C. L. BEST.

SIDEHILL HARVESTER.

APPLICATION FILED JULY 2, 1909.

1,020,391.

Patented Mar. 12, 1912.

4 SHEETS—SHEET 1.

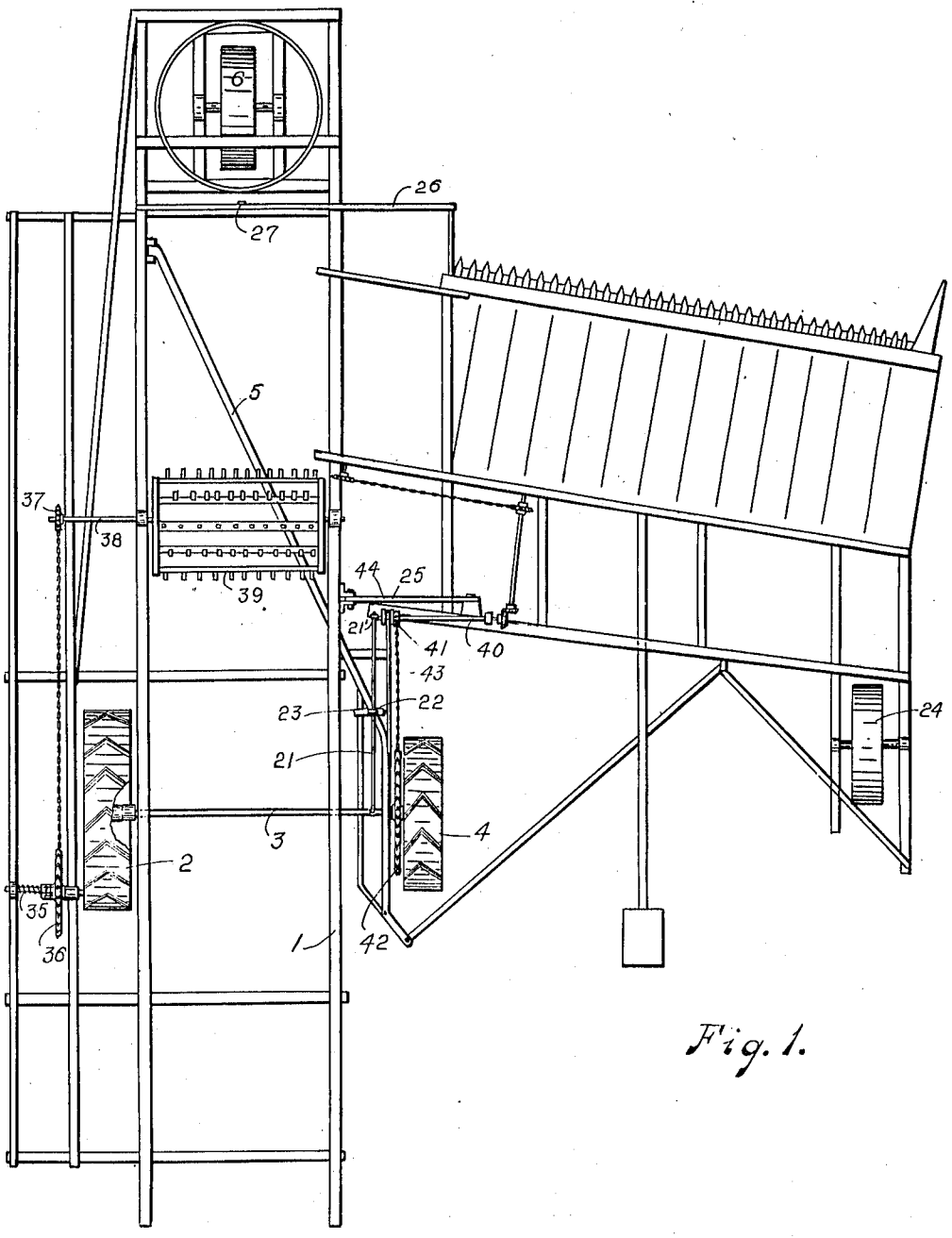

Fig. 1.

WITNESSES:

Jesse P. Eoff

Geo. B. Riley

INVENTOR

Clarence Leo Best

BY

W. S. Smyth

ATTORNEY

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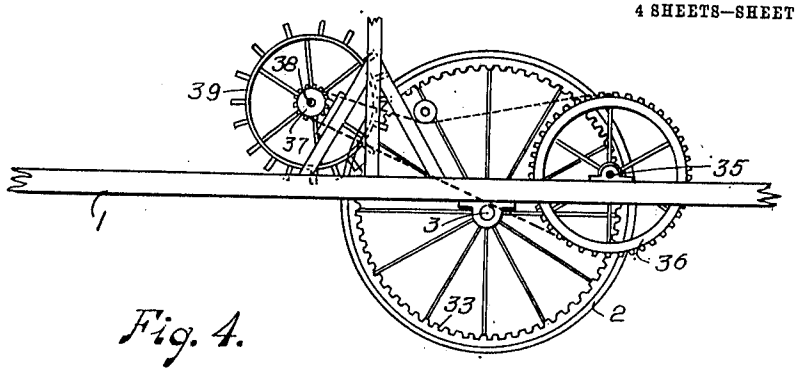

Fig. 4.

