the use of concave-teeth, resulting in clean threshing, less breakage of the straw, and the saving of power.

If it was not for the occasional breaking off



of a head of grain from the straw, clean threshing could be done by this mechanism without the use of any concave-teeth. Another effect secured by this means is the spreading, combing, and straightening of the straw directly around the cylinder before it reaches the concave teeth, which is very effective in increasing the threshing capacity of the machine, obviating the slugging of the cylinder, promoting clean threshing, and also in allowing the straw to pass the concave-teeth with little breakage. Above the roller 7, in a slanting position, is located a deflector 9 to cause the grain to come in contact with the rollers 7 and 8.

The grain is delivered to the rollers 7 and 8 by the carrier 10, which runs within about three inches from the forward side of the roller 8, leaving the opening 11 between the carrier 10 and the roller 8. By this arrangement the rollers 7 and 8 draw the straw and grain across the opening 11, while any heavy material, like stone or iron, falls through the said opening 11 and thus does not come in contact with the cylinder-teeth and cause breakage, damage, and detention of operations, which are frequently of a serious and expensive nature.

The slats 12 of carrier 10 are provided with backward-slanting teeth, which causes the rollers 7 and 8 to have a combing and straightening action on the straw as the said rollers 7 and 8 draw it through said backward-slanting teeth. They also have the effect of holding the bottom of each bundle of grain forward while the picker 13, which moves at a much faster speed, thoroughly loosens up, throws backward, and spreads out the upper portion of the bundle. By this means each bundle, no matter how compact, is thoroughly loosened up and spread out sidewise, and also spread out lengthwise from four to six feet by the combined action of the rapid motion of the picker 13 and the backward-slanting teeth of the carrier 10. The rollers 7 and 8 in their turn further spread each bundle from two to six feet more than the picker 13, and the combined action of the cylinder-teeth 3 and the said rollers 7 and 8 spread it ten to fifteen times the length it has attained when it reaches said rollers 7 and 8, so by the time it reaches the concave-teeth, at which point the capacity of the machine is always determined, each bundle is spread out several feet in width and to a distance of fifty feet or more in length. In front of the picker 13 and over the carrier 10 is located a band-cutting device consisting of a series of circular disks 14.

The deflector 9 is provided with adjustable tilting teeth or rakes 15, which can be set at a greater or less angle to temporarily hold back a portion of the grain from the rollers 7 and 8 in case too much is thrown back at one time by the picker 13.

Over the threshing-cylinder 1 is located a concave 16, as shown in Fig. 1. Immediately forward from the concave-teeth 17 is secured

a comb 18, extending across the machine and projecting downward, consisting of flat iron strips which have their lower ends open. They hold the straw in contact with the cylinder-teeth 3 while a portion of the grain is thrown out between them. In front of the comb 18 are located the adjustable combs 19 and 20, which are constructed similar to the comb 18, only they have their lower ends slightly hooked toward the cylinder. They are located just far enough from the cylinder to allow the straw to be thrown entirely free from the cylinder-teeth and to come to a full stop for an instant, when the result of the gravity of the straw, the shape of the combs, and the slight effect of the cylinder-teeth cause it to be again carried into contact with the cylinder-teeth 3, which quickly removes it and again throws it upon the deflectors 21, 22, and 23, while the separated grain is thrown through the combs 18, 19, and 20 by the centrifugal force of the cylinder against the deflector 24 and upon the deflectors 22 and 23. The hooked shape of the lower ends of the combs 19 and 20 prevent the straw from leaving them too quickly. They are swung on pivots 26 and 27, so that their lower ends can be placed and held at any desired distance from the cylinder 1 and there held by means of the levers 28 and 29. The comb 20 is attached to the shaker 25, from which it receives a shaking motion.

The deflectors 21, 22, and 23 are preferably secured to the shaker 25 and can be set at different angles to suit different kinds of work. They may be held securely between the sides of said shaker-bottom 25 by a clamping-bolt 30, running from one side of the shaker to the other, or by any other well-known means.

The deflector 24 may be secured to the sides of the machine. It throws all the grain which passes over the deflector 23 onto the slatted screen 31. The slatted screen 31 is composed of strips of iron secured to the base 32, as shown in Fig. 5, and extending nearly to the cylinder-teeth 3 when the shaker 25, to which it is attached, is at the backward end of its swing. The slats 33 of the screen 31 are far enough apart to allow the grain to pass between them, but too close to allow the coarse straw to do so, which is carried by its shaking action to the lower end of the screen 31, where the cylinder-teeth remove it. The lower ends of the slats 33 are held together and secured to the sides of the shaker 25 by means of a bolt 34 passing through them and also through the pieces 35, placed between them, and which hold them apart at the proper distance while the bolt 34 holds the slats 33 against them. The pieces 35 are shaped, as shown in Fig. 4, so as to deflect the grain which strikes them toward the front of the machine. The lower ends of the slats 33 also project upward for the purpose of deflecting the grain forward and also for the purpose of again stopping the motion of the straw as it is thrown upon them by the force of the cylinder-teeth 3.



