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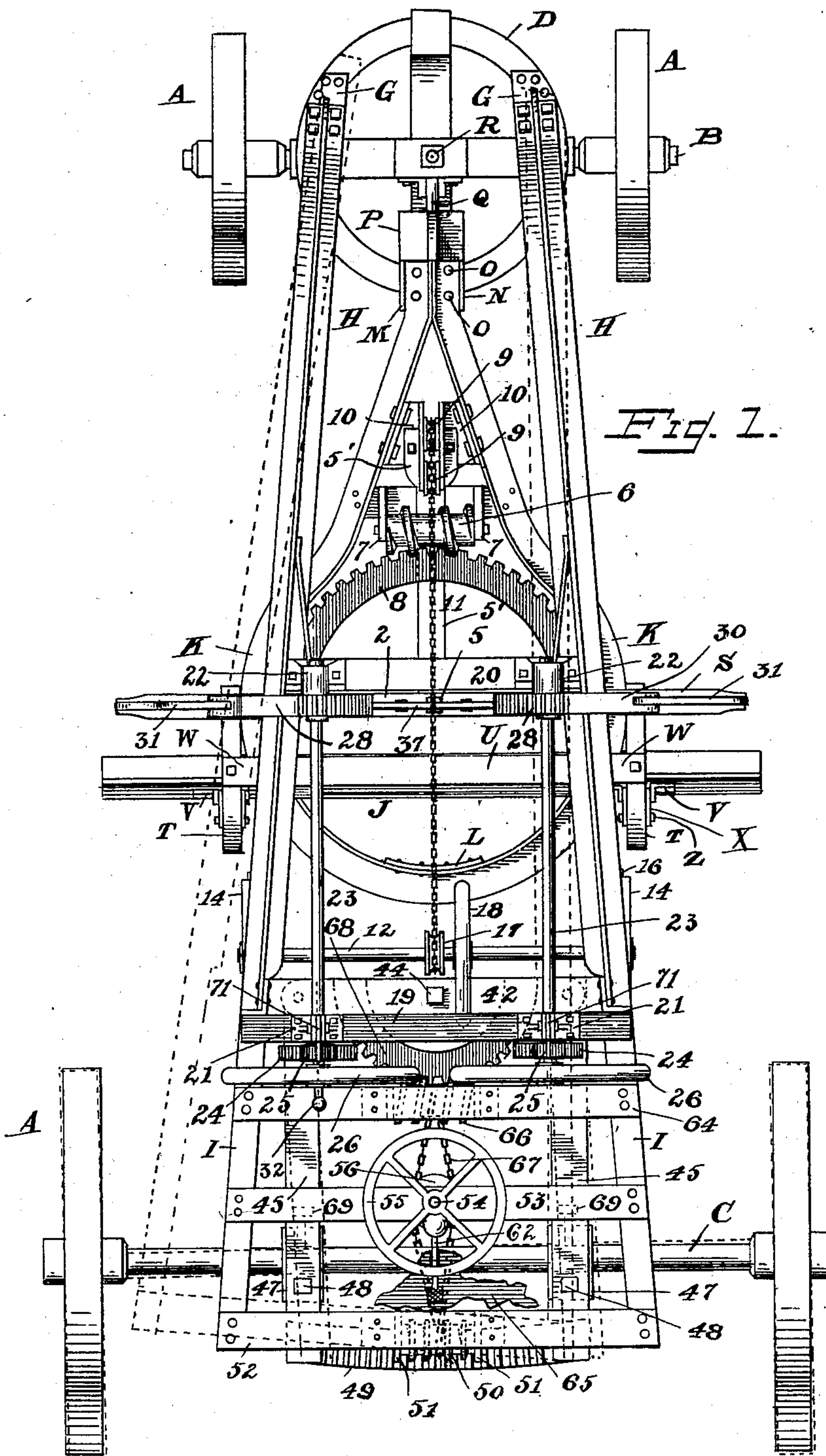
PATENTED JULY 7, 1903.

W. H. JOHNSTON.  
DITCHING MACHINE.

APPLICATION FILED JULY 7, 1902.

NO MODEL.

