No. 750,855.

PATENTED FEB. 2, 1904.

B. R. HOISINGTON.

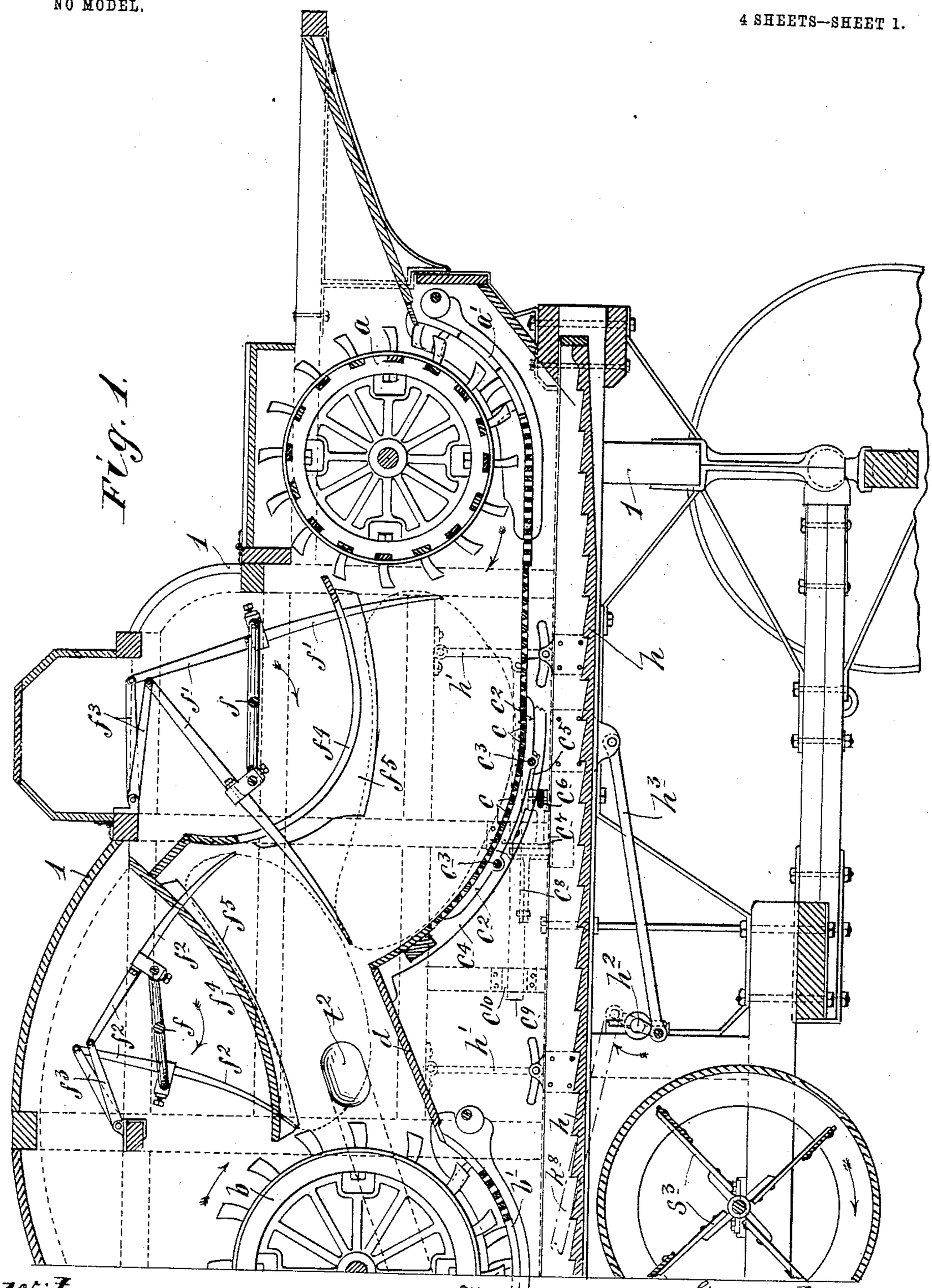
THRESHING MACHINE.

APPLICATION FILED JAN. 13, 1902.

NO MODEL.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses
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NO MODEL. 4 SHEETS—SHEET 2.

