W. S. GRAHAM.

CULTIVATOR.

APPLICATION FILED JUNE 25, 1909.

1,057,143. Patented Mar. 25, 1913.

5 SHEETS—SHEET 1.

Fig. 1.

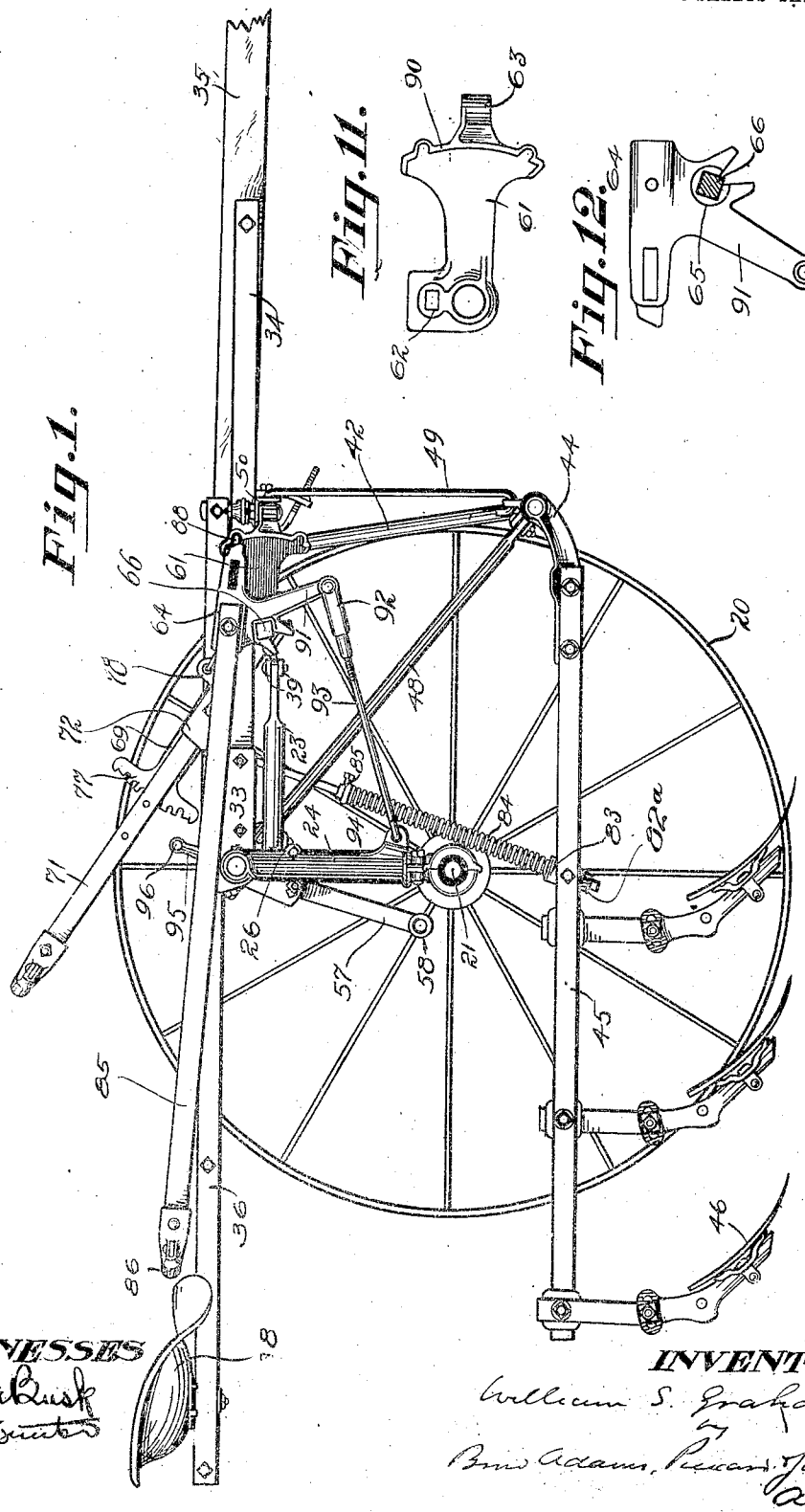
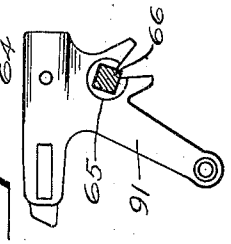


Fig. 11.