4 SHEETS—SHEET 1.



WITNESSES  
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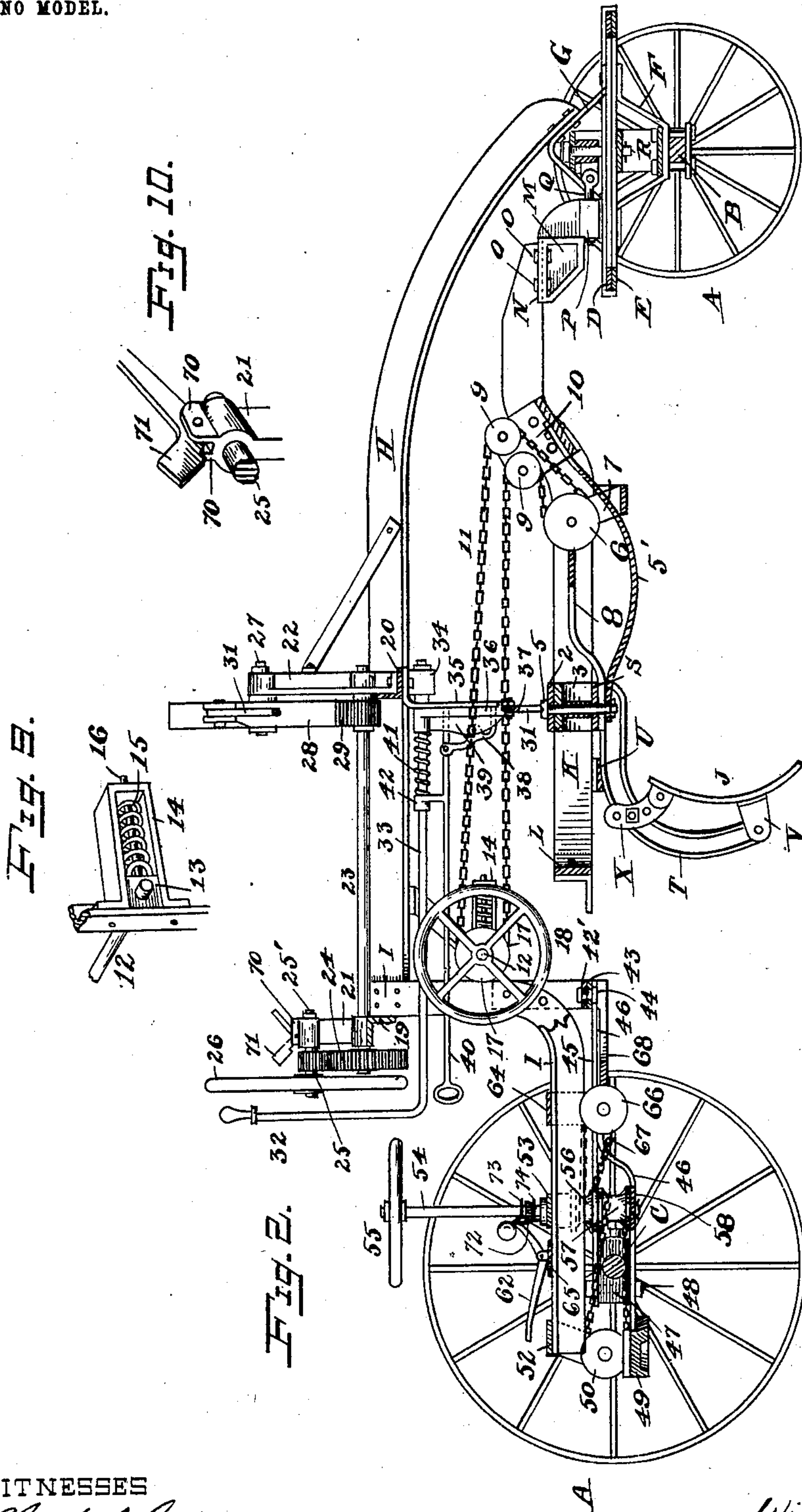
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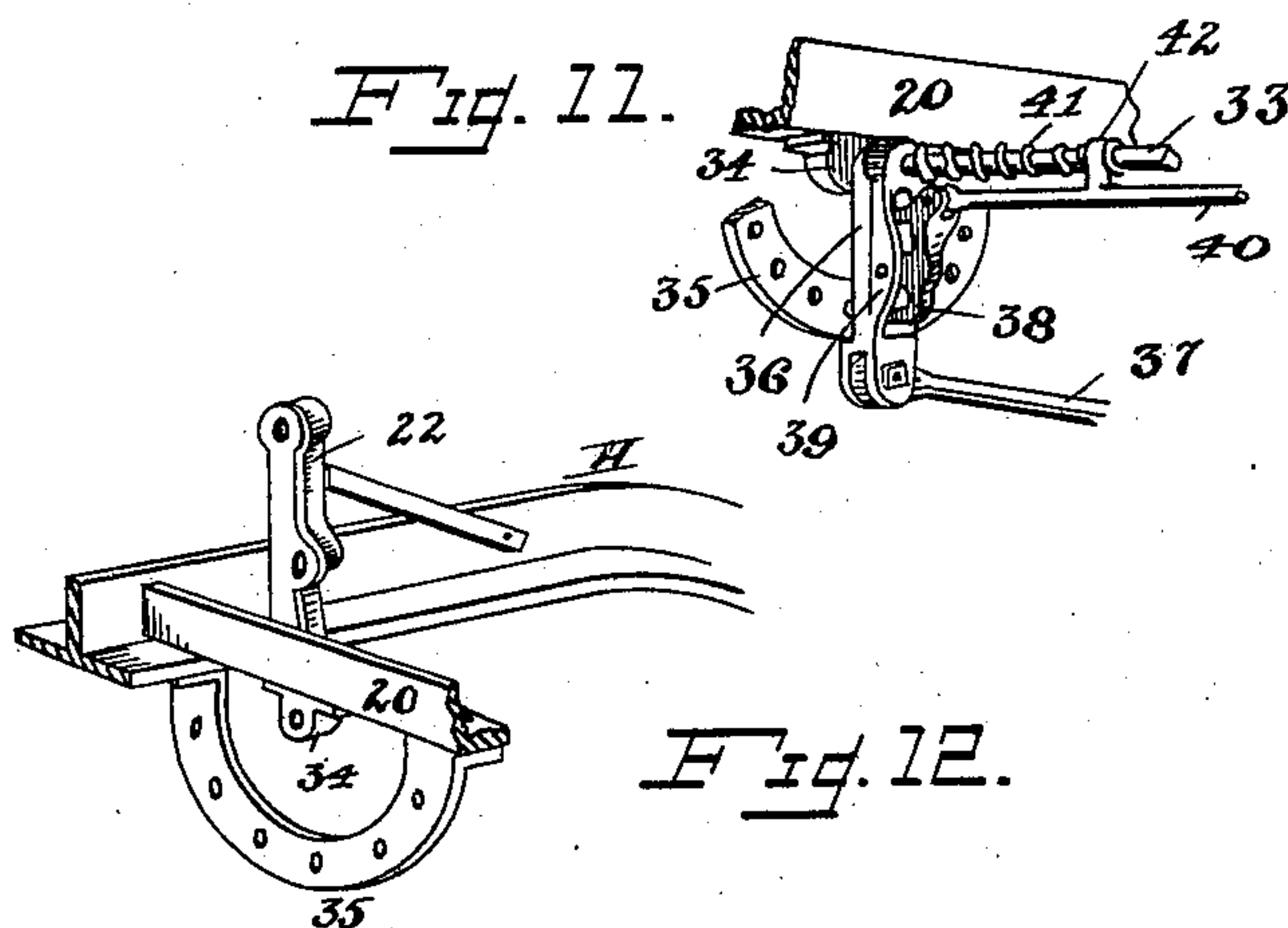