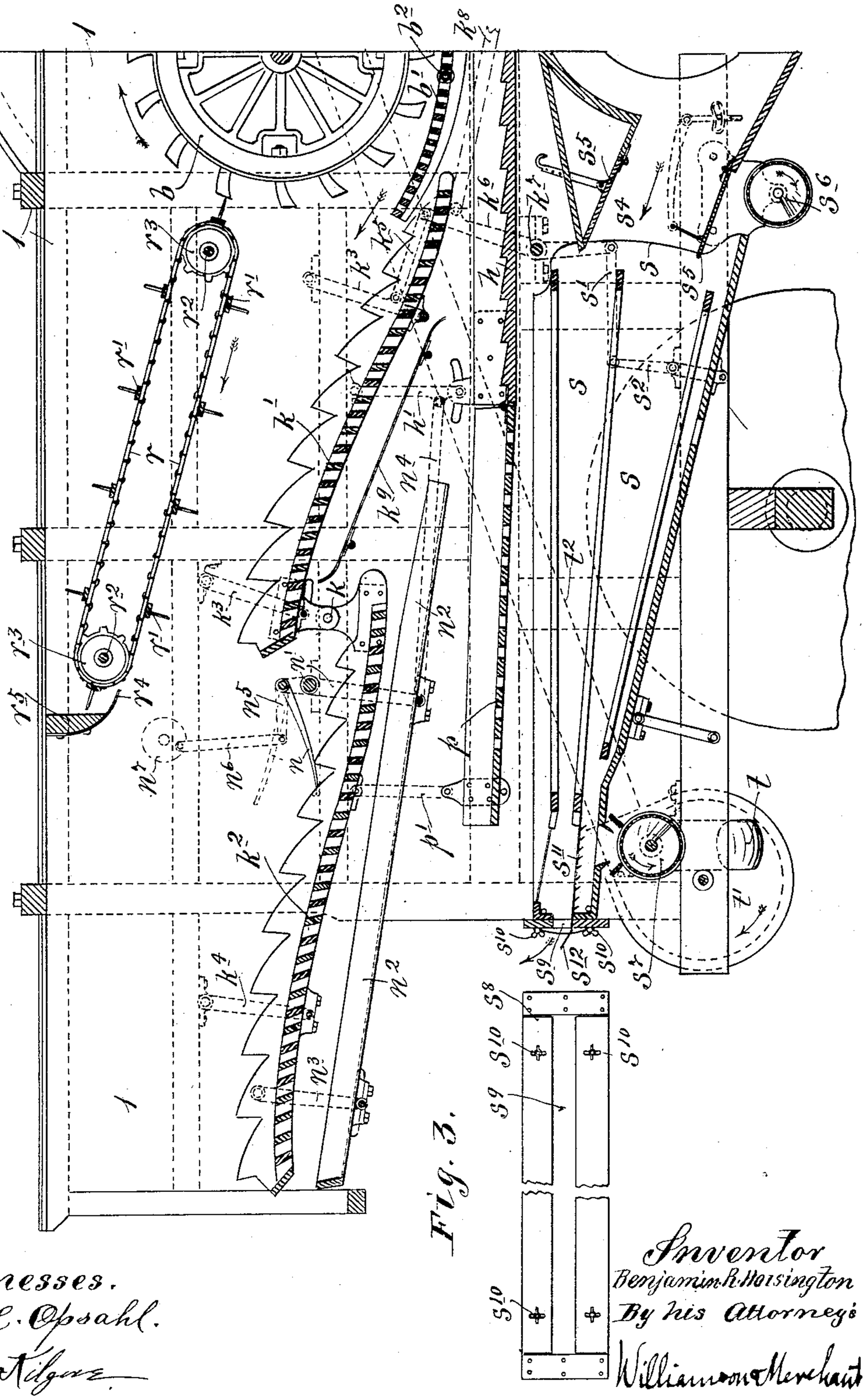

Fig. 2.

Fig. 3.

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NO MODEL. 4 SHEETS—SHEET 3.

Fig. 4.