The grain which passes through the slatted screen 31 falls upon the grain-bottom 36, which deposits it upon the grain-bottom 37, which in turn deposits it over and through the comb 38 upon the upper and forward end of the screen 39, which is also attached to the shaker-bolt 25, from which it receives a shaking motion. A portion of the blast from the fan 40 strikes the grain as it falls from the grain-board 37 and throws the lighter grain toward the threshing-cylinder, while the heavier grain falls upon the screen 39. The back side of the grain-board 37 is provided with the comb 38 to assist in carrying the lighter material backward. The grain again passes through a blast from the fan 40 as it falls from the upper screen 39 to the lower grain-board 41. The adjustable board 42 can be moved forward or backward to catch more or less light grain and refuse matter which is carried rearward by the blast from the fan 40.

After the straw is caught by the cylinder-teeth 3 from the lower end of the slatted screen 31 it is again thrown away from the cylinder-teeth 3 onto the comb 43, which has open ends extending rearwardly and is secured to the rear side of the screen 39. From thence the straw passes to the series of shaker-grates 44, which are located directly under the threshing-cylinder 1 and are secured to the shaker-bolt 25, from which they receive a shaking motion, which causes the straw to move rearwardly over them. The series of shaker-grates 44 extend across the machine and are set at different angles, about as shown in Fig. 1, so that the grain striking them from the tangent of the cylinder-teeth cannot rebound to the cylinder or backward into the machine, but must bound downward and forward through between them onto the grain-bottom 55 underneath.

As the straw is thrown onto the grates 44 by the cylinder-teeth 3 it is moved rearward by the action of the shaker 25 and is again caught by the cylinder-teeth 3 and thrown against the shaker-grates 47, the raised portion 48, and the revolving screen 50, which revolves in an opposite direction from the cylinder 1 and carries the straw upward and into the cylinder-teeth, which again catch it and throw it against the corrugated roller 7, which revolves in the same direction as the cylinder, and consequently carries the straw away from the cylinder and thus prevents the straw from wrapping around the cylinder. In the upper sides of the shaker-grates 44 may be secured rearwardly-projecting teeth 45 to somewhat retard the straw from being thrown rearwardly by the cylinder-teeth 3.

The screen-cylinder 50 is composed of the screen 49, secured in a circular form to its heads. Inside of this screen may be placed a device for preventing the grain from rebounding into the cylinder 1 or from flying or bounding through the said screen-cylinder 50 and into the straw on its back side. This device

may be constructed in several ways. The one I prefer is made of the slats or flat pieces of iron 52, running lengthwise of the said screen and secured to its heads at about the angle from its shaft shown in Fig. 1, by which arrangement the flying grain from the threshing-cylinder 1 is deflected by the slats 52 into the center of the screen-cylinder 50, at such an angle that it cannot be thrown out on the opposite side, but will be again deflected to its lower portion by striking the inside surfaces of the slats on the opposite side of said cylinder 50 and will pass downward and out of said cylinder 50 by its gravity through between the slats 52.

The shaker-slats 47 are set at about the angle shown in Fig. 4, so as to deflect all flying grain from the cylinder-teeth 3 into the screen-roller 50. The raised portion 48 also has the same effect, while its rear side and the shaker-slats 51 cause the straw which may get between them and the screen 50 to be carried forward and around the forward side of the screen 50.

The picker 62 is located back of the screen-roller 50 and revolves in an opposite direction and at a higher speed than the screen-roller 50 and picks the straw from it and throws it upon the shaker-slats 63, from whence it falls upon the shaker-slats 64, which carry it to the compression-rollers 68 and 69, which in turn carry it to the stacker-fan 70 without allowing much air to enter said stacker-fan 70 with it, by which means the air is forced to enter the stacker-fan 70 through and below the chaffer 59, and thus assist in separating the refuse matter from the grain and the tailings.

Over the screen-roller 50 and directly in line with the partition 66 is located a dividing-hook 65, which is held stationary in about the position shown in Fig. 1, so that it makes a division of the straw on the roller 50, which division is afterward maintained by the partition 66. The partition 66 runs as closely as possible to the picker 62 and the screen-roller 50, and thereby divides the straw in two parts, which are further separated by the flaring portion attached to the rear end of the partition 66, so it can enter both sides of the stacker-fan 70, which is located back and below the feed-rollers 68 and 69. A narrow piece 71 extends from the back part of the grain-bottom 61 upon and over the roller 68 to exclude the air from above the grain-bottom 61 from entering the stacker-fan 70 when the shaker 25 is moving back and forth. The rollers 68 and 69 are compressed toward each other and revolve toward each other to feed the straw into the stacker-fan 70, while they at the same time prevent the air from passing into said fan 70 with the straw.

The grain which passes through the shaker-slats 51, 63, and 64 falls upon the grain-bottom 61 and is carried forward and falls upon the grain-bottom 55, between which and the adjustable blast-board 56 a blast from the fan



40 passes. The board 56 is secured directly to the framework of the machine and has no shaking motion, but its rear end can be adjusted up or down to throw more or less air over or under the chaffer 59, as may be desired.