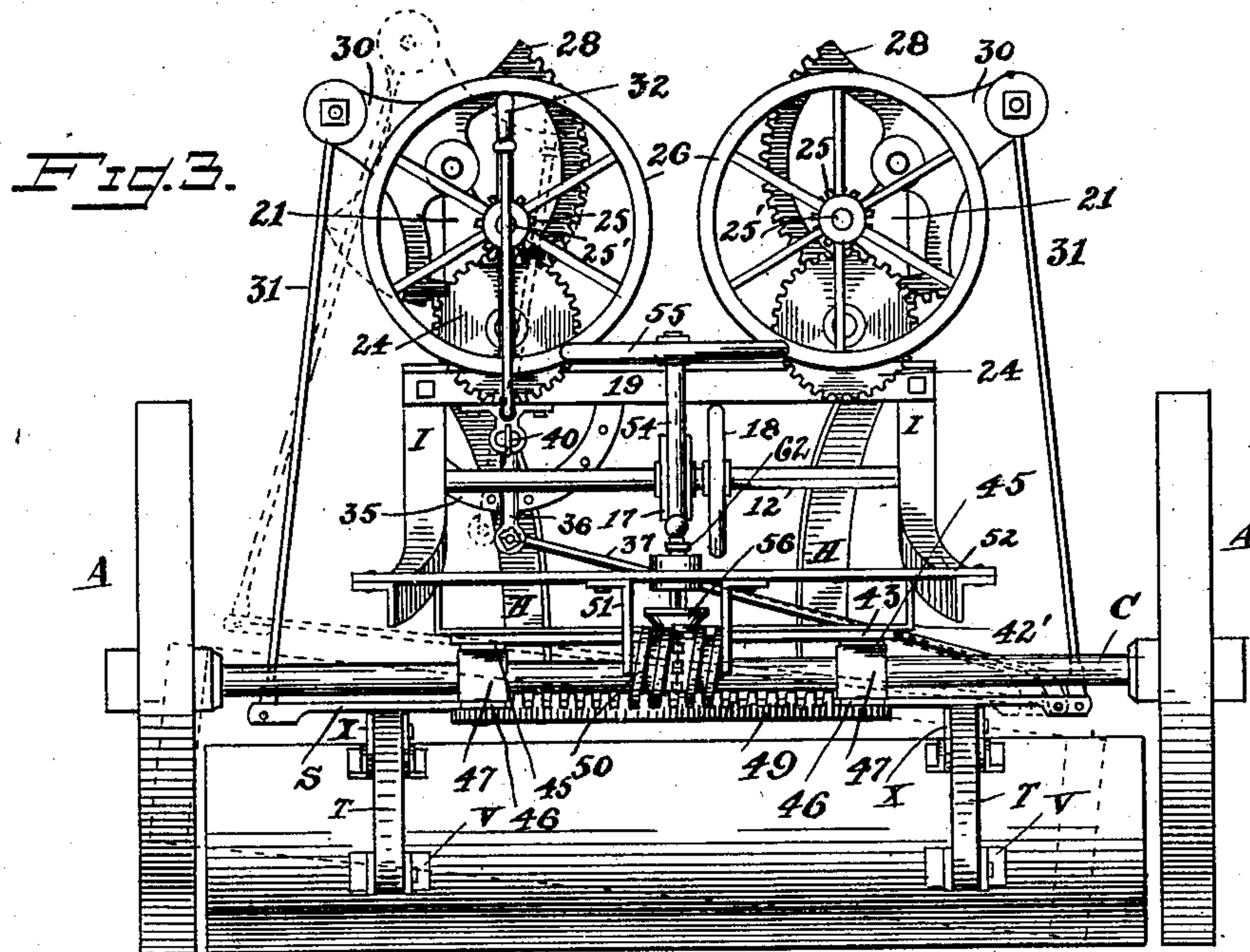
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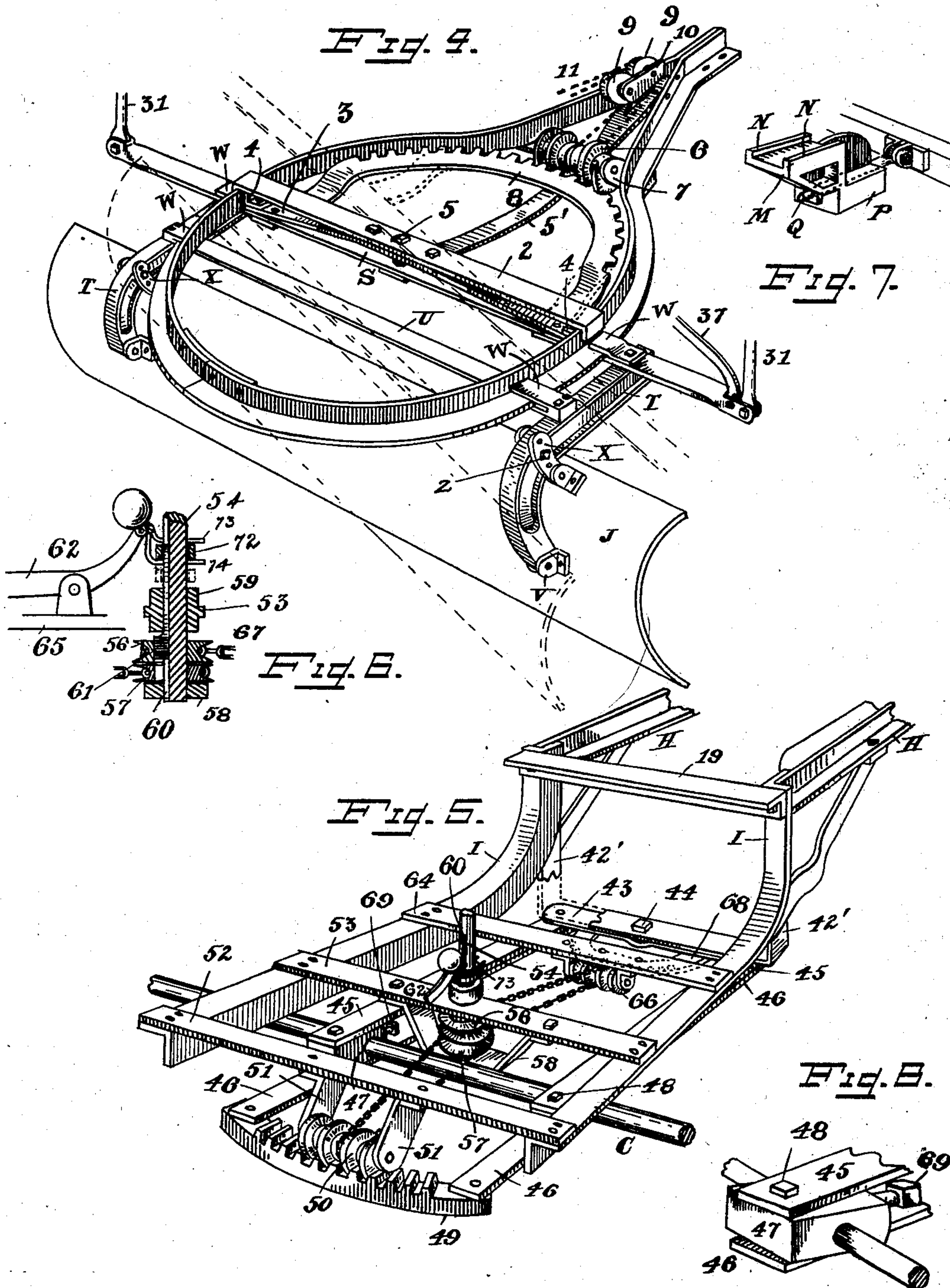
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4 SHEETS—SHEET 4.