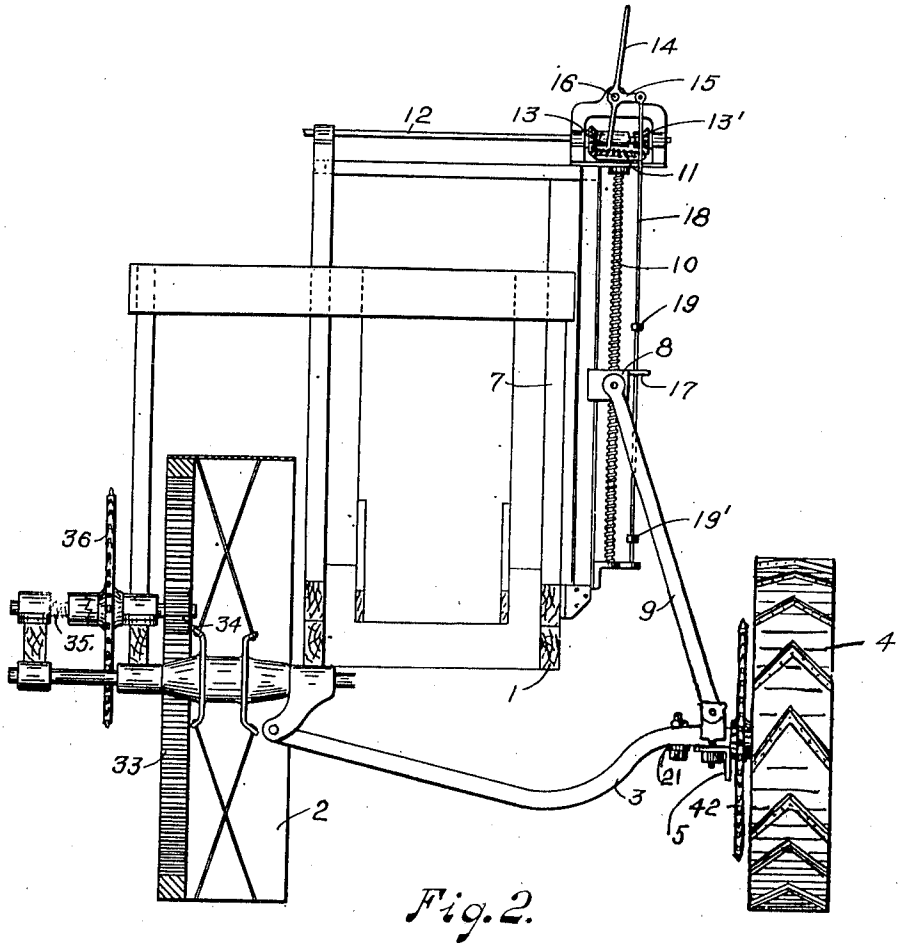

Fig. 2.

WITNESSES:

Jesse P. Coff

Geo. L. Riley.

INVENTOR

Clarence Leo Best

BY

W. A. Smyth.

ATTORNEY

C. L. BEST.

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4 SHEETS—SHEET 3.

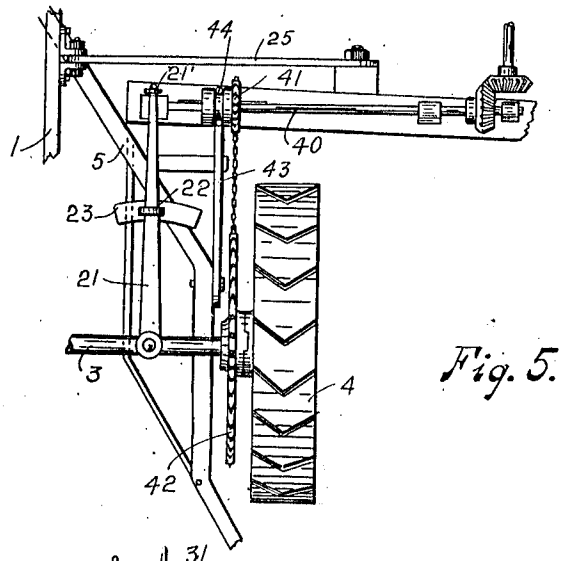

Fig. 5.