As the grain and chaff is thrown from the grain-bottom 55 to the chaffer 59 the blast passes through it, as it also does as it passes over the openings in the chaffer 59, which carries the chaff and short straw to the rollers 73 and 74, which carry the chaff and straw to the stacker-fan 70 without allowing much air to enter, except over the roller 73, where the adjustable blast-board 72 excludes the air as much as is desired from entering the stacker-fan 70 from between the roller 68 and the roller 73, and thus forcing more or less of it to enter the stacker-fan 70 from between the tailings-receptacle 76 and the comb on the grain-bottom 58, and thus clean the refuse from the tailings. The grain and tailings fall to the grain-bottom 58 from the chaffer 59, between which and the stationary blast-board 53 a portion of the blast from the fan 40 may pass and assist to remove the light material from the tailings as it passes over the comb 75, which is attached to the back end of the grain-bottom 58. The blast assists the roller 74, which has small projections or depressions on its surface, and the roller 73 above it, to carry the lighter material into the stacker-fan 70, while the tailings and the grain fall into the tailings-receptacle 76 and are elevated by the tailings-elevator 77. In case it is desired to save the chaff separate from the straw it is accomplished as follows: The deflecting-board 79, when in the position in Fig. 1, will carry the straw on its upper back side from between the rollers 68 and 69 into the stacker-fan 70 through the openings surrounding its shaft in the side of its case, while the chaff coming in through between the rollers 73 and 74 on the under and forward side of the board 79 will be deflected to the floor beneath the fan 70. When the board 79 is removed and the board 80 (shown in dotted lines in Fig. 1) is placed in position, all the chaff and the straw will be carried into the stacker-fan 70, which consists, preferably, of what is known as a "double-exhaust" fan, having an inlet-opening surrounding its shaft on each side and a single outlet located centrally with the fan-blades.

The shaker-bottom 25 is swung on the arms 81 and 82 and is moved back and forth by the pitman-arm 83, which is operated by the crank-shaft 54, which in turn is operated by the sprocket-chain driven by the shaft of the picker 62, as shown in Fig. 3. The cleaner-fan 40 is driven directly from the cylinder-shaft by the belt 85, as is also the picker 62 by the belt 84 and the stacker-fan 70 by the belt 86. The screen-roller 50, the crank-shaft 54 for the shaker-bottom 25, the band-cutting disks 14, the picker 13, the carrier 10, and the compression-rollers 7 and 8 are driven by the

sprocket-chain 87, which is driven by the shaft of the picker 62, which also drives the sprocket-chain 88, which in turn drives the rollers 68 and 69, the rollers 73 and 74, and the tailings-conveyer 76. The tailings-elevator is driven by a sprocket-chain from the back shaft of the carrier 10, as shown in Figs. 2 and 3.

The operation of the machine is as follows: The corrugated compression-rollers 7 and 8 draw the grain from the carrier 10 and feed it to the threshing-cylinder 1 in a positive and regular manner and at the same time hold back the straw of the grain from attaining the speed of the cylinder-teeth 3 until the entire length of the straw has passed between them. As the cylinder-teeth have over ten times the velocity of the circumferences of the rollers 7 and 8 it will be seen that they have an important whipping action on the heads of the grain while the straw is still held back by the rollers 7 and 8. By this arrangement, as a rule, over one hundred cylinder-teeth strike each head of grain before the straw is released from the rollers 7 and 8, thus effectually threshing the grain from all the heads which are held back by the rollers 7 and 8 without the use of concave-teeth, with the least possible amount of power, and with scarcely breaking the straw at all.

On account of there being occasionally a head of grain which is broken off from the straw I use the concave-teeth 17, which are placed at such a distance from the rollers 7 and 8 that the butts of the straw mostly have passed through the rollers 7 and 8 before the heads reach the said concave-teeth 17. By this arrangement I secure another important advantage in the art of threshing. Each bundle is spread out from six to ten feet in a lengthwise direction as it passes through the rollers 7 and 8 and is further spread out to over ten times this length by the combined action of the rollers 7 and 8 and the more rapid motion of the cylinder-teeth 3. Each bundle is thus spread out several feet in width and from sixty to one hundred feet in length before it reaches the concave-teeth 17. As the threshing capacity of a machine is always determined by its cylinder capacity at the point of the concave-teeth, by this arrangement I increase the threshing capacity of my machine several fold over the ordinary machines. Not only is the grain spread out evenly and very thinly as it reaches the concave-teeth 17, but by the action of the cylinder-teeth 3 while being held back by the rollers 7 and 8 each straw is combed and straightened out in a direction exactly around the cylinder 1 by the time it reaches the concave-teeth 17 and its butt-end is released from the rollers 7 and 8, thus enabling it to pass the concave-teeth 17 with very little or no breakage, and it ordinarily requires much more power to break up the straw, as is usually done, than to thresh out the grain by my system, to say nothing of the well-known disadvantage of having the straw finely broken up when it comes to sep-