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# UNITED STATES PATENT OFFICE.

WILLIAM H. JOHNSTON, OF PEORIA, ILLINOIS, ASSIGNOR TO WILLIAM H. BINNIAN, OF PEORIA, ILLINOIS.

## DITCHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 732,747, dated July 7, 1903.

Application filed July 7, 1902. Serial No. 114,605. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM H. JOHNSTON, a citizen of the United States, residing at Peoria, in the county of Peoria and State of Illinois, have invented certain new and useful Improvements in Ditching-Machines; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

This invention pertains to improvements in that class of implements known as "road-scrapers" or "ditching-machines."

The object of said invention is to provide a more simple arrangement of the component parts of a road-scraper.

A further object is to improve on the older forms of this class of machines by placing all of the operating parts within easy reach of the operator.

A still further and important object is to construct a road-scraper with a greater number of advantages for accomplishing the work required of it and to operate the parts for gaining these advantages by means placed within easy reach of the operator.

Another object is to perform two operations or movements of the machine from a single operating means, all of which will be fully brought out in the specification.

The invention in addition to the above relates to certain details of construction which will be pointed out in the claims.

In the accompanying drawings, Figure 1 is a plan view of my improved machine. Fig. 2 is a side view of the same, showing the same in part section. Fig. 3 is a rear view of the machine. Fig. 4 is a perspective view of a scraper, showing the means for carrying it. Fig. 5 is a perspective view of means for imparting a side swing to the carrying-wheels of the machine. Fig. 6 is a detail view, in part section, of a shifting-key used with part of the operating means of the machine. Fig. 7 is a perspective view of a pivot for the front of the machine on which the scraper-support is hung. Fig. 8 is a perspective view of a portion of the rear axle, showing a pivoted block for carrying the same. Fig. 9 is a perspective view of a yielding journal-box for carrying one of the operating-shafts. Fig. 10

is a perspective of a locking device for use in locking certain gear-wheels against movement. Fig. 11 is a perspective view of a locking device used in imparting end movement to the scraper. Fig. 12 is a perspective view of a bearing or support for two of the shafts which form part of the operating means, said figure also showing a portion of the device shown in Fig. 11.

In the various figures, A A represent the wheels of my machine, and B and C the front and rear axles, respectively. Upon the front axle B is mounted a fifth-wheel composed of an upper and a lower plate D and E, respectively. Said fifth-wheel is supported by means of stirrups F, only one of which is shown, Fig. 2. Stirrups G G are secured to the upper plate D, one being at each side, as shown in Fig. 1, and said stirrups each support a T-beam H, which forms a portion of the main frame. The ends of the said beams are bolted or riveted to said stirrups, the latter being in the form of an A, and are bent up in the arc of a circle, as in Fig. 2, and extend backward horizontally and diverge as they proceed in said backward direction. Said T-beams are inverted, as shown, and at their rear ends bolted or otherwise attached to angle-bars I I. The latter, as shown in Fig. 5, are secured at right angles to the beams H H and extend downward for some distance and are then bent at right angles and extend rearwardly in a horizontal manner and diverge toward the rear in the same line as the beams H H, as will be seen in Fig. 1. The manner of supporting the rear portion of the frame thus formed will be described later. Attention is now directed to the means for carrying the scraper, (indicated at J.) Such means consists of what I term a "gooseneck" and comprises two portions K K, which together form a circle of angle-iron, as shown in Figs. 1 and 4. The ends at the rear of the circle are abutted and secured together by means of a plate L, riveted on the inside. The other ends of the angle-bars converge and are finally brought together within a saddle-block M. (Shown in Figs. 1, 2, and 7.) This block consists of a body having an upwardly-projecting flange N at each side, and between these flanges the conver-



gent ends of the angle-bars are placed and held by means of bolts O, Figs. 1 and 2. The said block M has a lower extension P, through which passes a horizontal bolt Q, which is  
 5 pivoted for vertical swinging movement to a portion of the upper plate D of the fifth-wheel. The exact construction of this portion of the machine I do not lay any particular stress upon, but merely describe sufficient  
 10 thereof to make the idea understood. It will be sufficient to state that the portion to which said bolt Q is secured is suitably held by a vertical king-bolt R, about which said portion moves in order to permit the block M to  
 15 have a swinging movement horizontally. The said bolt Q is loose within the block M, and thereby permits the block M and its gooseneck to have a movement about said bolt, as will be hereinafter fully described. The  
 20 scraper J, before referred to, is carried by said gooseneck by means of a bar S, which extends beneath said gooseneck and upon which the latter rests. Channel-iron beams T T are bolted to the bar S, as shown in Fig.  
 25 4, and as an additional means of support for such beams a bar U is attached at each end to one of the beams and extends beneath the gooseneck in a manner similar to the beam S. Both the beams thus provided are made  
 30 to work loosely on the horizontal limb of the angle-iron of which the goosenecks are composed by means of lugs W, secured in suitable manner to the beams for which they are intended. It has been my practice to use the  
 35 same bolts for bolting the bars or beams to the bars T for this purpose. The forks formed by the lugs W and their beams S and U thus serve to guide the scraper J in a circular movement by the aid also of the angles  
 40 4, to be described. The said scraper is pivotally carried on the beams T T by the ears V, as shown in several of the figures, and is made adjustable on its pivots by means of bars X X, which are pivoted to the scraper,  
 45 and being provided with a series of holes Y and a bolt Z the scraper may be set at any desired angle by passing the bolt through certain of the holes in said bars and a hole (not shown) in the bars T T, all of which will be understood. I provide a support for the bar S,  
 50 which consists, first of a bar 2, which rests across the gooseneck, so as to pass over the center thereof, and the ends of such bar are bent down over the vertical limb of the angle-iron. Beneath this bar is a second bar 3,  
 55 bolted at its middle to said bar 2, as shown. Its ends are bent down and approach the inside of the vertical web at the bottom, as shown in Fig. 4, and each end carries an angle 4 by bolts. A bolt 5 passes through the bars 2 and 3 and thence through the bar S, and a tug-strap 5', which runs forward and connects with the gooseneck, as shown. A cotter-pin beneath completes the arrange-  
 60 ment. To the forward portion of the gooseneck, between the divergent ends, is journaled a worm 6. The journals for the shaft of said