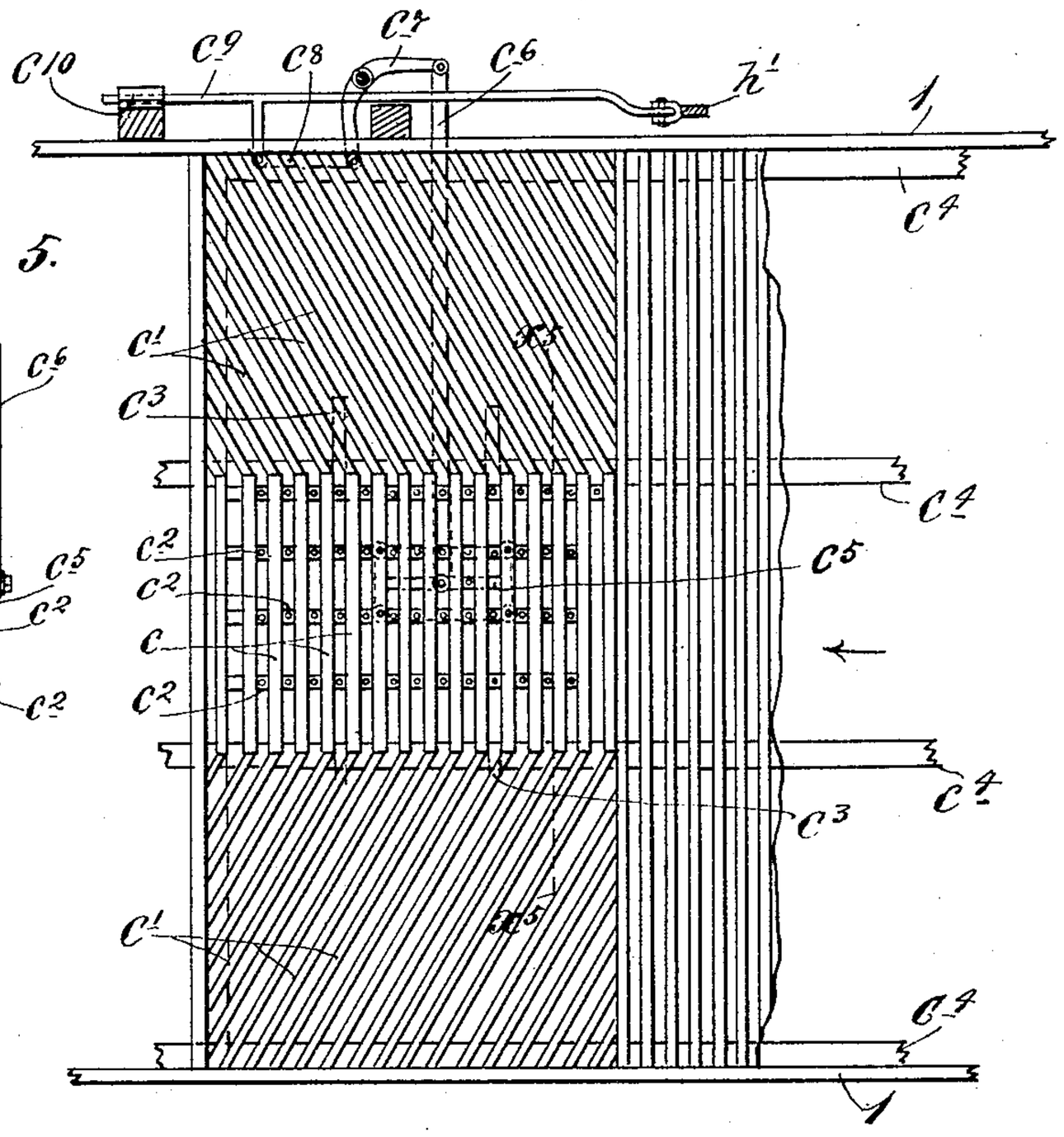


Fig. 5.

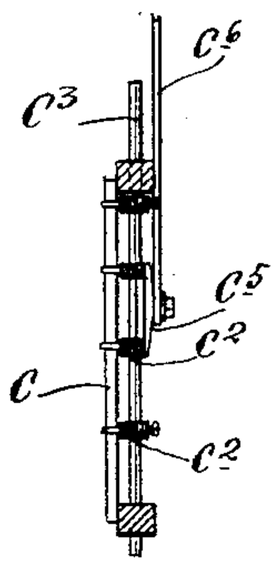


Fig. 6.

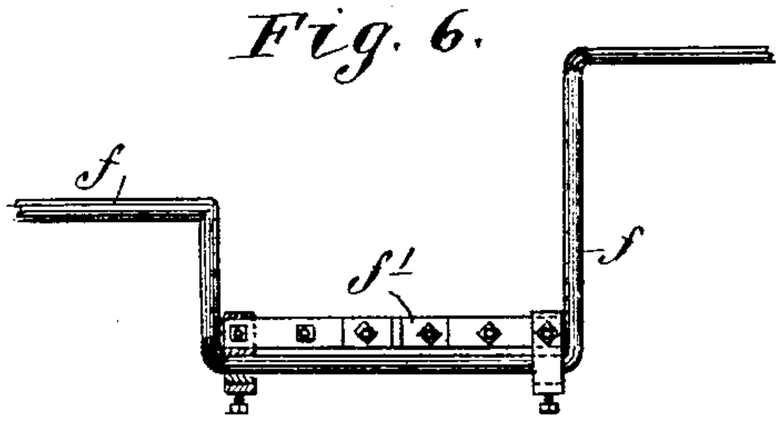
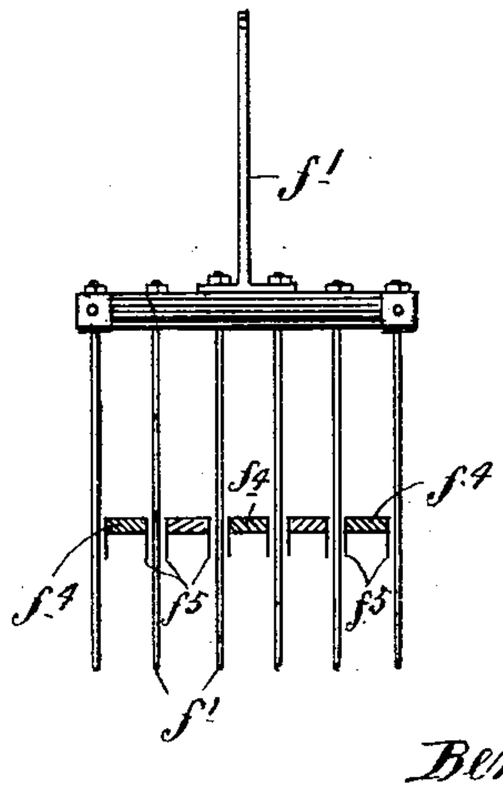


Fig. 7.



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NO MODEL. 4 SHEETS—SHEET 4.

Fig. 8.