arating the grain from it. As the grains are knocked out of the heads they are thrown in the direction of the tangent of the cylinder by the centrifugal force of the cylinder-teeth at whatever point around the cylinder they become loosened from the heads. As the straw and grain pass the concave-teeth 17 the straw is held toward the cylinder-teeth 3 by the comb 18, while a portion of the grain is thrown through the said comb 18 onto the cleaning mechanism in front of it. As the straw and grain pass beyond the comb 18 they are thrown away from and free of the cylinder-teeth 3 by the centrifugal force of the said cylinder-teeth 3 and against the comb 19, which allows the heavier and smaller grain to fly through to the cleaner, but stops the motion of the straw for an instant only until by its gravity it descends, so as to again come in contact with the cylinder-teeth 3, which again throw it against the combs 20 with a like result. The comb 20 may have a shaking motion to assist in the straw descending promptly and rapidly, so it is quickly removed by the cylinder-teeth before it can accumulate in a bunch and hold the grain from flying through it. As the cylinder-teeth 3 remove the straw from the comb 20 they again throw it upon the slatted screen 31, in whose backward side are the deflecting-pieces 35, which cause the grain to be deflected forward, while the slanting motion and the shaking action of the screen 31 cause the straw that is thrown upon it by the cylinder, as well as that which falls upon it through the deflectors 21, 22, and 23, to move backward to the cylinder, while the heavier grain falls through the said screen 31 upon the grain-bottom 36, which carries it forward onto the grain-bottom 37, by which it is delivered over and through the comb 38 to the action of the blast from the fan 40 and upon the screen 39, by the combined action of which it passes to the grain-spout 46, and is hence removed to one side of the machine in the usual manner. As the cylinder-teeth take the straw from the lower end of the screen 31 they again throw it upon the comb 43, which throws it backward upon the shaker-slats' bottom 44, while any grain that may still remain in the straw has a tendency to fly through said comb 43 to the shaker-bottom beneath. The adjustable board 42 catches as much or as little of the light grain and heavier refuse matter as may be desired and conveys them back to the shaker-slats' bottom 44, over which they and the straw are carried by its shaking motion and the action of the cylinder-teeth 3 backward to the screen-roller 50, while the grain, if any remains in the straw, is deflected downward and forward through between the shaker-slats 44. The combined action of the screen-roller 50 and the cylinder-teeth 3 carries the straw upward and over the screen-roller 50, while if any grain remains in it it can pass into the screen-roller 50 and be deposited on the shaker-bottom beneath. The

picker 62 takes the straw from the screen-roller 50 and throws it on both sides of the division-board 66 and onto the shaker-bottoms 63 and 64, from whence it passes over the strip 71, between the rollers 68 and 69, to both sides of the double-exhaust fan 70 and out its discharge-pipe to the stack or mow. The grain, chaff, and fine straw that pass through the shaker-bars 44, 47, 51, 63, and 64 fall upon and are conveyed by the grain-bottoms 55 and 61 over and through a direct blast from the cleaner-fan 40 or the suction-blast from the stacker-fan 70, or both, as the case may be, and are delivered onto and over the chaffer 59, by means of which and the action of the blast the grain is separated and falls through the chaffer 59 to the grain-bottom 58, while the chaff and fine straw are conveyed rearward by the shaking motion of the chaffer 59 and are carried into the stacker-fan 70 by the action of the rollers 73 and 74 and are removed with the straw. The chaff that falls to the grain-bottom 58 with the grain is removed to the stacker-fan by the blast as it passes over the comb 75, while the grain and tailings pass through the comb 75 to the conveyer or receptacle 76 beneath.

If it is desired to save the chaff separate from the straw, the chaff-board 80 is removed and the board 79 put in its proper position, as shown in Fig. 1, which will throw the chaff out of the machine under the stacker-fan 70 and cause the straw to enter the stacker-fan 70.

The grain and tailings that fall into the tailings-receptacle 76 are conveyed through the conveyer 78 to the feed-rollers 7 and 8 and are again rethreshed.

The flaring portion 57, which is attached to the back end of the dividing-board 60, which is located over the chaffer 59 and practically in the longitudinal center of the machine, is adapted to separate the chaff which is on each side of the dividing-board 60 some distance apart, so each portion will enter its proper side of the double stacker-fan 70 without clogging on the fan-case.

The blast-board 53 is secured in a stationary manner to the sides of the machine and assists to carry a portion of the blast from the fan 40 through under the grain-board 58 and under the tailings-screen 75 to assist in cleaning the chaff from the tailings as the latter passes through the screen 75 and falls into the tailings-receptacle 76.

I claim as my invention—

1. In a threshing-machine, the combination of an endless carrier, a picker, two feed-rollers, and a deflector located over the back feed-roller, having a series of adjustable rakes or teeth secured to said deflector and capable of being adjusted and having their outer ends held at any desired angle to temporarily catch and hold more or less of the grain when more than the usual quantity is thrown backward against them by the said picker, substantially as set forth.