Fig. 12.



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5 SHEETS—SHEET 2.

Fig. 14.

Fig. 13.

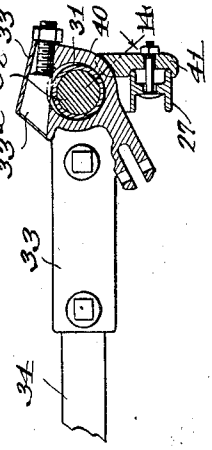
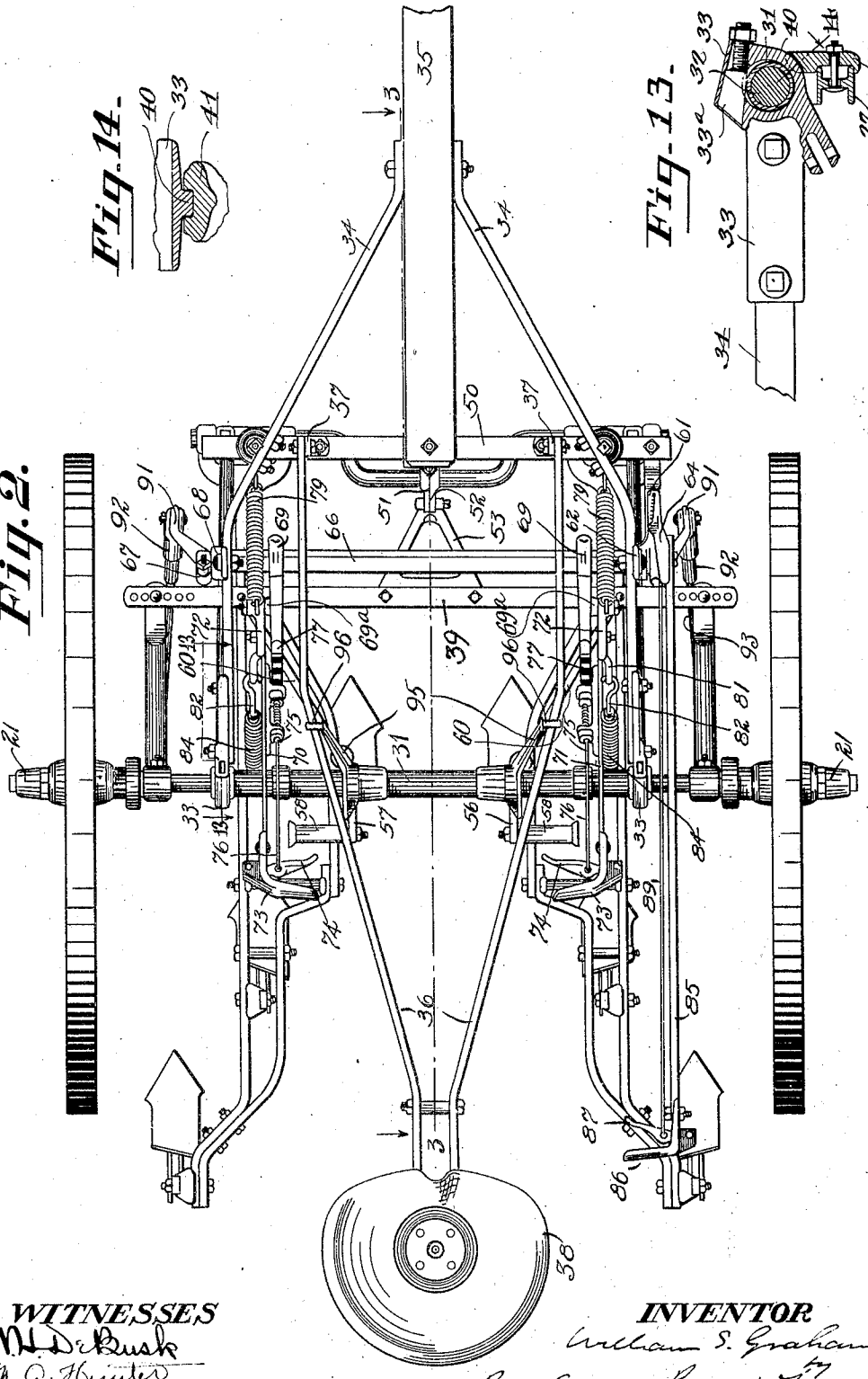


Fig. 2.