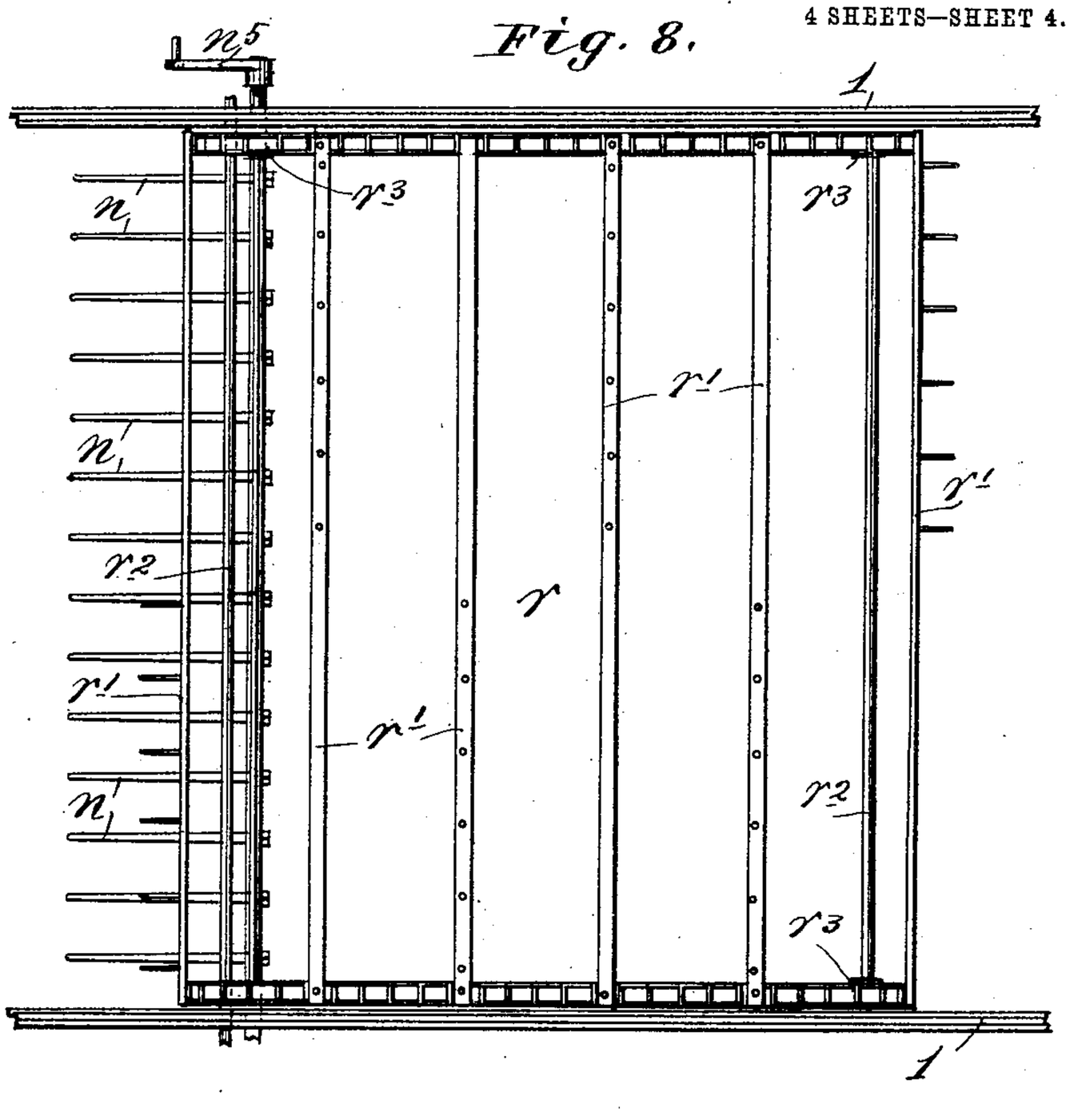
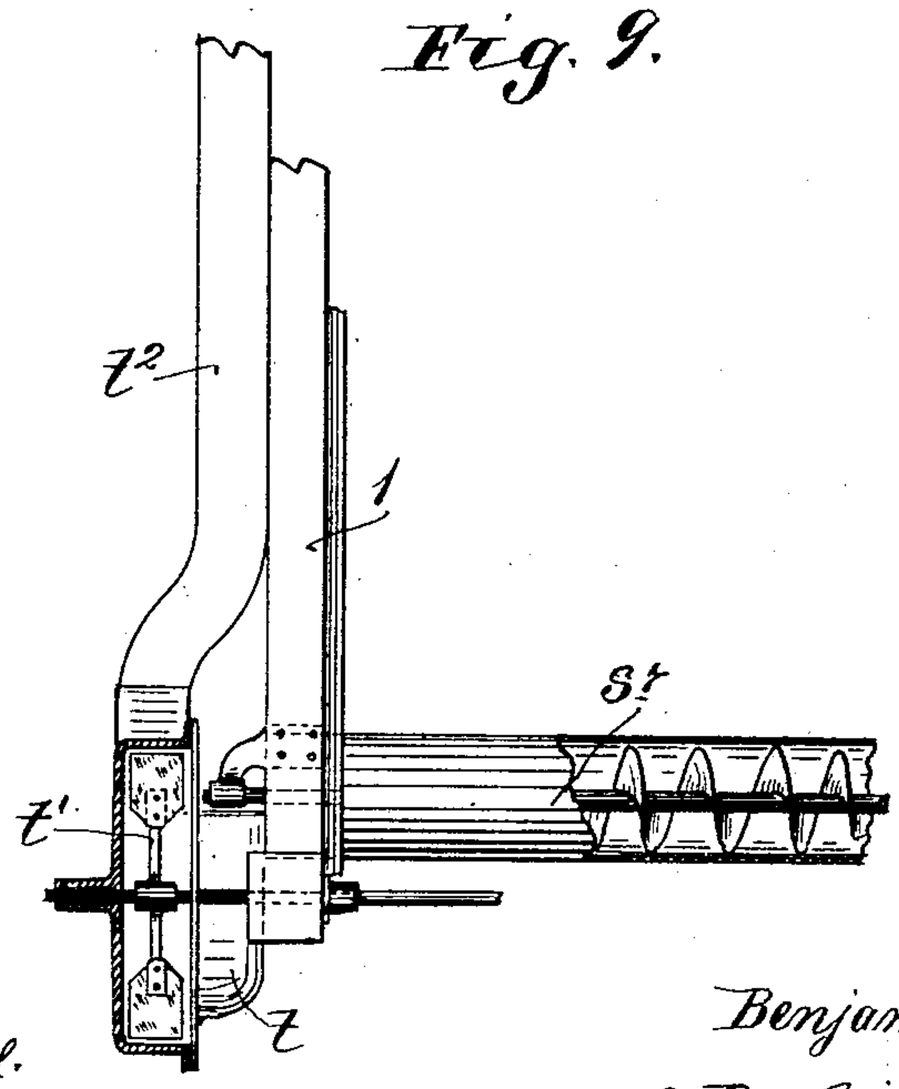