2. In combination with a threshing-cylinder a series of grate-bars or combs having a shaking motion, secured in front of the threshing-cylinder in a backward-slanting position whereby the straw is caught and again carried to the cylinder substantially as described.

3. In a threshing-machine, the combination with a threshing-cylinder, of a series of grate-bars or combs adjusted by arms and secured to the horizontal shaking mechanism of said machine, whereby the straw is caught and again carried to the cylinder, said bars having hooked ends to retard the straw, as described.

4. In a threshing-machine, a series of deflectors located in front of the threshing-cylinder and attached to a shaker from which they receive a shaking motion, having such an angle as to cause the grain to bound forward when it strikes them from the tangent of the cylinder, while their inclinations and shaking motion carry the straw backward to the cylinder, substantially as set forth.

5. In a threshing-machine, a series of cross-wise deflectors located in front of the threshing-cylinder to catch the straw as it is thrown off by the cylinder-teeth, provided with openings between them to allow the grain to fall through and having a shaking motion to again carry the straw rearwardly in contact with the cylinder, substantially as set forth.

6. In a threshing-machine, a screen composed of bars running lengthwise of the machine and located in front of the threshing-cylinder in combination with a series of deflectors located above said screen, substantially as set forth.

7. In a threshing-machine, a screen 31 located in front of the threshing-cylinder, composed of bars running lengthwise, and secured to a shaker from which they receive a shaking motion whereby the straw is returned to the cylinder and having forward ends extending close to the cylinder and rigidly secured together, substantially as set forth.

8. In a threshing-machine, a screen 31 composed of bars running lengthwise of the machine and placed at an angle in front of the threshing-cylinder, said bars having their lower ends held apart at the proper distance by pieces secured between them, the upper surfaces of said pieces having forward slanting inclinations to cause the grain striking them from the cylinder to bound forward, substantially as set forth.

9. In a threshing-machine, a screen 31 secured in front of the threshing-cylinder, composed of bars running lengthwise of the machine, having the upper surface of their lower ends extending upward so as to deflect the grain striking them in a forward direction, substantially as set forth.

10. In a thresher, a grain-screen located in front of the threshing-cylinder having a downward and backward inclination, in combination with a fan located in front thereof, the

blast from which passes over, under and up through said screen and thus separates the straw and chaff from the grain and returns the said straw and chaff to the threshing-cylinder, as described.

11. In a thresher, a shaker-bottom extending immediately below and close to the threshing-cylinder in combination with a comb secured in front of the threshing-cylinder, so that the straw after being stopped by the said screen or comb 27<sup>a</sup> is again caught by the cylinder-teeth and is again thrown away from said cylinder upon said shaker-bottom, as described.

12. In a threshing-machine, a threshing-cylinder, two compression-rollers above and back of its center and a concave provided with teeth above and in front of its center, in combination with one or more combs projecting downward in front of said cylinder and a series of deflectors located below said combs, said combs having their lower ends hooked toward the cylinder, substantially as set forth.

13. In a threshing-machine, a threshing-cylinder in combination with a downwardly projecting comb located in front thereof, a series of deflectors in front and below said comb and a screen located under said deflectors, as described.

14. In a threshing-machine, a threshing-cylinder in combination with downwardly-projecting combs in front thereof, a slatted screen beneath said combs and a shaker-bottom immediately beneath said cylinder, substantially as set forth.

15. In a threshing-machine, a threshing-cylinder in combination with downwardly-projecting combs in front thereof, slatted screen immediately beneath said cylinder, and a backwardly-projecting comb extending over said slatted screen, and below and in front of said cylinder, substantially as set forth.

16. In a threshing-machine, a threshing-cylinder in combination with downwardly-projecting combs in front thereof, a slatted screen with a forwardly-inclined surface at its lower end beneath said combs, and a shaker-bottom located immediately under said cylinder, substantially as set forth.

17. In a threshing-machine, a threshing-cylinder in combination with two compression-rollers located back of and above said cylinder, concave-teeth located in front of and above its center, downwardly-projecting combs in front of said concave, a series of deflectors beneath said combs, a slatted screen beneath said deflectors and a shaker-bottom immediately beneath said cylinder, substantially as set forth.

18. In a threshing-machine, a threshing-cylinder in combination with two compression-rollers located back of and above its center, concave-teeth located in front of and above its center, downwardly-projecting combs in front of said concaves, a series of deflectors beneath said combs, a slatted screen



beneath said deflectors, a shaker-bottom immediately beneath said cylinder, and a screen-roller located back of said cylinder, as described.

19. In a threshing-machine, a threshing-cylinder in combination with two compression-rollers located back of and above its center, concave-teeth located in front and above its center, downwardly-projecting combs in front of said concaves, a series of deflectors beneath said combs, a slatted screen beneath the deflectors, a shaker-bottom immediately beneath said cylinder, a series of backwardly-extending bars with open ends above said shaker-bottom, and upwardly-projecting teeth in said shaker-bottom immediately beneath said cylinder, as described.