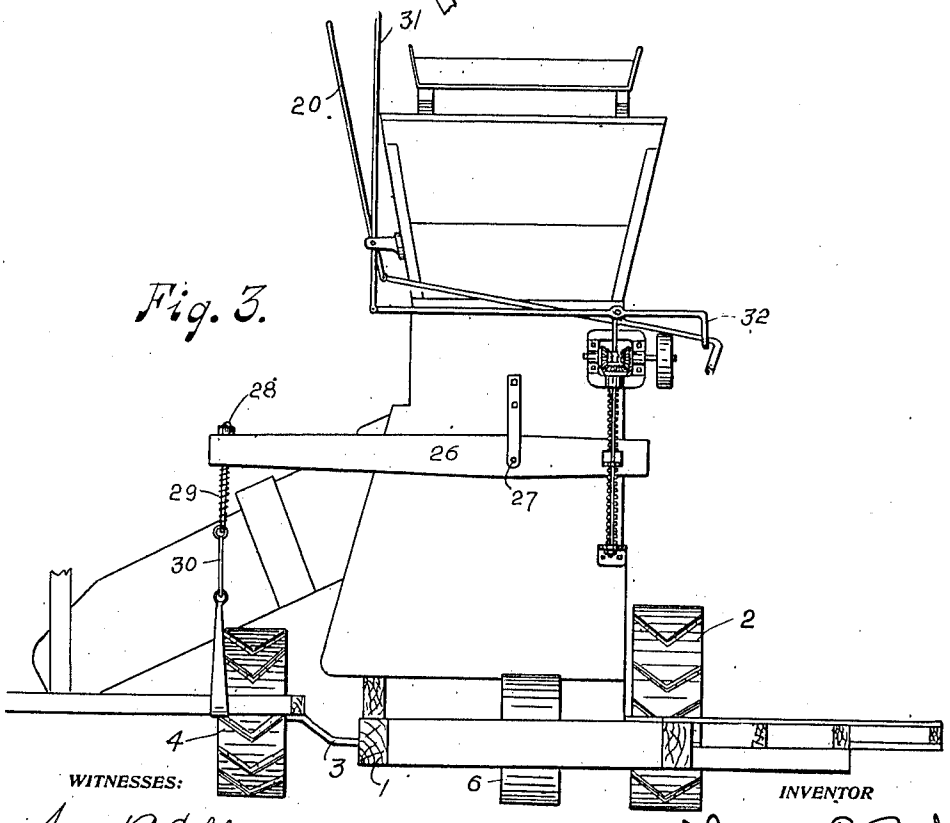

Fig. 3.

WITNESSES:

Jesse P. Coff

Geo. D. Tibbey.

INVENTOR

Clarence Leo Best

BY

W. H. Smyth.

ATTORNEY

C. L. BEST.

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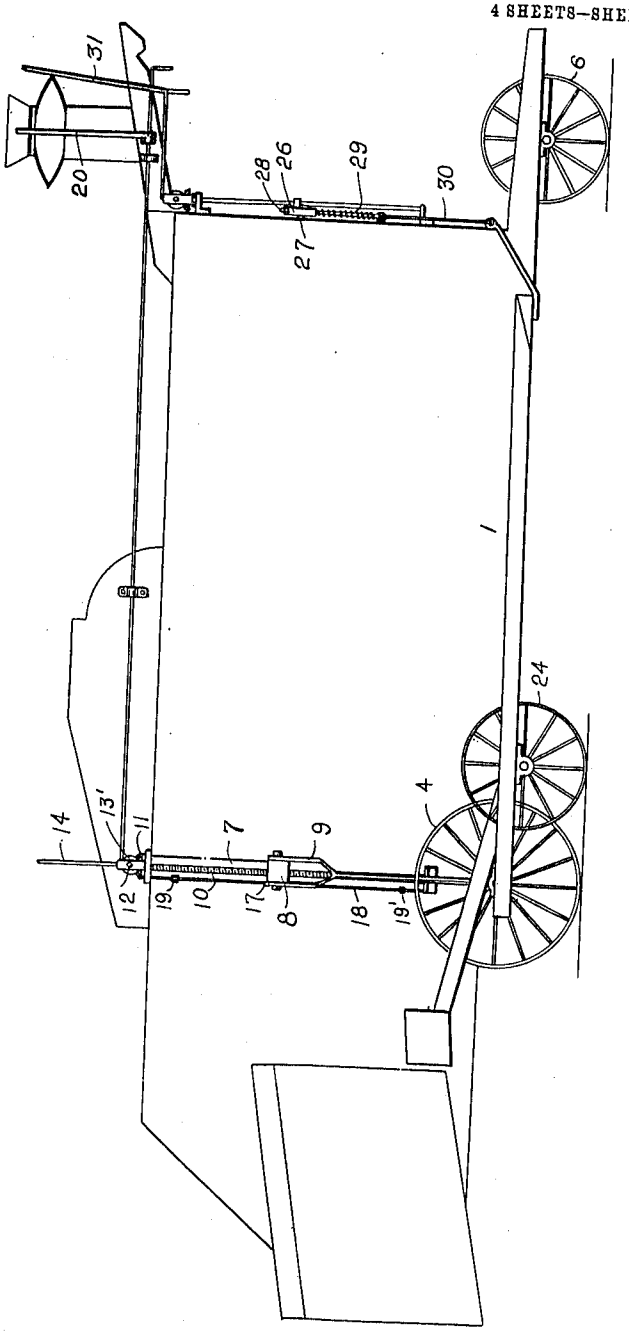

Fig. 6.

WITNESSES:

Jesse P. Eff

Geo. L. Riley.