Fig. 9.



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No. 750,855. Patented February 2, 1904.

UNITED STATES PATENT OFFICE.

BENJAMIN R. HOISINGTON, OF MINNEAPOLIS, MINNESOTA.

THRESHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 750,855, dated February 2, 1904.

Application filed January 13, 1902. Serial No. 89,397. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN R. HOISINGTON, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Threshing-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to threshing-machines, and has for its object to provide certain improvements therein with a view of securing greater efficiency both in the threshing and in the separating actions.

My aim is to increase the capacity of the machine and at the same time improve the quality of the work.

To these ends my invention consists of the novel devices and combinations of devices hereinafter described, and defined in the claims.

The invention is illustrated in the accompanying drawings, wherein like notations refer to like parts throughout the several views.

In said drawings, Figures 1 and 2 are complemental views, together making up a complete vertical longitudinal central section through the entire machine. Fig. 3 is a detail showing the adjustable opening in the tail-board of the grain-shoe. Fig. 4 is a detail in plan, with some parts broken away, showing a portion of the grating interposed between the two cylinders. Fig. 5 is a section on the line x^5 x^5 of Fig. 4. Fig. 6 is a detail in plan, showing one of the crank-action forks and a part of the crank-shaft detached. Fig. 7 is a view, partly in elevation and partly in section, showing one of the forks and the relation of the fork-tines to the guides and fenders coöperating therewith. Fig. 8 is a detail in plan view, showing the overhanging chain-rake and underlying agitator detached. Fig. 9 is a view, partly in elevation and partly in section, showing the relation of the pneumatic elevator to the tailings-conveyer trough of the grain-shoe.

In a suitable frame or casing *l* I mount two pairs of coöperating cylinders and concaves. The first or primary cylinder *a* and its concave *a'* are spaced apart from the second cylinder *b* and its concave *b'*. Between the two cylinders is interposed a grating, shown as provided with a central section having bars *c* parallel with the cylinder-axes and having marginal sections provided with bars *c'*, which extend outward on divergent lines from the central section or bars *c*. Otherwise stated, the two marginal sections of the grating have bars *c'*, which extend inward toward each other from the side margins of the grating on convergent diagonal lines. This angular disposition of the bars *c'* in respect to each other in the two marginal sections and in respect to the central section makes this grating act on the stock with a spreading action, as will later appear, and hence this grating may for convenience of distinction be called the "spreading-grate." This spreading-grate extends from the delivery end of the grating of the first concave *a'* to a junction with the upper end or head of the feed-table *d* for the second cylinder. Said spreading-grate is substantially horizontal at its receiving end and then rises on a curvilinear line with a long sweep, extending rearward to its junction with said feed-table *d* for the second cylinder.

Interposed between the two cylinders are also located two sets of crank-action forks f' and f^2. The supporting-shafts *f*, on which the forks f' and f^2 are mounted, receive rotary motion in any suitable way from some of the moving parts of the machine and at the proper speed for the action desired. The fork-handles are connected by links f^3 to fixed parts of the main frame. The fork-tines work between suitable guide-bars f^4 of curvilinear form, properly shaped and located for the actions desired. The guide-bars f^4 are also provided with downwardly-extended flanges, or it might be sheet-iron strips f^5, properly shaped to serve as fenders for preventing the fork-tines from engaging with the stock on their return strokes.