20. In a threshing-machine, a threshing-cylinder in combination with two compression-rollers located back of and above its center, concave-teeth located in front of and above its center, downwardly-projecting combs in front of said concaves, a series of deflectors beneath said combs, a slatted screen beneath the deflectors, a series of backwardly-extending slats with open ends above a shaker-bottom, upwardly-projecting teeth in said shaker-bottom, immediately beneath said cylinder, and a screen-roller located back of said cylinder, as described.

21. In a threshing-machine, a threshing-cylinder in combination with two compression-rollers located back of and above its center, concave-teeth located in front and above its center, downwardly-projecting combs in front of said concaves, a series of deflectors beneath said combs, a slatted screen beneath the deflectors, a shaker-bottom immediately beneath said cylinder, a series of backwardly-extending slats with open ends above said shaker-bottom, and a screen-roller located immediately back of said cylinder, having a slatted drum inside of said screen, substantially as set forth.

22. In a threshing-machine, a threshing-cylinder in combination with a series of downwardly-projecting combs located in front thereof, a series of deflectors in front and below said combs, a shaker-bottom located under said threshing-cylinder, and a series of bars with open ends extending upward, located above said shaker-bottom, substantially as set forth.

23. In a threshing-machine, a threshing-cylinder in combination with two compression-rollers located back of and above the center thereof, a series of combs in front thereof, and a shaker-bottom having backwardly-inclined teeth located immediately under said cylinder, substantially as set forth.

24. In a threshing-machine, a threshing-cylinder, in combination with two compression-rollers located back of and above its center, a series of combs in front thereof, a shaker-bottom located immediately under said cylinder and a screen-roller located back thereof, substantially as set forth.

25. In combination with a threshing-cylinder, concave-teeth secured in front and above the center of the cylinder, a slatted screen secured in front of said cylinder, a downwardly-inclined grain-bottom secured beneath said slatted screen, a rearwardly and downwardly inclined grain-bottom, located back of and beneath the downwardly-inclined grain-bottom, and a grain-screen secured beneath said backwardly-inclined grain-bottom and a cleaner-fan delivering a blast, passing from the cleaner-fan passing under, over, and up through the screen, substantially as set forth.

26. In a threshing-machine, a downwardly and rearwardly inclined screen secured to a shaker in front of the threshing-cylinder, in combination with a comb secured to its rear end whose teeth or bars extend backward toward the bottom of the threshing-cylinder and over the shaker-bottom, as described.

27. In a thresher, the combination of a revoluble cylindrical screen located immediately back of the threshing-cylinder and just above a shaker-bottom which extends past it, having an opposite motion to that of the cylinder and being adapted to carry the straw upward and into contact with the cylinder-teeth and allowing the grain to pass into it as it is thrown off by the cylinder, substantially as set forth.

28. In a thresher, a screen roller or cylinder located immediately back of the threshing-cylinder, having a slatted drum or its equivalent inside of the screen, adapted to prevent the grain which passes into the cylinder from being thrown through the screen on its rear side, but permitting its escape through the bottom, substantially as set forth.

29. In a thresher, the combination of a screen-roller located back of the threshing-cylinder and so closely to the lower one of two feed-rollers located over and back of said cylinder, as to just allow the straw to pass between said screen-roller and said feed-roller, thereby preventing any grain from being thrown out between them by the cylinder, substantially as set forth.

30. In a thresher, a screen-roller located back of the threshing-cylinder, in combination with a slatted drum located inside of said screen, said slats having such inclinations that they will catch all the grain flying between them or striking their flat surfaces tangentially from the threshing-cylinder and deflect it into the interior of said drum, from whence it will escape through the lower portion by its own gravity, substantially as set forth.

31. In a thresher, a screen-roller located back of the threshing-cylinder having a very coarse mesh which merely excludes the straw and allows the grain to pass through in combination with a drum located inside of it, composed of slats set at such an inclination that while they catch all the grain which strikes their flat surfaces tangentially from the threshing-cylinder, said grain will rebound



inside of said drum in such a manner that it cannot pass out of it except through between the slats of said drum in its lower portion by its own gravity, substantially as set forth.

32. In a thresher, the combination of slats or bars located in a shaker-bottom under and just back of the center of the threshing-cylinder, said slats having such an inclination as to deflect the grain striking them from the tangent of said cylinder, into a screen-roller located back of said cylinder, substantially as set forth.

33. In a thresher, a shaker-bottom located directly under a screen-roller which is located back of the threshing-cylinder, in combination with slats secured to said shaker-bottom directly under said screen-roller, said slats having a forward inclination, to work any straw which may get between them and the said screen-roller, forward and between said roller and the cylinder while the loose grain falls between said slats to the grain-bottom beneath, substantially as set forth.

34. In a thresher, the combination with a screen-roller located back of the threshing-cylinder, of a raised portion secured to the shaker-bottom just in front of said screen-roller, adapted to assist in carrying the straw upward between said screen-roller and the threshing-cylinder and having its forward side of such an angle as to deflect the grain perpendicularly into said screen-roller, substantially as set forth.