worm consist of ears 7, secured to the frame. Said worm engages a semicircular toothed rack 8, which is secured to the under side of  
 70 the bar S, and movement imparted to the worm also imparts a swinging movement to the rack, and consequently to the bar S and the scraper J. The swinging movement carries the entire scraper and its parts around  
 75 in either direction, according to the direction of revolution of the worm. The means for imparting this movement is shown in Fig. 2 and partly in Fig. 4. In the latter figure two  
 80 sheave-wheels 9 are journaled between brackets 10, secured to the gooseneck in suitable manner, and over these wheels a chain 11 runs and passes around the worm 6 in a groove provided for it and wherein the chain is positively held against slipping.  
 85

As shown in Fig. 2, a shaft 12 is carried just ahead of the frame portions L I. The bearing for one end of said shaft is shown in Fig. 9 and consists of a block 13, through which the shaft passes, and said block is carried  
 90 in a horizontal yoke or housing 14, secured to the said frame portion 1. The opposite end of the shaft is mounted in the same way, and a spring 15 is inserted between the end of the yoke and the block and keeps  
 95 the latter normally in the position shown, while a pin serves to guide the block in its movements within the yoke, the cause of such movement to be described later. Said shaft  
 100 12 carries a grooved wheel 17, over which the chain 11 is adapted to run, and a hand-wheel 18 imparts rotary movement to the shaft to move the chain. Now it will be seen that  
 105 since the bars 2, 3, and S are free to turn on the gooseneck and that the toothed semicircular rack or segment is attached to said bar S when the worm 6 is revolved by means of the chain and the hand-wheel said bars S,  
 110 and consequently the scraper J, will receive a swinging movement, such as has been described hereinbefore. It will be seen also that the strain on the scraper will be received by the tug-strap 5' and the gooseneck. By the means just described it is possible to place  
 115 the scraper at any angle in a horizontal plane, and I have provided means in addition thereto for tipping said scraper at any angle in a vertical plane as well. The arrangement for accomplishing this is shown in Figs. 1, 2, and 3, but more particularly in the latter figure.  
 120 Upon cross-beams 19 and 20 are mounted bearings 21 22, respectively, which carry the horizontal shafts 23. The shafts carry at their rear ends gear-wheels 24, with which mesh pinion-gears 25, mounted on short shafts 25', having  
 125 bearings also on the portions 21 described. Said short shafts are revolved by means of hand-wheels 26, which are just behind the pinions, as shown. The bearings 22 besides having the forward ends of the shafts 23 carry, by  
 130 short shafts 27, the segment-levers 28, which mesh with pinions 29 on said shafts 23. Said segment-levers have the projecting arms 30, to which are pivotally hung rods 31, whose lower



extremities are loosely attached to the projecting ends of the bar S of the scraper mechanism, as shown. When the hand-wheels 26, or either of them, turn, the segment-levers 5 will be moved to raise or lower the depending rods 31, and this raises or lowers the scraper at one end or the other or bodily move the entire scraper, depending upon what movements are given said hand-wheels. 10 In broken lines in Fig. 3 I have illustrated how the scraper is raised at one end and showing the position of the segment-lever at one side of the machine.

In addition to the horizontal and vertical 15 movements of the scraper I am enabled to impart an end movement to the scraper and accomplish this by means of a lever 32, Figs. 2, 3, and 11. Said lever 32 stands in a vertical position normally or when the scraper is hanging in the middle of the machine and is bent 20 at right angles to form a horizontal shaft 33, having a bearing at 34 beneath the cross-beam 20. Adjacent to such bearing is a segment consisting of a depending semicircular 25 perforated plate 35, secured in suitable manner to said cross-beam 20. Secured to the shaft 33 is a depending arm 36, to the lower end of which is pivotally attached a rod 37, which runs obliquely to the bar S at one end, 30 as shown in Figs. 3 and 4. It will be observed that when the lever is thrown to either side of its normal vertical position the scraper will be thrown in the contrary direction, as indicated in broken lines in Fig. 3. In this 35 figure said broken lines indicate the raised position of the scraper combined with the end movement thereof, as will be understood. In order to sustain the scraper in whatever position it is desired to keep it, I provide a 40 pawl 38, which is pivoted between ears 39 on the arm 36 described. The lower end of such pawl is designed to enter the holes or perforations in the plate 35, and the opposite end of said pawl is connected with a push-rod 40, 45 which has a vertical arm 42 thereon to surround the said shaft 33. A spring 41 between the said arm 42 and the arm 36 normally keeps the pawl in engagement with one of the holes in the plate 35, and when it is desired 50 to shift the scraper J in an endwise manner the rod 40 is pushed from the operator, thus releasing the pawl from the said plate 35, after which the lever 32 can be swung as desired. Thus far the mechanism described 55 relates entirely to the various movements of the said scraper.

An important part of my invention and to which I attach considerable value is the means for swinging the entire frame to one 60 side, as indicated in broken lines in Fig. 1, in order to carry the scraper J to an extreme position for work. In Figs. 2 and 5 I show a U-shaped hanger 42, having its ends attached to the frame portions I I. At the middle of 65 this hanger is pivoted an arm 43 at its middle by means of a bolt 44, and to each end of said arm 43 are pivoted the ends of two arms