The primary set of forks f' are of the proper construction and proper location for coöperation with the underlying spreading-grate *c c'*, and the second set of forks f^2 are of the proper construction and proper location for coöperation with the primary set of forks and the feed-table *d* for the second cylinder. In view

of the character of the spreading-grate as hereinbefore described the stock, under the cooperation of the primary forks f' and the said grate, will be fed forward from the primary cylinder toward the second cylinder with a stripping and a spreading action. The motions of the two sets of forks f' and f^2 are so timed in respect to each other that when any given fork of the primary set f' is in delivering position one of the forks of the second set f^2 will be in receiving position, ready to take the stock from the primary fork and feed the same to the second cylinder under a continuation of the stripping action. The relations and the actions of the two sets of forks to each other and to their respective guides and fenders are all clearly shown in Fig. 1 of the drawings. In said view the dotted lines show in diagram the paths of the lower ends of the forks, from an inspection of which it will be seen that on their return strokes the forks travel above the lower margins of their fenders f^5, and thus will not engage with the stock on their return strokes.

As will be further noted by reference to Fig. 1, when one of the forward tedders stands in a delivery position it extends approximately in line with the feed-table d, and at that time practically forms a continuation thereof. While the said fork or tedder f' stands approximately in such position one of the rear forks or tedders f^2 makes a working stroke or a portion thereof, under which movement its free end travels in the general direction of the face of the former-noted fork or tedder f'; otherwise stated, under working strokes the free ends of the cranks or tedders f' f^2 move transversely or approximately at right angles to each other and are so timed that the former carry the stock within reach of the latter and serve to support the stock while the said forks or tedders f^2 carry the same onto the feed-table d.

Underneath the central section of the spreading-grate is located, as shown, a grate-cleaner, which is best seen in Figs. 4 and 5. Said grate-cleaner is made up of a series of toothed bars c^2, extending lengthwise of the machine and made fast to a pair of supporting cross-rods c^3, the ends of which extend outward beyond the cleaner-bars c^2 and work through perforations or passages in the underlying grate-supports c^4 as guides. The teeth of the cleaner-bars c^2 project upward and work between the grate-bars c under a crosswise-reciprocating motion, thereby keeping clean the central section of the spreading-grate. The grate-cleaner gets its motion indirectly from the underlying grain-pan h. The grain-pan h is suspended from suitable hangers h' and gets a motion lengthwise of the machine from a constantly-running crank-shaft h^2, having one or more pitmen h^3 connected with the grain-pan.

A plate c^5 is secured, as shown best in Fig. 5, to two of the toothed cleaner-bars c^2 and is connected by links c^6 with a bell-crank lever c^7, pivoted to the main frame outside the casing. The bell-crank lever c^7 is connected by short links c^8 to a reciprocating rod c^9, one end of which moves through a suitable guide c^{10} and the other end of which is connected to one of the grain-pan hangers h'. Hence under the reciprocating motion of the grain-pan the rods c^9 will receive a reciprocating motion therewith lengthwise of the machine, and through the connections c^5 to c^8, inclusive, the grate-cleaner will be reciprocated crosswise of the machine as desired for its cleaning action.

In case the marginal or diagonal grate-bars c' should be extended inward on convergent lines until they should meet at the center of the spreading-grate then, of course, no grate-cleaner would be required. Otherwise stated, it may be possible and desirable to dispense with the central section of the grate having the bars c parallel to the cylinder-axes, and in that event no cleaner would be needed. I prefer the construction shown, because with the central section having the bars c parallel with the cylinder-axes I expect to secure a more uniform feed or delivery from the upper end of the spreading-grate. If the marginal sections with diagonal grate-bars were extended inward on convergent lines to a junction with each other at the center of the grate, the spreading action on the stock might cause too great an accumulation at the sides and leave too little stock to be delivered from the central portion of the grate at its junction with the feed-table d for the second cylinder.

Directly to the rear of the second cylinder and its concave is located a straw-rake of the customary grating and fish-back type, but differing from the customary straw-rake in important respects, which will later appear. This straw-rake is composed of a pair of sections k' and k^2, connected together by a hinged joint k. The primary section k' is suspended from two sets of hangers k^3. The second or rearward section k^2 is suspended at its inner end from the primary section k' through the hinged joint k and at its outer end is suspended from a pair of hangers k^4. The hangers k^3, suspending the forward end of the first rake-section k', are connected by links k^5 with the upper arms k^6 of a rock-shaft k^7, and the said arms k^6 are connected by pitman-rods k^8 with cranks on the constantly-running crank-shaft h^2, hitherto noted as imparting motion to the main grain-pan h. In view of the way in which the rake sections k' and k^2 are connected, mounted, and driven, as described, it follows that said two rake-sections k' and k^2 will reciprocate together, but will move in different non-parallel planes, and at all times a considerable drop will be afforded to the stock passing from the first section k' to the second section k^2. At this drop between the rake-sections k' and k^2 is located a fingered tosser or agitator n, the