INVENTOR

Clarence Leo Best

BY

W. T. Smyth.

ATTORNEY

UNITED STATES PATENT OFFICE.

CLARENCE LEO BEST, OF SAN LEANDRO, CALIFORNIA, ASSIGNOR TO THE BEST MANUFACTURING COMPANY, OF SAN LEANDRO, CALIFORNIA, A CORPORATION OF CALIFORNIA.

SIDEHILL-HARVESTER.

1,020,391. Specification of Letters Patent. Patented Mar. 12, 1912.

Application filed July 2, 1909. Serial No. 505,741.

To all whom it may concern:

Be it known that I, CLARENCE LEO BEST, citizen of the United States, residing at San Leandro, in the county of Alameda and State of California, have invented certain new and useful Improvements in Sidehill-Harvesters, of which the following is a specification.

This invention relates to combined harvesters adapted to operate on uneven ground or sidehills.

It especially relates to the class of machines which derive their progressive power from horses.

The main object of the present invention is to provide constructions to meet the difficulties peculiar to the horse sidehill harvesters and incidentally some of those common to other types. The field of operation of this class of apparatus and surrounding conditions are peculiarly adverse and unfavorable and these combined cutting, threshing, cleaning and sacking, devices are necessarily ponderous, complicated and costly mechanisms. This problem generally stated, which it is the object of the present invention to accomplish, is to provide a machine propellable by horses capable of cutting, threshing, cleaning and sacking grain under the usual conditions in a better manner and at a less cost than heretofore, also needing a minimum of supervision. Owing to the great bulk of the materials to pass through such machines and the large areas which must be traversed to make these costly machines commercially available they are necessarily of great weight. Cutting, threshing and cleaning to be effective involve high speed in the working parts. This is especially so of the peripheral travel of the thresher cylinder. These two conditions involving weight of the machine and speed of the moving parts bring about the effect that comparative small percentage of the motive power is employed in the actual work of cutting, threshing, cleaning and sacking. Probably 90% of the work is absorbed in maintaining the travel of the machine and the speed of the operating mechanism, especially the threshing cylinder. In practice, little or no difference is distinguishable, in the traction of these machines, running empty and in heavy grain. The factors, weight and friction, thus may become essential elements, and in practice are of vital moment, frequently determining success or failure.

One of the objects of the present invention is to materially reduce traction expenditure and diminish destructive strains.

Of the many difficulties encountered in practice, not the least is the necessity of crossing, while in operation, dead-furrows, ditches, and other abrupt depressions; steeply rolling land, hog-wallow land, and an infinite variety of other forms of sharply uneven-surfaced land. Thus in a machine intended to harvest practically all land which can be commercially cultivated, the capability of rapid adjustability to surface contour is a commercial *sine qua non*. To provide controllable, power-operated adjustment between the large coöperating elements, to meet these conditions is an important object of the present invention. As the threshing machines available for this class of work involve screens, conveyers and other gravity devices, it is necessary that the surface-contour adjustability should be of a character to maintain the thresher-cleaner parts transversely horizontal, regardless of the ground slope. And this maintenance of the vertical position of the thresher must not prevent the cutting mechanism from following the varying angle of the surface nor the varying height of the grain. To keep the thresher vertical while the ground angle varies is of curse equivalent to changing the angular relation of the thresher to the ground. So, though in reality the thresher does not change from its vertical position, it must constantly, by adjustment, change its angle to the rest of the machine in order to preserve its perpendicularity. For this reason, in addition to those mentioned, it is important to successful operation that not only shall the whole machine be flexible and rapidly adjustable to the surface contour, but this adjustability must be of a character to maintain the thresher unchanged in its vertical position. To accomplish this efficiently is another important object of the present invention.

The importance of reducing the draft in

this character of device has been referred to in connection with the small per cent. of power necessary to the actual work of the machine. It is even more important for another very practical reason,—one which goes to the very heart of the problem of harvesting large areas with horses. As the number of horses increases, the skill necessary to handle them increases in much faster ratio. Men capable of driving ten to twelve horses are comparatively plenty,—those equally skilled with twenty to forty horses are so scarce as to render machines requiring this horse power, no matter how otherwise efficient, of exceedingly small availability and use. And,—in this same connection,—the driver's seat being necessarily high with unobstructed outlook, he is best situated to control the height of the cut. Thus if the number of the horses necessary could be reduced so as not to occupy the driver's whole attention and further if the power needed to adjust the height of the sickle could be derived from the horses he could control this part of the operation. Under these conditions, better work would be done for the driver controls the speed of the team, and consequently the feed of the machine. This arrangement too would effect the saving of one whole man, a matter of the highest importance in harvest time apart from its direct economy.

The foregoing indicates another important object of the present invention, namely, to provide a combined harvester adapted to be completely controlled and operated by a crew of two men,—a driver and a sack-sewer, an accomplishment heretofore deemed impossible.