35. In a thresher, the combination of a screen-roller located back of the threshing-cylinder and a picker-roller located back of the upper side of the said screen-roller, said picker having a higher speed than said screen-roller to pick the straw off from the screen-roller, substantially as set forth.

36. In a thresher, the combination of a screen-roller a picker located back of said screen-roller and shaker-slats located under and back of said picker, upon which shaker-slats the said picker throws the straw as it picks it off from the screen-roller, substantially as set forth.

37. In a thresher, a screen-roller located back of the threshing-cylinder, a picker located back of said screen-roller, in combination with a series of shaker-slats located underneath said threshing-cylinder, having a backward inclination, adapted to deflect the grain striking their broad sides from the tangent of the cylinder, forward and downward while their shaking motion works the straw backward, substantially as set forth.

38. In a thresher, the combination of a screen-roller located back of the threshing-cylinder, a picker located back of said screen-roller, a series of shaker-slats located back of said screen-cylinder in combination with another series of shaker-slats located back of them and at a lower level, so the straw has to descend abruptly from the upper one to the lower one, substantially as set forth.

39. In a thresher, the combination of a

picker located back of the threshing-cylinder and a dividing-board coming in close contact to said picker on its back and lower sides by which means the straw is divided, substantially as set forth.

40. In a thresher, the combination with a picker, of a dividing-board coming in close contact thereto, and an exhaust stacker-fan located nearly in the crosswise center of the machine, back of the dividing-board, adapted to receive the straw and the chaff from each side of said dividing-board, through two openings, one on each side of said fan, as described.

41. In a thresher, the combination of a screen-roller located back of the threshing-cylinder, a picker-roller back of said screen-roller, a dividing-board located back of said picker and an exhaust stacker-fan located back of said dividing-board, adapted to receive the straw and chaff from each side of said dividing-board, through two openings, one on each side of said fan, substantially as set forth.

42. In a threshing-machine, the combination of a screen-roller located back of the threshing-cylinder, a picker located back of the screen-roller, dividing-board located back of said picker, and two compression-rollers located back of and partly beneath said dividing-board, substantially as set forth.

43. In a threshing-machine, the combination with two compression-rollers located above and forward from the casing of a stacker-fan, located practically in the crosswise center of said machine, which draws in the straw from two openings one on each side of its center and forces it out of a single outlet, said fan being so inclosed in a straw-chamber as to cause most of the air which is forced out of said fan with the straw, to enter said fan from a chaffer and grain-cleaner located in front of said fan, and thus clean the grain by the exhaust-air drawn into said stacker-fan, as described.

44. In a threshing-machine, the combination with two compression feed-rollers located above and forward from the casing of a stacker-fan, inclosed in a straw-chamber, adapted to take the straw from said rollers through two openings, one on each side of its case, and a strip secured to the back end of a grain-bottom which is secured to a shaker located in front of said rollers, said strip working back and forth with said shaker, close to, upon and over the lower compression-roller, to exclude the air from entering said exhaust stacker-fan from above said shaker, and thereby force it to enter through the cleaner and assist in cleaning the grain, as described.

45. In a threshing-machine, a stacker-fan located in the rear end of said machine, and inclosed in a straw-chamber, and adapted to receive the straw through an opening in one or both sides of a casing which wholly surrounds the periphery of said fan, in combination with two feed compression-rollers located in front of or over the casing of said



stacker-fan, a shaker in front of said rollers, a grain-bottom inclining downwardly and forwardly secured to said shaker and a thin strip secured to the rear end of said grain-bottom, and working back and forth over the lower compression-roller, to exclude the air from entering said stacker-fan from above the rear end of said grain-bottom, substantially as set forth.

46. In a threshing-machine, the combination of a stacker-fan whose periphery is wholly inclosed in an outside case and which receives the straw through openings which surround its shaft, in one or both of its sides, two compression-rollers located at the rear end of a chaffer in front of said fan-case, said rollers being adapted to carry the chaff and fine straw from said chaffer to said fan, and an adjustable blast-board located above the upper compression-roller, whereby the air can be admitted into said stacker-fan to a greater or less degree, substantially as set forth.

47. In a threshing-machine, the combination of a stacker-fan inclosed in an outside case which wholly surrounds its periphery, and has openings surrounding its shaft to receive the straw and chaff, two compression-rollers located in front of said fan-case, two compression-rollers located above the first-mentioned rollers and an adjustable blast-board located between the upper of the two first-mentioned rollers in front of said fan-case and the lower of the two last-mentioned rollers located above the said fan-case, to allow more or less air to enter said stacker-fan with the chaff as may be desired, substantially as set forth.

48. In a threshing-machine, two compression-rollers located at the rear end of a shaker-bottom and above or forward from the outside case of a stacker-fan, which is located in the rear portion of said machine and which receives the straw through openings in its case immediately surrounding its shaft, in combination with two compression-rollers located in front of said stacker-fan, at the rear end of a chaffer for the purpose of excluding more or less of the air from entering said stacker-fan with the straw and chaff, substantially as set forth.