shaft of which is journaled in the upper arms of a rocker n', the lower arms of which suspend the inner or lower end of an underlying grain-pan n^2, the upper or outer end of which is suspended from a pair of hangers n^3. The lower arms of the rocker n' are connected by links n^4 with the rearmost pair of the hangers h', which support the main grain-pan h. These connections impart a rocking motion to the grain-pan n^2, the rocker n', and the fingered agitator n. The agitator n is also provided with a crank-arm n^5, connected by a pitman n^6 outside the casing to a crank-disk n^7, which receives rotary motion in any suitable way from movable part of the machine. Hence from the connections n^5 to n^7, inclusive, the agitator n will receive an up-and-down rocking or tossing motion in its bearings on the upper arms of the rocker n', which in turn reciprocate the agitator lengthwise of the outer rake-section k^2, as hitherto noted. In virtue of this peculiar compound motion of the agitator n the same will have a shaking and a propelling action on the stock, passing from the first to the second section of the straw-rake. This is very effective for shaking out the grain from the straw at that point.

Below the first or primary rake-section k' is a stationary grain-pan k^9, properly disposed to deliver the grain onto the delivery end of the main grain-pan h. To the rear end of the main grain-pan h is hinged a chaffer-board p, the rear end of which is suspended from the second or outer rake-section k^2 by hangers p'.

Directly to the rear of the second cylinder b is located what I call a "chain rake" r. This chain rake is of the chain-and-slat endless-conveyer type and is properly mounted to overhang the first section k' of the underlying straw-rake and is of a length to extend somewhat beyond the delivery end of said straw-rake section. This chain rake differs from the customary chain rake in the fact that its slats r' do not have teeth for their entire length, but have teeth for one half of their length and are without teeth for the other half of their length. The toothed and untoothed portions of adjacent slats are in staggered relation to each other, as best shown in Fig. 8. This affords a stripping action on the stock. The chain rake is mounted on suitable supporting-rollers r^2, with its chains engaging sprocket-wheels r^3 thereon in the customary way. One of the roller-shafts r^2 receives motion from some movable part of the machine. At its delivery end the teeth of the chain rake r work between stripping-fingers r^4, fixed to a guard-plate r^5, secured to the main frame, as shown in Fig. 2, thereby preventing any of the stock being carried around to the top of the rake.

Underneath the chaffer-board p is located the grain-shoe s, which, with the exception hereinafter noted, is of the customary construction and mounted in the customary way, details of which it is not thought necessary to note. Said shoe receives motion indirectly from the constantly-running crank-shaft h^2, hitherto noted as imparting reciprocating motions to the main grain-pan h, the straw-rake k' k^2, &c. For this purpose the lower arm of the rocker k^6, receiving motion from the crank-shaft h^2, is connected by link s' to the upper arm of the shoe-rocker s^2. The shoe receives its blast of air from the fan s^3 through the case outlet or delivery spout s^4, and at this point the blast is subject to regulating-dampers s^5 for directing the same as desired. The thoroughly-cleaned grain delivered from the shoe s is received by the clean-grain conveyer s^6 and directed off to the weigher and bagger or other delivery. (Not shown.) The tailings from the shoe are dropped into the customary tailings-conveyer s^7. The parts of the shoe so far described are all old. As an improvement, however, I provide a tail-board s^8 with a blast-outlet s^9 therethrough, which tail-board s^8 is adjustably secured to the delivery end of the shoe by slot-and-pin connections s^{10}, and in virtue of the construction of the tail-board and its adjustable connection to the shoe the blast-outlet s^9 from the tail end of the shoe may be varied in size as desired. Then to the rear of the intermediate sieve of the shoe I provide a lip-sieve s^{11}, which extends outward and is provided with an upturned flange s^{12}, projecting through the opening s^9 in the tail-board, all as clearly shown in Fig. 2 of the drawings. The lip-sieve s^{11} is properly formed to pass the grain and unthreshed heads therethrough into the tailings-conveyer s^7, while at the same time it will hold cylinder-teeth, nuts, or other such foreign materials that would be injurious or destructive to the machine when the tailings come to be rethreshed. Being a lip-sieve, the passages will be kept open for the grain, and, nevertheless, the teeth and nuts will be held on the lip-sieve, and as the tail-board is provided with the opening s^9 this escape for the blast will cause the same to carry off the chaff, and the lip-sieve will be maintained constantly clean, in proper condition to catch and hold the teeth and nuts. The upturned flange s^{12} prevents the teeth and nuts from being shaken off the shoe and out through the opening s^9.