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5 SHEETS—SHEET 3.

Fig. 3.

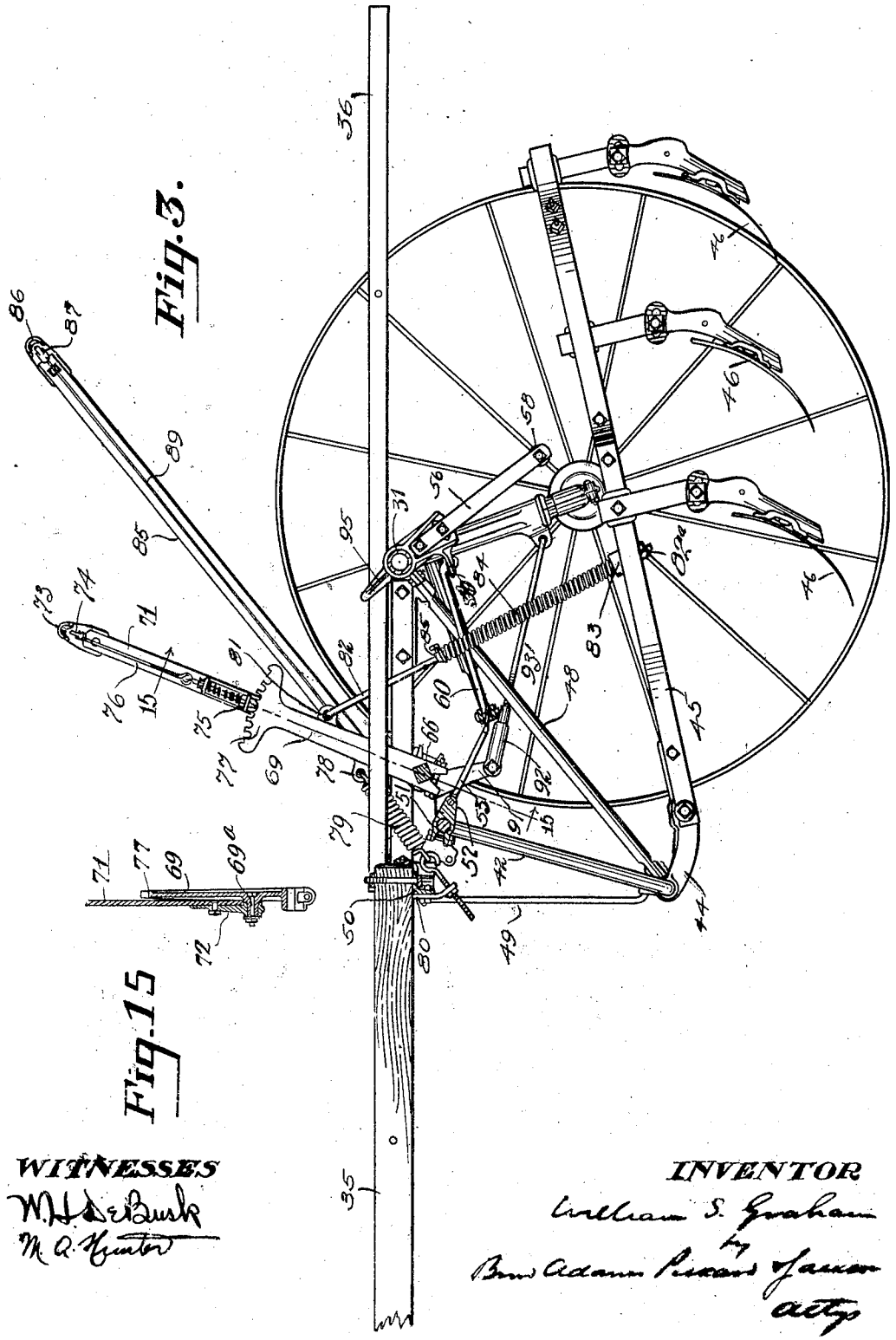

Fig. 15.

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5 SHEETS—SHEET 4.

Fig. 4.