In some respects horses are a superior motor for this character of device and operation than traction engines. For the reasons hereinbefore referred to, a great excess of power, over the normal, is required to start this character of machine into effective motion. It is here that the essential difference between horse and engine traction becomes of practical moment. The traction engine must be made sufficiently powerful and heavy to furnish at all times the maximum power needed even though this be required only for a few moments of starting, and the power thereafter needed is but a fraction of this. A small team on the contrary will for the minute of starting apply a force many times greater than they could maintain as a steady effort. This is precisely what is needed in the present instance. Steam has however to a large extent displaced horses as the motor for combined-harvesters owing to the almost insurmountable difficulties in the way of utilizing teams of more than twelve to sixteen horses. This suggests another object of the invention, which is, to so construct and arrange the working parts, and particularly the driving connections of the thresher-cylinder, the feed of the grain thereto, and the control of the header, in a manner favorable to and in accordance with the conditions of harvesting and the peculiarity of horse-team-motor work.

In the device of the present disclosure are incorporated several radical departures from present practice and other changes which, apparently and superficially, do not seem so great. Both of these forms of improvement in their effects and consequences are so far reaching and important as to constitute the device of this invention a type by itself.

The foregoing described objects are accomplished by the devices illustrated in the accompanying drawings, in which:—

Figure 1 is a plan view, portions of the structure being removed for clearness of illustration. Fig. 2 is an end elevation in which some of the parts are omitted and others are shown in section. Fig. 3 is a front elevation showing the arrangement of the sickle raising device in relation to the driver's seat. Fig. 4 is a detail, on a larger scale, showing the driving connections of the threshing cylinder. Fig. 5 is a detail on a larger scale, showing the driving mechanism for the header also its supporting and position maintaining devices. Fig. 6 is a side elevation, portions being removed.

As the cutting, threshing and cleaning devices, in themselves are of substantially the kind heretofore employed and their description not essential to the present disclosure, which relates principally to means by which these elements are maintained in relation to each other and by which power and motion are effectively given to their working parts, it is not necessary to describe these large coöperating elements in detail. The description hereafter therefore will be restricted largely to the devices and arrangements peculiar to my invention.

Referring to the drawings 1 is a frame or foundation for supporting the threshing and cleaning structure. It may be of any suitable form or material. Journaled in or on this frame is a supporting and driving wheel or main-wheel 2. Extending beneath the frame transversely thereof and substantially at right angles thereto, is an axle-bar 3 of a second supporting and driving wheel or grain-wheel 4 which is journaled thereon. The end of bar 3, opposite from the grain-wheel 4, is hinged or flexibly connected to the frame 1 preferably at or adjacent to the plane of rotation of wheel 2. I usually place the hinge intermediate of the sides of the wheel. Extending angularly forward from a point near the grain-wheel 4 on bar 3 is a strong brace 5 the outer end of which is hinged or flexibly connected to frame 1 forward of wheel 2 and on the same side of

the center line of the threshing machine as wheel 2. There is thus formed by the bar 5, axle 3 and the frame 1 a triangular frame, and the prolongation of one side of the bar 5 constitutes a bearing for said axle 3 of the grain wheel 4. These parts constitute a powerful brace for the frame, as will be appreciated.

At the forward end of the main frame or foundation is located a suitable guiding and supporting wheel 6 intermediate of and substantially equi-distant from wheels 2 and 4. Thus there is formed, for the support of the thresher or separator a symmetrically disposed triangular wheel-base, having a guide-wheel at the apex and a traction power transmitting wheel at each of the base angles, with the further characteristic that one of the base wheels is vertically movable, with reference to the other.

Extending upwardly, preferably from and strongly secured to the frame 1 and adjacent to wheel 4 above the axle-bar 3, is an abutment frame 7, Fig. 2, which I show in the form of a guide for and upon which is slidably mounted an abutment block 8. Connecting this block with the axle-bar 3 at a point adjacent to the wheel 4 is a strong link or brace 9. Means are also provided for varying the position of the block 8 upon its guide which I have shown as a screw 10 paralleling the abutment guide 7, in which guide the screw may be journaled. The block 8 is provided with threads fitting the screw 10 to effect their relative movement. In the drawings Figs. 2 and 6, I have shown the screw 10 as rotatable and provided at its upper end with a bevel gear 11. Means are provided for effecting the rotation of screw 10 in either direction at will from any suitable power transmitting part of the device. I have shown this screw driving mechanism as a rotating shaft 12 which derives its rotation through any suitable connection from the wheel 2. Upon shaft 12 are gears 13 and 13′ adapted to be thrown into and out of driving engagement with gear 11, on opposite sides thereof. Means are also provided for this engagement of gears 13 and 13′ with gear 11 at will, shown as a handle 14. An automatic disengaging device may also be provided to limit the vertical travel of abutment block 8, which I have shown as a bell-crank 15 connected to handle 14 at its pivot 16. A tapped arm 17 is provided attached to block 8 or traveling therewith. A rod or link 18 hangs from the bell-crank 15 adjacent to the path of travel of tappet arm 17, and on the rod 18 on opposite sides of the arm 17 are tappets 19 and 19′ adjustably attached on rod 18 in the path of travel of the arm 17, as clearly shown in Fig. 2. Extending forwardly from the pivot of arm 14 and to which this arm is securely attached I usually provide a shaft in suitably supported boxes, and also a second operating handle 20 within reach of the driver from his seat and likewise within reach of the sack-sewer from his position as shown in Figs. 3 and 6.