45 and 46. The upper arm 45 is straight and extends rearwardly over the rear axle C. The lower arm 46 extends backward parallel with 70 the upper arm and is then bent downward and rearward, as shown in Fig. 2. Between each pair of the arms is a block 47, through both of which the said axle C passes. A bolt 48 passes through both arms and the block 75 behind the shaft and forms a pivot for the block, which at times swings outward, as shown in Fig. 8. The lower arms 46 project rearward from the blocks 47, while the upper ones are merely long enough to receive the 80 said bolts 48. On the extreme ends of the said lower arms 46 is hung a toothed rack 49, formed in the arc of a circle whose center is struck from the center of the fifth-wheel at the front of the machine. Above said rack 85 and meshing therewith is a worm 50, carried between downwardly and rearwardly projecting arms 51, bolted to the under side of a cross-bar 52, bolted upon the tops of the frame I I. Some distance from said cross-bar 52 90 and parallel therewith is a second cross-bar 53, through which passes a vertical shaft 54, carrying at the top a hand-wheel 55. Beneath the cross-bar on said shaft are two grooved wheels 56 and 57. Around the lower 95 wheel 57 passes a chain, which also runs around the worm 50, described. The lower end of the shaft is supported by a bracket 58, bolted to the bar 53. Above and below the bar 53 is a boss 59, Fig. 6, which forms a 100 bearing for the shaft and assists in maintaining it in rigid vertical position. A keyway 60 is cut in the shaft, and within it is adapted to slide a key 61. In each wheel 56 and 57 is also a keyway corresponding with that in the 105 shaft. The upper end of the key 61 is suitably attached to a foot-lever 62, which is weighted at 63 in such manner that the key is normally at its lowest position, as indicated by broken lines in said Fig. 6; but when the 110 foot is placed upon said lever 62 the key is drawn up into the upper wheel 56. Said lever is mounted upon a platform on which the operator stands, said platform covering the frame I I above the bars 52 53 and the bar 115 64, about to be described. Only a portion of the platform is shown in the drawings. (See Fig. 1 at 65.) A third bar 64, above mentioned, carries on its under side a worm 66, which is operated by means of a chain 67 120 passing around the grooved wheel 56, as shown. Said worm is adapted to engage with and swing a semicircular rack 68, secured to the pivotal arm 43, as better shown in Figs. 1 and 5. 125

It often becomes necessary to swing the scraper J much farther to one side or the other than can be done with the lever 32, and when this time arrives the operator, standing upon the platform 65, merely turns the hand- 130 wheel 55 to the right or left, according to the side he desires to swing the said scraper. This movement imparts movement to the worm 50 through the wheel 57 and its chain



and swings the frame I and H on the pivot-bolt R of the fifth-wheel D E. In reaching the position indicated in broken lines in Fig. 1 it is evident that since the arms 45 and 46, which are supported by the axle, must turn slightly in the opposite direction—that is to say, the frame in swinging over to the position and angle shown in said Fig. 1 will move the pivot-bolt 44 of the arm 43, to which the arms 45 and 46 are connected, in the same direction—and since the wheel and axle support the entire frame they will of course remain stationary, but will swing at an angle, as shown by broken lines, by the movement of the said arms 45 and 46. However, this movement of the wheels and axles will be very slight by reason of the pivotal blocks 47 described, which allow the arms 45 46 to swing on the pivot-bolt 48, while the axle remains in substantially the same position, except for the friction of the parts which would tend to move said axle. I provide locking-bolts 69, which pass into the forward ends of the blocks 47 against the axle, and these serve to prevent the blocks slipping on said axle.

Since the wheel 57 is normally locked to the hand-wheel shaft 54, it will be seen that the mechanism for swinging the implement-frame is always ready for immediate action. After the frame has been set at the desired position by the above means it becomes necessary to bring the wheels of the rear axle into perfect line, and in order to do this it is only necessary to place the foot upon the foot-lever 62, and thus raise the key 61 into the top wheel 56 while still turning the hand-wheel. This action imparts movement to the worm 66 and turns the arm 43 by the rack 68, and this imparts a movement to the arms 45 46 in the direction of their length and places the shaft C parallel with the front one, so that the machine will move ahead in a straight line. Having done this, the scraper has been carried out as far as desired and the work proceeds. It will be seen that the support for the rear end of the frame comes from three points. The axle C supports the arms 45 46, and those at one end carry the frame I I by the U-shaped yoke 42 and at the extreme rear end by the rack 49 and the worm 50, which has a bearing on the said frame I I.

As regards the universal movement of the scraper J by means of the various operating portions it must be seen that a universal pivot-point must be provided for the forward end of the gooseneck. The king-bolt R is provided for the horizontal movement, the pivotal connection of the bolt Q with the portion surrounding said king-bolt provided for the vertical, and the said bolt Q being loose in the block P provides for a rocking movement, and the three connections combined permit of the universal movement, so that the scraper can be swung or raised to any and every angle possible. The foregoing being true some means must as a matter of course be provided for permitting the chain

11 to be free to operate at all times. This is provided for by employing the yielding bearing shown in Fig. 9, which allows the chain to be drawn upon when the distance between the wheels 9 and 17 increases. The bearing-block for the shaft will be drawn against the spring, which will naturally yield, so that the chain will not be stretched so tight as to be useless for adjusting purposes.

I have described the shafts 23 and their gears tipping the scraper at any angle in a vertical plane. When the desired position is reached, some arrangement must be provided for maintaining it in that position. Upon the top of the bearings 21, Figs. 2 and 10, are two ears 70, between which is pivoted a latch 71, adapted to enter between the cogs of the pinion 25. The operator when wishing to raise the scraper throws back the latch out of the cogs and after manipulating the hand-wheel returns said latch to its locking position, and there the parts are held until again liberated for further use.

Returning now to the means for shifting the key 61, which I have gone over in a casual way, it may be understood that a ring 72 surrounds the shaft and has the said key secured thereto and made therewith, and a double fork 73 74 straddles the shaft above and below the ring. Now it will be understood that the shaft may be turned, and with it the key, without hindrance from the foot-lever 62, to which the said forks are attached. By raising or lowering the lever the key is shifted to the desired wheel, as described.

I claim—

1. In a ditching-machine, the scraper, a supporting-frame for such scraper from which the latter is pivotally hung, a rack adapted to move with the scraper, a worm for engaging the rack and an endless chain for rotating the worm and imparting movement to the scraper through the medium of the said rack for the purposes set forth.

2. In a ditching-machine, the scraper thereof, a frame for carrying it in pivotal manner, a semicircular rack adapted to turn with the scraper, a worm carried on the frame and engaging the rack, an endless chain encircling the worm and a hand-wheel and its shaft for imparting movement to the chain and worm to swing the scraper through the medium of the rack.

3. In a ditching-machine the scraper pivotally carried thereon, a rack for use in swinging the same about its pivot, means engaging the rack for turning it, and a chain for imparting motion to the said means for turning the scraper on its pivotal support as described.

4. In the ditching-machine, the scraper pivotally carried thereon, a rack for use in swinging the same about its pivot, means engaging the rack for turning it, a chain connected with and imparting movement to the said means for turning the scraper as desired and means for yieldingly holding the chain for the purposes described.