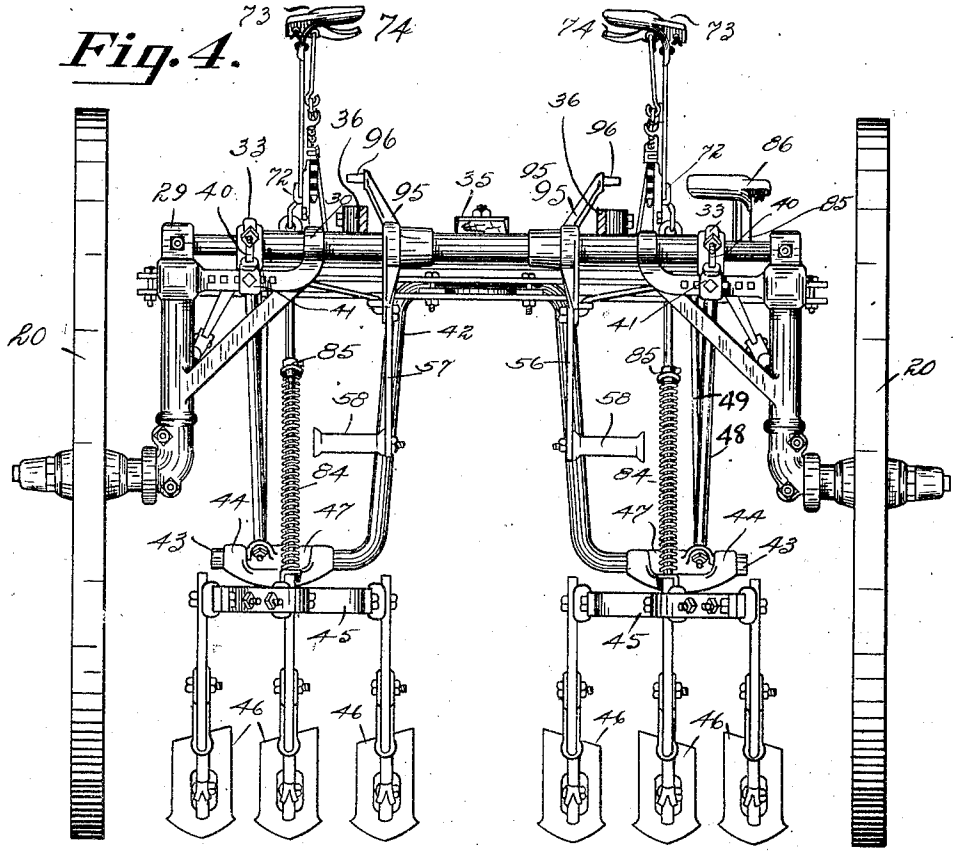


Fig. 5

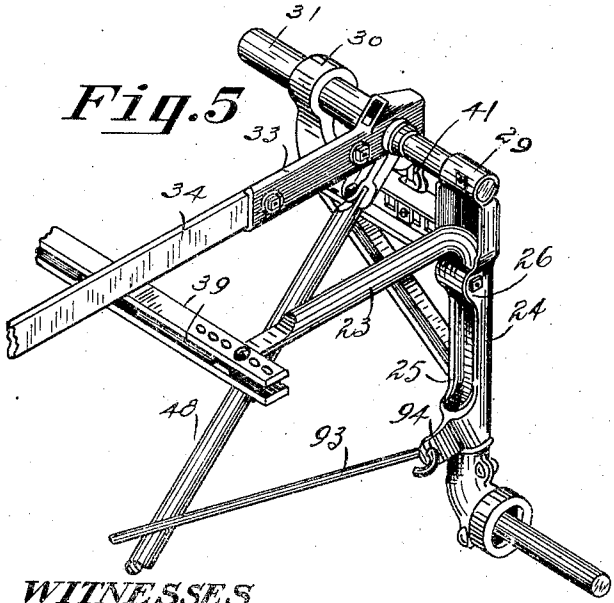
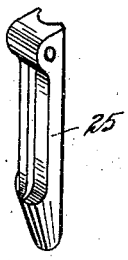


Fig. 6.



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APPLICATION FILED JUNE 25, 1909.

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5 SHEETS—SHEET 5.

Fig. 7.