The grain cutter and thresher-feeder called the "header" is of ordinary form except in those features which I will now describe. In this connection it should be noted that the thresher-machine base constitutes an entirely self-supporting and symmetrical wheel-base of triangular form, capable of maintaining the vertical position of the thresher on uneven ground without assistance from the header frame or other source. I utilize this peculiarity to relieve the header frame of the necessity of carrying a portion of the weight of the thresher or resisting the racking strains incident thereto. The header frame therefore may be made lighter than it could be if called upon to perform a carrying function in addition to its proper duties. The thresher side of the header is hung to and supported upon horizontally movable connection or radius arm 21. Arm 21 projects forwardly from the axle-bar 3 to which it is pivotally attached. Intermediate of its ends arm 21 is provided with a roller 22 which rests upon a supporting plate or track 23 secured upon brace 5, as shown in the detail Fig. 5. The outer or grain side of the header is supported by a wheel 24, Fig. 1.

As has heretofore been pointed out, the maintenance of a vertical position in the thresher on unequally varying ground contours is equivalent to an actual oscillatory movement of the thresher with regard to its base. Such oscillatory movement would naturally affect the relation of the header grain-elevator-spout to the grain receiver of the thresher or feeder-house while cutting on an upwardly sloping sidehill. This would, if not provided for, frequently project the grain-spout so far into the feeder-house of the thresher as to materially diminish the available space and render it insufficient in heavy grain. To obviate this difficulty I provide the radius link 25, one end of which is hinged to the frame 1 and the other end is attached to the header, as shown in Fig. 1 and also in detail Fig. 5. The supports of the header thus described form a pivot upon which the front end of the header with its sickle may be raised and lowered to effect a higher or lower cut. These means are here shown, as illustrated in Fig. 3, to consist of a lever 26 pivoted transversely of the thresher at the front end thereof at 27 a point preferably dividing the lever 26 into unequal lengths. To the longer arm of the lever and depending therefrom is loosely attached an eye-bolt 28 provided with a spring 29, between the eye of the bolt and the lever. This eye-bolt is connected by a link 30 to a convenient attachment at the

front of the header frame, preferably somewhat in advance of the sickle-bar. Connected with the other end of the lever 26 is a substantially similar arrangement of power-driven screw and nut, as that described for raising and lowering the brace link 9. The guide frame may however be omitted. Handles are provided for throwing the power-driven bevel gears into and out of engagement with the screw. These handles, respectively 31 and 32 extend as shown in Fig. 3, to within convenient reach of both the driver and the sack-sewer.

The main-wheel 2 is provided with an internal gear 33 which meshes into and drives a pinion 34 upon a short jack-shaft or transmission shaft 35 journaled on frame 1. Upon the shaft 35 is also secured a large chain-wheel or sprocket-wheel 36 in driving connection with a pinion 37 secured upon the shaft 38 of the threshing cylinder 39 which is located and journaled in the thresher, as clearly shown in Figs. 2 and 4.

The various moving parts of the header, as shown in Fig. 1 and in the enlarged detail Fig. 5, receive their motion from a jack-shaft 40 journaled on the header frame adjacent to its connection with the thresher frame. Upon the shaft 40 is slidably secured a sprocket-pinion 41 in driving association, by means of a chain, with a large sprocket-wheel 42 secured to the grain-wheel 4. A radius-arm 43 pivoted horizontally on brace 5 extends forwardly therefrom and engages with a grooved hub 44 of pinion 41.

In operation and as slope of the ground varies, transversely of the machine, one of the gears 13—13′ is thrown into engagement with 11, raising or lowering the abutment block 8 on the screw 10 as the slope requires, and thus maintaining the thresher in vertical position. As the brace 9 is supported by the axle-bar 3 the weight of the thresher is borne directly by the wheel 4 and the line of stress is confined in a plane substantially co-incident with the vertical movement of the axle-bar of wheel 4. Thus all longitudinal strains or the racking and twisting of the thresher or thresher-housing from this source is avoided. As the block 8 is guided in the frame 7 the screw 10 is relieved from all but longitudinal strains which it is naturally adapted to resist. These parts can therefore be reduced in size and weight. The in, or thresher side of the header, by the described connections is also borne by the axle-bar 3 independent of the thresher or thresher-housing.

By the described means the adjustment of the thresher to the slope and the raising and lowering of the sickle to vary the height of the cut as occasion requires may be effected by the driver employing the handles adjacent to his seat or by the sack-sewer through the handle near his location and in either case the operation is performed by motive power.