5. In a ditching-machine the front and rear carrying-wheels and the main frame therefor, a scraper, a support for the scraper consisting of a circular frame, means for loosely carrying the same at its forward end to permit a universal movement therefor as set forth, a supporting-bar to which the scraper is secured, the same adapted to carry the said frame, means attached to the frame for pivotally carrying said bar at the middle thereof at the middle of the frame, and means for swinging the bar on its pivot to likewise swing the scraper for the purposes set forth.

6. In a ditching-machine, the main frame, the front and rear carrying-wheels, a scraper, a supporting and carrying frame for said scraper, the same adapted to vibrate with relation to the main frame, means for pivotally carrying the scraper beneath said frame, and means for imparting movement to the scraper in a horizontal plane independent of said frame.

7. In a ditching-machine, the main frame, the carrying-wheels therefor, a scraper, a circular frame for carrying the latter, said frame having attachment with the front of the machine, a bar pivoted at the middle of the frame and to which said scraper is secured, a cogged rack attached to the bar and a worm-wheel engaging the same for swinging the rack and bar to impart a swinging movement to the scraper in a horizontal plane.

8. In a ditching-machine, the main frame, the carrying-wheels therefor, a scraper, a circular frame having pivotal attachment with the front of the machine, such attachment providing a universal joint by which the said frame is capable of movement in all directions, a bar extending across such circular frame for carrying the scraper and pivoted at the center thereof and on which pivot said bar is adapted to swing in the same plane with the frame, and means for tipping the scraper at any angle in a vertical plane.

9. In a ditching-machine, the main frame thereof, the carrying-wheels therefor, a scraper, means for pivotally carrying the same to swing in a plane vertical to the axis of the pivot, means for imparting movement to the scraper in a vertical plane, and means for shifting it in the direction of its length all for the purposes explained.

10. In a ditching-machine, the main frame thereof, the carrying-wheels therefor, a scraper, carrying means for the scraper, the same being attached to the front of the machine and allowed a swiveling movement therein, means on the main frame for moving the scraper in a vertical plane which consists of segment-lever pivoted on said main frame and having connection with the scraper-carrier and devices for operating such levers to raise and lower said scraper.

11. In a ditching-machine, the scraper, a frame for carrying it, said frame permitting movement of the scraper in any direction or at any desired angle, means for pivoting

said scraper on its carrying-frame to permit movement thereof in the same plane as that occupied by said frame, a rack for turning the scraper on its pivot, a worm engaging the rack, a chain and hand-wheel mechanism for operating the worm for turning the rack and scraper, means for tipping the scraper up at one end or the other or raising the same bodily from the ground, such means consisting of a substantially vertical rod connected with the carrying mechanism of the scraper at each end, means for moving the rods in the direction of their lengths for the purposes indicated, and means for shifting the scraper transversely of its line of forward movement which consists of a bar having connection with the scraper-carrying frame and extending across the machine at right angles to the line of movement of said machine, a lever for shifting the rod in the direction of its length and means for locking the same wherever placed for the purposes set forth.

12. In a ditching-machine, the scraper, means for carrying it and permitting a universal movement thereof upon the machine, and means for imparting a vertical movement to either end of the scraper or both ends simultaneously which comprises a substantially vertical rod connected to each side of the scraper-carrying means, a segment-lever for each rod, both being pivoted on the machine, said rods being carried thereby, and gears having engagement with the segments the turning of which imparts an up-and-down movement to the rods for the purposes described.

13. In a ditching-machine, the main frame, the wheels for carrying the same, a scraper, a carrier for said scraper, the same capable of being turned at any angle, means for swinging the scraper on its carrier in a plane corresponding with that of the carrier, means for moving said scraper in a vertical plane and means also for shifting the scraper from side to side of the machine, which consists of a lever mechanism fulcrumed on the main frame, and rods connecting said mechanism with the carrier for the scraper and devices for operating such mechanism for raising and lowering the said scraper.

14. In a ditching-machine, the main frame, and carrying-wheels, a scraper, a circular frame for carrying it, a bar extending across the frame to which the scraper is attached, means secured to said frame to which said bar is pivoted, a semicircular toothed rack secured to said bar, a worm having engagement with the rack, means for imparting rotary movement to said worm to turn the rack and swing the scraper on its pivotal support, a rod attached to each end of the bar which supports the scraper, segment-levers on the main frame above the scraper to which said rods are connected, and gears for operating said levers to raise and lower the said scraper by means of its rods for the purposes explained.



15. In a ditching-machine, the main frame and carrying-wheels, a scraper, circular frame for carrying it, a bar extending across the frame and to which the scraper is attached, means secured to said frame to which said bar is pivoted, a semicircular toothed rack secured to said bar, a worm having engagement with the rack, means for imparting rotary movement to said worm to turn the rack and swing the scraper on its pivotal support, a rod attached to each end of the bar which supports the scraper, segment-levers on the main frame above the scraper to which said rods are connected, gears for operating said levers to raise and lower the said scraper by means of its rods, a rod attached to the scraper-carrying bar, a lever fulcrumed on the main frame and having the said rod connected therewith whereby the scraper may be shifted in the direction of its length for the purposes described and means for locking the scraper in the position placed substantially as described.

16. In a ditching-machine, the main frame and carrying-wheels, a scraper, a frame for carrying the same, a toothed segment for swinging the scraper, a worm for engaging the segment, a sheave-wheel, a shaft on the main frame for carrying the said sheave-wheel, sheave-wheels on the scraper-carrying frame in the vicinity of the worm and a chain passing over the several wheels and the worm to transmit movement to the segment when the chain is moved.

17. In a ditching-machine, the main frame, the front and rear carrying-wheels, the rear axle, supports on said axle, arms between which the said supports are pivotally held, said arms having their support on the main frame in a pivotal manner, said supports on the axle pivoted to said arms for the purposes described, means for shifting the main frame upon the pivots of the arms and means also for shifting the rear axle on the pivots of the said supports by means of the arms, the said means for shifting the frame and axle being comprised in a single device.

18. A ditching-machine comprising the main frame and wheels, the scraper beneath the main frame, means for shifting the main frame along the rear axle to set the scraper over as described and for the purposes set forth, said means also being employed to adjust the rear axle to its normal position when rendered out of line in moving the frame as described, such means being comprised in a single device which after having been adjusted is held against voluntary movement.