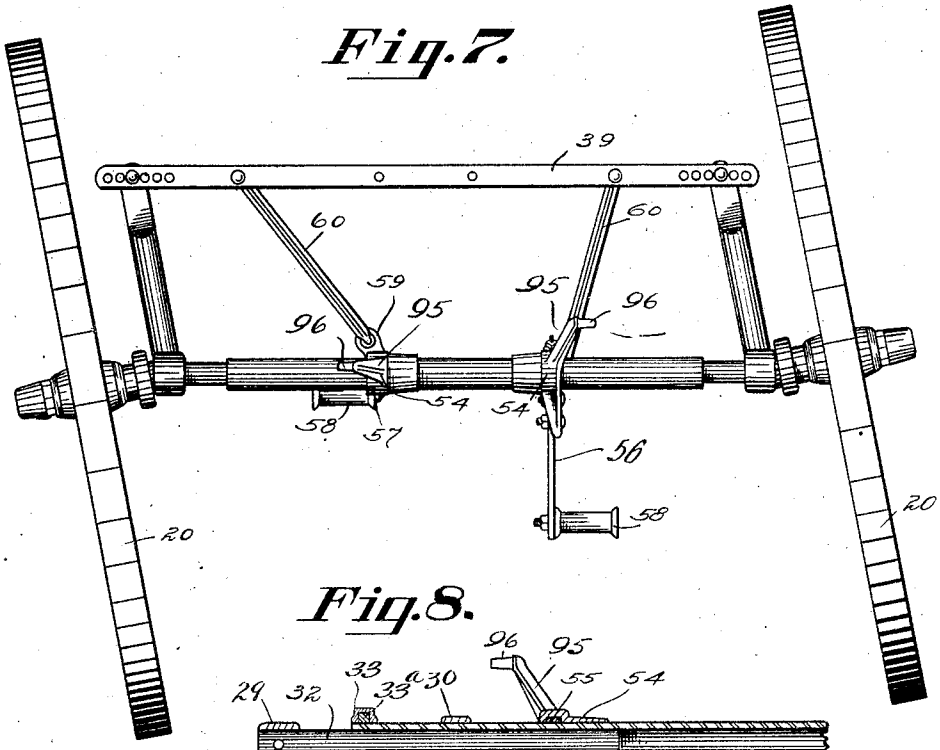


Fig. 8.

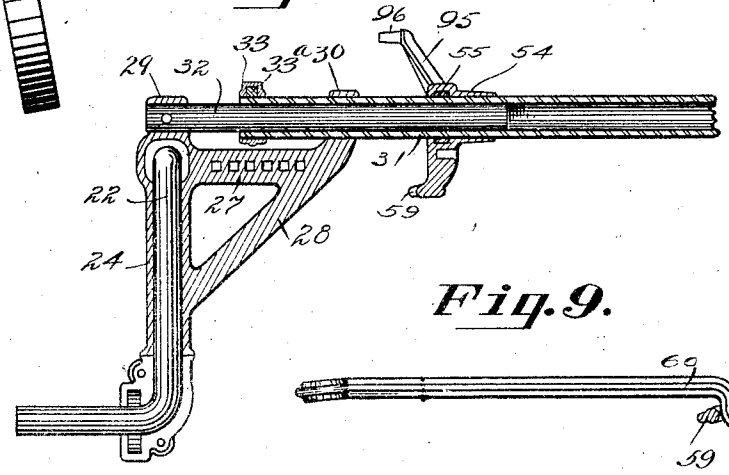


Fig. 9.

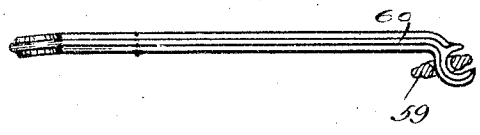
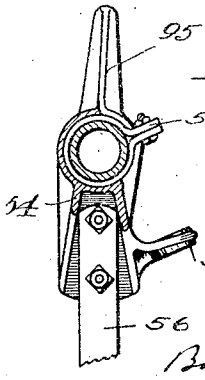


Fig. 10.



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CULTIVATOR.

1,057,143. Specification of Letters Patent. Patented Mar. 25, 1913.

Application filed June 25, 1909. Serial No. 504,278.