The balancing of the header upon the wheels 4 and 24 is arranged so that there is a slight preponderance of weight on the forward or sickle end. This excess is sustained by the link-bolt 28 and lever 26. The link-bolt 28 as described, is free to lift upward without affecting the position of the lever. The function and object of this arrangement is to provide for the automatic raising of the sickle when encountering a hummock, rock, or other relatively small obstruction. The spring 29 under these circumstances acts as a cushion and returns the sickle to its normal position, and permits these automatic adjustments to occur without injurious jar to the header mechanism.

It has been found in practice that a peripheral speed of 5000 ft. per minute and over, is desirable for the threshing cylinder. The practice in combined harvesters heretofore has been to secure this speed by high rotational velocity imparted to a cylinder of small diameter. This practice has been fraught with difficulties and loss. To it is due some of the practical troubles in utilizing horses, and it is also responsible for much of the power and time wastage which it is part of the object of the present invention to overcome and avoid. As the rotational speed of the traction wheels is necessarily slow, seldom more than 10 to 12 revolutions per minute, high rotational speed in the thresher cylinder, under the conditions of practice, involves several speed increasing shafts and pulleys with consequent loss of power in their journals and other points of frictional contact. The large diameter cylinder of the present disclosure with its direct driving connection operates in a manner different from the small high-rotative-speed cylinder of ordinary practice and performs functions practically impossible to the latter. And it eliminates mechanism heretofore needed to perform some of these functions. Owing to the flatter arc of the large diameter cylinder the feeder throat is greatly increased in available height, and a much greater effective area of cylinder is presented to the grain straw with consequent elimination of liability to choke, as frequently happens with the small throat of small diameter high rotative speed cylinder. The necessity of beaters, feeders, and the like, other than the traveling floor draper are eliminated from the feeder-house thus reducing the feeder-house to its simplest terms, which is a most desirable result, as it dispenses with fragile, rapid moving, power consuming mechanisms.

The supporting and motion limiting devices for the thresher-side of the header frame, that is 21—21′—25 and 43 a direct

chain drive is made available from the thresher supporting grain-wheel 4 as illustrated in Fig. 5, with consequent economy of parts and reduction of friction and draft. The slidable attachment of the sprocket pinion 41 on shaft 40 permit lateral motion in the header while accommodating itself to uneven ground and without disarrangement of its driving connection with the relatively less movable source of power and motion. The arm 43 by its engagement with the groove 44 holds the sprocket-wheel 41 in proper relation to the sprocket-wheel 42 while permitting endwise motion of the shaft 40 with the header frame.

Great flexibility between the header and thresher is effected by arrangements just referred to, and this with the described devices for maintaining the thresher vertical permit both the thresher and header structures to be very materially lightened in weight without any sacrifice of requisite strength. The arrangement for power control so greatly increases the facility of operation that two men can handle the machine effectively. Thus all the stated objects of the invention are accomplished by means of simple and practical devices.

What I claim is:—

1. A side-hill harvester comprising a thresher mounted on a leveling base with main-wheel and grain-wheel, an axle-bar for the grain wheel which extends beneath the thresher and is hinged adjacent to the main-wheel and intermediate the sides of the main wheel, means to maintain the vertical position of the thresher on hillsides consisting of mechanism adapted to effect the hinge movement of the axle-bar on its hinge, and means to cut and feed grain or the like to the thresher.

2. A side-hill harvester comprising a thresher mounted on a leveling base with a main-wheel and a grain-wheel, an axle-bar for the grain wheel which extends beneath the thresher and is hinged adjacent to the main wheel, means to maintain the vertical position of the thresher on sidehills consisting of a screw adapted to effect the hinge movement of the axle-bar on its hinge, and means to cut and feed grain or the like to the thresher.

3. A side-hill harvester comprising a thresher mounted on a leveling base with main-wheel and grain-wheel, an axle-bar for the grain wheel which extends beneath the thresher and is hinged adjacent to the main-wheel, means to maintain the vertical position of the thresher on hillsides consisting of a rotatable screw and an abutment-block movable thereby, a guide for the block, a link-brace between the block and axle-bar to effect the hinge movement of the axle-bar on its hinge, and means to cut and feed grain or the like to the thresher.

4. A side-hill harvester comprising a thresher mounted on a leveling base with main-wheel and grain-wheel, an axle-bar for the grain-wheel, which extends beneath the thresher and is hinged adjacent to the main wheel, means to maintain the vertical position of the thresher on hillsides consisting of a rotatable screw and an abutment movable thereby, a guide for the abutment, a link between the abutment and axle-bar, power connections engageable at will to effect the rotation of the screw and the hinge movement of the axle-bar on its hinge, and means to cut and feed grain or the like to the thresher.

5. A side-hill harvester comprising, a thresher mounted on a frame, a main-wheel and a guide-wheel journaled on the frame, a grain-wheel journaled on an axle-bar which extends beneath the frame and is hinged thereto, a brace attached to the axle-bar and which extends forwardly to a hinge whereby it is connected to the frame, connections between the frame and axle-bar adapted to effect the hinge movement of the axle-bar on its hinge and maintain the position of the thresher, and means to cut and feed grain or the like to the thresher.