19. In a ditching-machine, the main frame, the front and rear axles and their wheels, the said main frame pivotally carried on the said front axle and adjustably carried on said rear axle for lateral movement thereon as described, a scraper, a carrying-frame therefor pivotally carried on the front of the machine, means carried on the main frame for imparting movement to the scraper transversely of

its line of movement, and means for shifting the rear end of the main frame also in a transverse direction to impart still further movement to the scraper for the purposes set forth.

20. A ditching-machine comprising the main frame, the carrying-wheels therefor, the rear axle, arms pivotally secured to a part of the main frame at one end and projecting rearward therefrom and pivotally carrying the said axle at their rear ends, a toothed rack attached to the said arms behind the axle, a worm journaled on the main frame and engaging the said rack, a shaft also journaled on the main frame, a chain-wheel thereon, and a chain on the wheel, said chain engaging the worm and imparting rotary movement thereto to move the rack and swing the main frame, said worm and rack together preventing retracting movement of the frame after being set.

21. A ditching-machine comprising the main frame, the carrying-wheels therefor, the rear axle, arms pivotally secured to a part of the main frame at one end and projecting rearward therefrom and pivotally carrying the said axle at their rear ends, a toothed rack attached to the said arms behind the axle, a worm journaled on the main frame and engaging the said rack, a shaft also journaled on the main frame, a chain-wheel thereon, a chain on the wheel, said chain engaging the worm and imparting rotary movement thereto to move the rack and swing the main frame upon the pivotal connection of the arms with said main frame, a toothed rack for imparting movement to the arms in the direction of their lengths, a worm carried on the main frame and engaging said rack, a chain-wheel on the shaft above mentioned and a chain passing over such chain-wheel and the said worm for imparting movement to the latter for the purposes set forth, there being means on the shaft for locking one or the other of the chain-wheels to the shaft independent of the other whereby only one of the worms is operated at a time for the purposes described.

22. A ditching-machine comprising the main frame, the carrying-wheels and their axles, means for pivotally supporting the rear end of the main frame independent of the rear axle whereby lateral movement may be imparted to the said frame for the purposes set forth.

23. A ditching-machine comprising the main frame and carrying-wheels, the rear axle, means for supporting the rear end of the main frame to have lateral movement independent of said axle, manually-operated means for imparting such lateral movement to the frame, such means also adapted to adjust the rear axle and its wheels to bring them into line to permit the machine to go forward in a straight line after shifting the frame, said frame and the axle being capable of movement independently for the purposes set forth and described.

24. In a ditching-machine, the main frame



and carrying-wheels, the yoke 42' secured to said frame, the arm 43 pivoted to said yoke, the rearwardly-extending pairs of arms 45, 46, pivoted at their forward ends to said arms 5 43 substantially as shown, blocks 47 pivoted between said arms 45, 46, the rear axle C held rigidly in said blocks and permitted to have pivotal movement on said arms 45, 46 by means of said pivotal blocks, the rack 49 secured to the rear ends of the rods 46, a worm 10 50 having bearings on the main frame and engaging the rack, a hand-wheel shaft 54 on the frame, a chain-wheel 57 loosely mounted on such shaft, a chain for said wheel and 15 worm, a rack 68 secured to the arm 43, a worm 66 on the main frame for engaging the rack, a chain-wheel 56 on the said hand-wheel shaft, a chain thereon for revolving the worm 66, and means for locking either one of the 20 chain-wheels to the shaft 54 separately all for purposes herein set forth and described.

25. In a ditching-machine, the main frame and carrying-wheels, in combination with scraper, a support beneath the main frame 25 for the said scraper, said support adapted for partial rotary movement on its pivotal support with the front of the machine, said scraper-support also adapted for a vertical and horizontal movement for purposes described, such support pivotally carrying said 30 scraper, means on the main frame for swinging the scraper on its pivot, means also on the main frame for shifting said scraper together with its support in a lateral direction or in a direction substantially at right angles 35 to the line of movement of the machine, means also for moving the scraper vertically, and a device on the main frame for swinging said main frame laterally to impart still more 40 side movement to the scraper.

26. A ditching-machine comprising the main frame and carrying-wheels, a scraper arranged so as to be set at any angle, means for setting such scraper and sustaining it 45 where placed, a device for shifting the scraper in the direction of its length beneath the main frame and means for shifting the said main frame and scraper laterally together whereby greater movement can be given the 50 said scraper than by the shifting device for moving it independent of the said main frame.

27. A ditching-machine comprising the main frame and carrying-wheels, scraper ar-

ranged beneath the main frame, a support therefor having pivotal connection with the 55 front of the machine, means for shifting said scraper in the direction of its length, and means for imparting lateral movement to the rear end of the main frame to also impart a further movement to the scraper in the di- 60 rection of its length for the purposes set forth and described.

28. In a ditching-machine, the main frame and carrying-wheels, the scraper, J, the frame K for carrying it, said frame having loose 65 connection with the front portion of the machine and permitted free movement in all directions, means for swinging the scraper on the frame in a plane with the plane of the frame, such means consisting of the rack 8 70 held in rigid relation to the scraper, a worm 6 on the frame for engaging the rack, the hand-wheel shaft 12 on the main frame, the sheave-wheel 17 on said shaft, the chain 11 for driving the worm from said wheel 17, 75 means on the main frame for imparting vertical movement to the scraper which consists of the segment-levers 28, the rods 31 connected therewith and with the support for the scraper, the hand-wheel shafts 25' connect- 80 ing by means of gearing to said levers for operating them, means for imparting a movement to the scraper in the direction of its length which consists of the lever 32 on the said main frame, the rod 37 connecting the 85 same with the said scraper-support, and means for shifting the main frame at its rear end to impart further movement to said scraper in the direction of its length, which consists of the arms, 45, 46, the arm 43 to 90 which they are pivotally connected, the blocks 47 pivoted between the said arms 45, 46, the rear axle C held in said blocks, the racks 49 attached to the rear ends of the rods 46, the worm 50 journaled on the main frame, the 95 hand-wheel shaft 54 journaled on the frame, the sheave-wheel 56 thereon and the chain for driving said worm from said wheel as set forth.

In testimony whereof I affix my signature 100 in presence of two witnesses.

WILLIAM H. JOHNSTON.

Witnesses:

G. B. DEANE,  
JOSEPH STOREY.