To all whom it may concern:

Be it known that I, WILLIAM S. GRAHAM, a citizen of the United States, residing at Canton, in the county of Fulton and State of Illinois, have invented certain new and useful Improvements in Cultivators, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to cultivators, and its object is to provide a new and improved construction by which the wheels may be angled and the gangs shifted laterally simultaneously by the same lever movement, by which the gangs may be raised or lowered either separately or in pairs, by which the wheels may be shifted backward relative to the frame simultaneously with the raising of the gangs in pairs by means of a single lever, by which the wheels may be automatically locked against angling and the gangs against lateral movement when the gangs are raised or when the wheels are shifted to their rearmost position, and by which the wheels may be shifted laterally for different widths between the rows to be cultivated. I accomplish this object by the means shown in the drawings and hereinafter specifically described.

That which I believe to be new will be set forth in the claims.

In the drawings:—Figure 1 is a side elevation of a cultivator embodying my improvements, with one of the wheels removed for the sake of clearness of illustration. Fig. 2 is a plan view of the machine. Fig. 3 is a view on line 3—3 of Fig. 2. Fig. 4 is a rear view with the seat and its support removed. Fig. 5 is an enlarged detail, being a perspective view showing the mounting of the frame of the machine on the wheel axles. Fig. 6 is an enlarged detail of one of the blocks by which the axles are retained in position. Fig. 7 is a plan view illustrating the means for angling the wheels. Fig. 8 is an enlarged detail, being a section through one of the brackets which connect the wheel axles with the frame, certain of the coacting parts being omitted for clearness of illustration. Fig. 9 is an enlarged detail of one of the push rods by which motion is transmitted from the treadles to the transverse bar connected to the forwardly-turned front ends of the axle members. Fig. 10 is an enlarged detail, partly in section, showing the mounting of the treadles upon the frame of the machine. Fig. 11 is an enlarged detail of the bracket upon which is pivoted the lever by which the gangs are raised in pairs. Fig. 12 is an enlarged detail of the part by which said lever is connected with the rock-shaft through which motion is imparted to the gangs to raise them in pairs. Fig. 13 is an enlarged detail, being a section taken on line 13—13 of Fig. 2. Fig. 14 is an enlarged detail, being a section taken on line 14—14 of Fig. 13. Fig. 15 is a section taken on line 15—15 of Fig. 3.

Referring to the drawings:—20 indicates carrying wheels mounted upon spindles 21. Each spindle 21 is provided with a vertical portion 22 (see Fig. 8) which, at its upper end, is provided with a forwardly-projecting portion 23 (see Fig. 5), the three parts being formed integral. Each spindle member 21 is revolubly mounted in a vertical sleeve 24, said sleeve being cut away for the greater portion of its length at its front side to enable the integral spindle member to be inserted.

As shown in Fig. 5, the lower end of the sleeve that is not cut away is enlarged to receive the lower end of a block 25 (see Fig. 6) which is used to take the place of the cut-out portion of the sleeve to hold the spindle member 21 in position, said block being secured in place at its upper end by a bolt passing through it and through lugs 26 on the sleeve. At the point where the forwardly-projecting portion 23 emerges from the sleeve 24, sufficient play is provided to enable the part 22 to be rotated to a limited extent in the sleeve 24 by the lateral movement of the front end of the part 23, thus angling the wheels relative to the machine, as will be readily understood.

As shown in Fig. 8, the sleeve 24 is part of a bracket comprising also a horizontal bar 27, a diagonal bar 28, and horizontal transverse sleeves 29 and 30, one of such brackets being provided at each side of the machine, as shown in Fig. 4. 31 indicates a tubular bar extending from side to side of the machine, each end being inserted in one of the sleeves 30 so as to slide freely therein. 32 indicates rods, one at each side of the machine, each adapted to slide freely at its inner end in said tubular bar 31, and each bolted or otherwise secured at its outer end

within the sleeve 29, such construction providing for a free and easy movement of each bracket laterally relative to the tubular bar 31, as will be seen. The rod 32, tubular bars 31, spindle members 21 and the brackets by which such parts are connected, constitute in effect a wheel-arch pivoted relative to the frame. 33 indicates two brackets one of which is securely attached upon each end of the tubular bar 31 by means of a wedge bolt 33^a. 34 indicates hounds which are bolted at their rear ends to the brackets 33 and at their forward ends to the tongue 35, as shown in Fig. 2. 36 indicates seat-supporting bars which are, by means of angle irons 37, secured at their forward ends to the crossbar 50 hereinafter referred to, extending rearwardly therefrom and resting upon the tubular bar 31. Secured to the rear ends of these bars 36 is a seat 38 of any suitable type.