49. In a threshing-machine, a shaker-bottom located below and extending back of the cylinder, two compression-rollers revolving toward each other, located at the rear end of said shaker, the lower one having projections from its surface to carry the chaff and short straw upward and away from the bottom of said shaker and allow the grain to pass under it and through the said shaker-bottom, substantially as set forth.

50. In a threshing-machine, a chaffer located back of the threshing-cylinder and secured to the shaking mechanism, a roller located at its rear end, having slight corrugations from its surface to carry the chaff and straw upward and backward, allowing the grain to pass underneath, as described.

51. In a thresher, a shaker-bottom located

immediately under the threshing-cylinder, having teeth projecting upward toward the cylinder and a grain-bottom located beneath said shaker-bottom in combination with a chaffer located beneath the delivery end of said grain-bottom and extending backward, through the openings in said chaffer the cleaning-blast passes and separates the chaff from the grain, substantially as set forth.

52. In a thresher, a chaffer located beneath and back of the threshing-cylinder, in combination with a grain-bottom having its delivery end located over the forward end of said chaffer and a cleaner-fan delivering a blast, passing from a cleaner-fan located in front of the threshing-cylinder, passing between said grain-bottom and said chaffer and up through the openings in said chaffer, as described.

53. In a threshing-machine, two compression-rollers running toward each other, located back of a shaker-bottom and above the forward side of the outside case of a stacker-fan, which wholly incloses the periphery of said fan, the openings of which fan-case are located on each side of said case and are inclosed in a tight straw-chamber, said rollers being adapted to convey the straw to said stacker-fan without allowing much air to enter with it, thereby causing the fan to draw the air through the cleaner and clean the grain, substantially as set forth.

54. In a threshing-machine, two rollers running toward each other, the lower one being located immediately over the back end of a chaffer and adjacent to the forward side of the case of a stacker-fan, and having a rough or uneven surface to lift and carry the chaff to the stacker-fan without allowing much air to enter said fan which receives the straw and chaff through openings in the sides of its case around its shaft, as described.

55. In a thresher, a grain-bottom located beneath and back of the threshing-cylinder, in combination with a lengthwise dividing-board secured to its upper surface (adapted to divide the grain and chaff into two portions) running lengthwise of the machine and nearly in its center, with a flaring portion at its rear end adapted to separate the two portions of divided grain and chaff a short distance from each other, as described.

56. In a thresher, a chaffer located beneath and back of the threshing-cylinder, having a division-board secured to its upper surface with a flaring portion at its rear end, and a grain-bottom located underneath said chaffer, also having a dividing-board secured to its upper surface with a flaring portion at its rear end, in combination with a stacker-fan located back of said chaffer and grain-bottom, adapted to receive the straw from each side of said division-board, as described.

57. In a threshing-machine, the combination with a threshing-cylinder of two corrugated rollers located above and back of its center, a backward-slanting partition located over



the back roller, and a series of adjustable rakes secured to said partition, substantially as set forth.

58. In a threshing-machine, the combination  
5 of a threshing-cylinder, a roller located back  
of the threshing-cylinder, a dividing-hook lo-  
cated over said roller, and in line with a par-  
tition extending backward from said roller,  
said partition having a flaring portion at its  
10 rear end, as described.

59. In a threshing-machine, a roller located  
back of the threshing-cylinder, in combina-  
tion with a dividing-hook located over said  
roller and in line with a partition extending  
15 backward from said roller, and a stacker-fan  
located back of said partition, with an inlet  
on each side, as described.

60. In a threshing-machine, the combination  
of a screen-roller located back of the thresh-  
20 ing-cylinder, a dividing-hook located above  
it, adapted to divide the straw into two por-  
tions, a picker located back of said hook and  
a partition located back of said screen-roller  
and picker on a line with said dividing-hook,  
25 so as to maintain the division of the straw  
made by the hook, substantially as set forth.

61. In a threshing-machine, a threshing-  
cylinder composed of a tubular piece having

teeth secured thereto in such a manner as to  
present no bars or cavities whereby the grain 30  
could be carried past the separating devices,  
in combination with two feed-rollers located  
above said cylinder, adapted to feed the grain  
to said cylinder in a uniform manner, and at  
much less speed than that of said cylinder- 35  
teeth, a series of separating-combs located in  
front of said cylinder adapted to catch the  
straw and allow the grain to fly through them  
and again return the straw to the cylinder,  
and a shaker-bottom located beneath said 40  
cylinder, substantially as set forth.

62. In a threshing-machine, a stacker-fan  
located in its rear end, in combination with  
the deflecting-board 79 located in front of and  
below said fan, adapted to separate the chaff 45  
from the straw, which board can be removed  
and the board 80 put in its proper place,  
when it is desired to have both the straw and  
the chaff pass into and out of said fan to the  
stack or mow, substantially as set forth.

La Salle, New York, December 13, 1895.

DAVID N. LONG.

Witnesses:

CHRISTIAN WECKESSER,  
HENRY Y. HENNING.