The tailings from the shoe caught by the conveyer s^7 are delivered therefrom to a pneumatic elevator, whereby the same are conducted to the front of the second cylinder, as shown in Figs. 1 and 2. This pneumatic elevator differs radically from the ordinary pneumatic elevator in the fact that the fan-case is not connected directly to the tailings-conveyer, as has hitherto been done, but is provided with a receiving mouth or pocket t, which is open to the atmosphere outside of the conveyer-trough, but is located in proper position to receive from the tailings-conveyer s^7, as best shown in Fig. 9. The fan t' of the

pneumatic conveyer is located at the lower end of its trunk t^2 and receives motion in any suitable way from some movable part of the machine. Inasmuch as the receiving mouth t of the pneumatic elevator is thus open to the atmosphere, as described, and is located in proper position to receive the tailings from the conveyer s^7 under the action of gravity it follows that the tailings-conveyer and the grain-shoe are free from the suction of the pneumatic elevator. This is a radical improvement over all other pneumatic elevators hitherto in use, so far as known by me. The old type of pneumatic elevators had the eye of the fan-case directly connected to the tailings-conveyer, and hence the suction from the elevator-fan would have a bad effect on the desired separating and cleaning action of the shoe.

My improvements enable a pneumatic elevator to be used to an advantage.

Respecting the threshing cylinders and concaves, it should be noted that both concaves have the customary front end eccentric adjustment. (Not deemed necessary to note by reference-letters.) It should be noted, however, that the concave b', coöperating with the second cylinder b, rocks on a central pivot under the eccentric adjustment, as shown at b^2 in Figs. 1 and 2 of the drawings. This affords a compensating adjustment to said concave b'; otherwise stated, when the forward end of the concave b' is lowered to afford a freer feed of the stock to the cylinder b the rear or delivery end of the concave grating is raised, thereby affording a greater drop to the stock and increasing the efficiency of the separating action at that point, somewhat in proportion to the increase of the feed. The grating of the concave b' also extends for a greater length than the customary concave and on a somewhat different curve.

The actions of the different groups of mechanisms have been so fully stated in the detailed description that any extended summary of the general operation is not deemed necessary.

It must be obvious that this machine has large threshing and separating capacity. All the stock is threshed twice. It is hardly possible for any unthreshed stock to escape the second cylinder and concave. In its travel rearward of the first cylinder the stock is fed forward under a succession of stripping actions and a succession of agitating actions, and hence it follows that all the grain must be thoroughly separated out from the straw in its long course of travel through the machine.

It must be understood that the main features of the invention are capable of modifications and that the details of the construction may be widely varied without departing from the spirit of the invention. Moreover, it must be obvious that some of the features are capable of use in a threshing-machine having a single cylinder and concave.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. The combination with primary and secondary feed tables or supports extending in intersecting planes, of primary and secondary crank-acting forks working respectively over the said feed-tables, which primary forks when in delivery positions extend approximately in a line with the said secondary table, and which secondary forks make their working stroke in the general direction of said secondary table and while the said secondary forks are approximately alined with said secondary table, substantially as described.

2. The combination with two threshing cylinders and concaves, of a grate interposed between the two cylinders and having diverging marginal bars for spreading the stock, a feed-deck for the secondary cylinder receiving from said grate, and two sets of tedders or crank-acting forks interposed between the two cylinders which two sets of tedders are so timed and mounted that the first support the stock while the second engage and move the stock approximately in the direction of said feed-deck, substantially as described.

3. In a threshing-machine, the combination with a straw-rack made up of two sections, mounted to move in different planes, of agitating-fingers located at the drop between said rake-sections, and means for imparting to said agitating-fingers a rocking or tossing motion in a vertical plane and an endwise-propelling movement lengthwise of said straw-rack, substantially as described.

4. In a threshing-machine, the combination with a straw-rack, made up of sections, offset vertically to afford a drop between them, of oscillating supports for said rack, a fingered agitator carried by certain of said oscillating supports and receiving therefrom endwise movements in the vicinity of said drop, and means independent of said rack and its supports for vibrating said fingered agitators vertically, and at a speed which is independent of the movements of said rack.

5. In a threshing-machine, the combination with the grain-shoe and its tailings-conveyer, of a pneumatic elevator for conducting the tailings from the shoe to the front of a threshing-cylinder, which pneumatic elevator is provided with a receiving-mouth external of said conveyer and open to the atmosphere, whereby said conveyer and said shoe are relieved or kept free from any suction thereon from the elevator-fan, substantially as described.

6. In a threshing-machine, a grain-shoe having a tail-board with blast-outlet and a lip-sieve extending rearward of the main sieve which delivers to the tailings-conveyer for cooperation with the blast-outlet in said tail-

board to pass the chaff and to catch and hold cylinder-teeth, nuts and other foreign material, substantially as described.

7. In a threshing-machine, the grain-shoe having the adjustable tail-board with blast-outlet variable by said adjustment, at will and provided with a lip-sieve extension rearward of the main sieve delivering to the tailings-conveyer, and which lip-sieve extension is provided with an upturned guard-flange extending outward through the blast-opening of the tail-board, substantially as and for the purposes set forth.

8. In a threshing-machine, the combination with the threshing cylinder and concave, of a grating receiving therefrom and a grate-cleaner mounted to reciprocate underneath the grate and provided with teeth which work in the openings between the grate-bars, substantially as and for the purposes set forth.

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

BENJAMIN R. HOISINGTON.

Witnesses:

ELIZABETH KELIHER,

F. D. MERCHANT.