As shown in Figs. 5 and 7, the forward ends of the portions 23 of the spindle members are pivotally connected between two parallel transverse bars 39 whereby by movement of the bars 39 longitudinally of themselves the wheels 20 may be simultaneously angled.

As best shown in Figs. 13 and 14, each of the brackets 33 is provided on its rear and lower side with a circumferential flange or rib 40. 41 indicates a block grooved on its front face to engage said rib 40. These blocks 41 are adapted to be bolted to the horizontal portions 27 of the brackets which connect the wheel spindles to the frame of the machine and thus hold said brackets against lateral movement, at the same time permitting a limited swinging movement of the bracket relative to the tubular bar 31 upon which the brackets 33 are fast.

As shown in Figs. 5 and 8, the bars 39 are provided with a series of holes through any one of which the bolt that connects the portions 23 thereto may be passed, and the horizontal portions 27 of the brackets have a like number of holes through the corresponding one of which the bolt which secures the block 41 in position may be passed. By this means the wheels may be readily and quickly shifted laterally for rows of different widths, as will be readily understood. 42 indicates the shovel arch (see Fig. 4) having out-turned horizontal portions 43 at its lower end. 44 indicates yokes revolubly mounted upon the horizontal portions 43, attached to which are shovel beams 45 of any approved type, carrying shovels 46. 47 indicates sleeves mounted upon the horizontal portions 43 between the arms of the yokes 44. Secured at their lower ends to the sleeves 47, each being pivoted between ears formed on one of the sleeves, are two push-bars 48, the upper ends of which are pivoted between ears formed on the bottoms of the brackets 33, as shown in Figs. 5 and 13. 49 indicates rods hooked at their lower ends in ears on said sleeves 47, as best shown in Fig. 1, and hooked at their upper ends in suitable openings in the transverse L-shaped bar 50 which is bolted at its center to the tongue 35 and secured near its ends to the hounds 34. These two parts 48 and 49 which support the lower ends of the arch 42 permit lateral movement of the arch. Upon the upper horizontal portion of the shovel arch 42 (see Fig. 3) is a split sleeve 51 which is adapted to be clamped securely in place by means of a bolt. Extending rearwardly from this sleeve 51 is a short arm 52 to which is attached by means of a horizontal pivot a plate 53. This plate is secured at its rear end between the transverse bars 39 by bolts, the distance between which bars 39 is sufficient to provide for some little play between the plate and the bars 39 so that they may be either held in alinement in their normal position or may be angled slightly relative to each other when the wheels are shifted backward in the frame when the gangs are raised in pairs, as hereinafter described.

It will be readily understood from the above description that when the bars 39 are shifted longitudinally of themselves in angling the wheels, as above described, they will carry with them to one side or the other of the machine the plate 53 and arch 42, which in turn will throw the front ends of the shovel beams correspondingly to that side.

Revolubly mounted upon the tubular bars 31 and depending therefrom (see Fig. 8), are two brackets 54 secured against lateral movement by collars 55. Bolted to these brackets 54 are two foot-levers 56—57, each provided with a treadle 58. Each bracket 54 is provided with a perforated lug 59 on its front face, into which the rear end of a push-bar 60 is hooked, the front end of which bar 60 is provided with an opening through which opening and through suitable openings in the bars 39 at some little distance farther toward the side of the machine than the bracket 54 is passed a bolt or rivet.

From the above description, it is apparent that by pushing the foot-lever 57 forward the bars 39 are caused to shift to the left in Fig. 7, thus carrying the arch 42 to the left and at the same time angling the wheels to carry the machine to the left, as hereinabove described. Pressure upon the foot-lever 56 serves thereupon to return the parts to the normal position (shown in Fig. 4), and further pressure upon the foot-lever 56 of course serves to angle the wheels and to shift the shovel arch and the front ends of the shovel beams to the right in said figure.

61 indicates a bracket (see Fig. 11) pro-

vided with an ear 62 which is bolted to the hound 34 on the right-hand side of the machine as shown in Fig. 2, and provided with an ear 63 which is bolted to the transverse bar 50.