6. A side-hill harvester comprising, a thresher mounted on a leveling base with main-wheel, grain-wheel and guide-wheel, an axle-bar for the grain-wheel which extends beneath the thresher and is hinged adjacent to the main-wheel, means to maintain the vertical position of the thresher on hillsides by hinge movement of the axle-bar, a header to cut and feed grain or the like to the thresher to which it is attached by a link, and flexible attachments to the axle-bar to support the header.

7. A side-hill harvester, comprising, a thresher mounted on a frame, a main-wheel and a guide-wheel journaled on the frame, a grain-wheel journaled on an axle-bar hinged to the frame, a header to cut and feed grain or the like to the thresher supported upon a horizontally movable connection projecting from the axle-bar to support the header.

8. A side-hill harvester comprising, a thresher with a side opening feeder-house and mounted on a wheel base, an axle-bar for the grain-wheel of the base which is hinged to permit of its vertical arc movement, means to maintain the vertical position of the thresher by the hinge movement of the axle-bar, a header having a feeder-spout to carry grain through the feeder-house opening, a horizontal arm between the header and axle-bar and a vertical arm between header and thresher whereby through the co-action of the two arms the header is supported and the position of the feeder-spout is controlled.

9. A side hill harvester comprising a

thresher mounted on a leveling base with a main wheel and a grain wheel, an axle bar for the grain wheel which extends beneath the thresher transversely of the longitudinal axis thereof and is hinged adjacent the main wheel adjacent the end of the axle thereof, means to maintain the vertical position of the thresher on hillsides by the hinged movement of the axle-bar, a threshing cylinder on a rotatable shaft, power connections for driving the cylinder consisting of an internal gear on the main wheel, a counter shaft journaled on the frame, a pinion on the counter-shaft meshing with the gear, a sprocket-wheel on the counter-shaft, a sprocket-pinion on the cylinder shaft, a sprocket-chain directly connecting the sprocket wheel and pinion, and means to cut and feed grain or the like to the cylinder.

10. A side hill harvester comprising a thresher, a wheel base therefor including a thresher supporting frame, a main wheel, a grain wheel journaled on an axle bar hinged to the frame adjacent to the main wheel, a header flexibly connected to the thresher frame to cut and feed grain to the thresher, power connections between the main wheel and thresher for operating the latter, and power connections between the grain wheel and header for operating the latter.

11. A side hill harvester comprising a thresher, a wheel base therefor including a thresher supporting frame, a main wheel, a grain wheel journaled on an axle bar hinged to the frame adjacent to the main wheel, a header flexibly connected to the thresher frame to cut and feed grain to the thresher, power connections between the main wheel and thresher for operating the latter, power connections between the grain wheel and header for operating the latter, and means for raising and lowering the sickle end of the header whereby the height of the cut may be varied.

12. A wheel-base for side-hill harvesters comprising, a thresher-supporting-frame, a main-wheel and a guide-wheel journaled on the frame, a grain-wheel journaled on an axle-bar hinged to the frame adjacent to the main-wheel, and means for effecting the hinge movement of the axle-bar on its hinge.

13. A wheel-base for side-hill harvesters comprising, a thresher-supporting-frame, a main-wheel and a guide-wheel journaled on the frame, a grain-wheel journaled on an axle-bar hinged to the frame adjacent to the main-wheel, a vertically movable brace-link attached to the axle-bar and connecting it to power means for effecting the hinge movement of the axle bar.

14. A wheel-base for side-hill harvesters comprising, a thresher-supporting-frame, a main-wheel and a guide-wheel journaled on the frame, a grain-wheel journaled on an axle-bar hinged to the frame adjacent to the main-wheel and movable in a plane at right angles to the plane of rotation of the main-wheel, a power operated screw and connections between the screw and axle-bar whereby the screw effects the hinge movement of the axle-bar.

15. A side hill harvester comprising a thresher, a wheel base therefor including a thresher supporting frame, a main wheel, a grain wheel journaled on an axle bar hinged to the frame adjacent to the main wheel, a header flexibly connected to the thresher frame to cut and feed grain to the thresher, power connections between the main wheel and thresher for operating the latter, power connections between the grain wheel and header for operating the latter, and means for raising and lowering the sickle end of the header whereby the height of the cut may be varied, consisting of engageable and disengageable power connections whereby the height of the cut is varied at will.

16. A side hill harvester comprising a thresher mounted on a leveling base with a main wheel and a grain wheel separated laterally from one another, an axle bar projecting between the respective wheels intermediate the sides thereof and beneath the thresher, the grain wheel being mounted on the axle bar at one end thereof and the opposite end of the axle bar being pivoted at a point adjacent the end of the axle of the main wheel, a brace bar projecting at an angle forwardly from the axle bar adjacent its point of connection with the grain wheel and pivoted to the frame to swing vertically at a point in substantial alinement with the main wheel, and means for adjusting the axle bar vertically comprising a pivoted link connected to the bar, and means for adjusting said link vertically.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CLARENCE LEO BEST.

Witnesses:
F. O. MEYERS,
H. C. BARTON.