64 indicates a bracket (see Fig. 12) which is provided with a boss 65 adapted to fit and rotate in, a circular opening in the bracket 61, passing centrally through which boss is one end of a square rock-shaft 66. The other end of the rock-shaft 66 passes centrally through a similar circular boss on a sleeve 67 which fits and rotates in a circular opening in a bracket 68 which is bolted to the hound 34 at the opposite side of the machine from the bracket 61. The bracket 64 and sleeve 67 are bolted rigidly to the rock-shaft 66, so that the bosses are held firmly in contact with the circular openings in the brackets 61 and 68 so as to rotate therein, the rock-shaft also being thus rotatable in said brackets.

69 indicates two brackets non-rotatably secured on the rock-shaft 66.

70—71 indicate levers which are bolted to brackets 72 that are pivotally mounted on bosses 69^a formed integral with said brackets 69, each of which levers is provided with a handle portion 73, a latch 74, spring-actuated plunger 75, and rod 76 connecting the plunger and latch, which plungers are adapted to engage the teeth of racks 77 carried by said brackets 69 to set the levers separately at any desired position relative to the brackets. Each of the brackets 72 has on its front face a short distance above the pivot point of the bracket 72 upon the bracket 69 a perforated lug 78 to which is attached one end of a coiled spring 79 the other end of which is adjustably attached to an arm 80 depending from the transverse bar 50, said spring tending to hold said bracket 72 in its forward turned position.

On the rear face of each bracket 72 is a perforated lug 81 to which is attached the upper end of a pull-rod 82. The lower ends of the rods 82 pass through holes in brackets 83 secured upon the gangs 45, being slidable therein but prevented from withdrawal therefrom by heads 82^a on their lower ends. Upon each rod 82 is located a compression spring 84 which bears at its lower end against the bracket 83. These springs bear at their upper ends against collars 85 which are secured by set-screws upon the rods 82, by which construction the spring may be caused to press more or less heavily upon the gangs as desired.

From the above description, it will be seen that when either of the levers 70 or 71 is moved forward, through the medium of the pull-rod 82, the gang connected to such lever is raised, such raising of the gang being assisted by the pull of the extended spring 79, the strength of which can be adjusted, as above described. It will also be seen that when the lever is moved backward to permit the gang to be in its lowered position, the spring 84 serves to hold the gang yieldingly in the ground, the effective strength of this spring also being adapted to be adjusted, as described.

Coming now to the means for raising the gangs in pairs and for shifting the wheels backward and forward relative to the frame, 85 indicates a lever bolted to the bracket 64 whereby the rock-shaft 66 is adapted to be turned. The lever 85 is provided with the usual handle portion 86, latch 87, spring-actuated plunger 88, and rod 89 connecting the latch and the plunger.

90 indicates a flange on the bracket 61, provided with two notches which the plunger 88 is adapted to engage to hold the lever in position, as will be readily understood.

91 indicates arms depending from the bracket 64 and sleeve 67, to the lower ends of which are pivotally attached heads 92 into which are screw-threaded the front ends of rods 93, the rear ends of which are hooked in perforated lugs 94 on the front faces of the sleeves 24.

From the above description it will be seen that when the lever 85 is moved upward from the position shown in Fig. 1, for example, the rock-shaft 66 will be rotated clockwise in said figure, causing the levers 70 and 71 to move forward, raising both of the gangs 45, both of the springs 79 assisting in the operation. At the same time, through the medium of the rods 93, the sleeves 24 and therefore the axles 21 will be moved backward relative to the frame so as to compensate for the additional weight of the gangs at the back part of the machine and to maintain the proper balance of the machine on the wheels. It will be seen that if the lever 85 be moved upward while the machine is still in motion, the operation will be greatly assisted by the tendency of the wheels to stop and the consequent backward pull upon the rods 93.

Each of the brackets 54 is provided with an arm 95 rising therefrom and provided at its upper end with a horizontal stud 96, extending over the seat-supporting bar 36 at that side of the machine. As shown in Figs. 1 and 4, when the gangs are in lowered position and the wheels are consequently in their foremost position, the studs 96 are some little distance above the bars 36. When, however, the gangs are raised by means of the lever 85 and the wheels are, as has been described, at the same time shifted backward relative to the frame, the bars 39 are lowered and shifted slightly backward, as seen by a comparison of Figs. 1 and 3, causing a corresponding change in position of the push-rods 60 and brackets

54. The result is that each of the studs 96 is brought into contact with one of the bars 36, thus holding the brackets 54 against turning and preventing any angling of the wheels or lateral shifting of the gangs while the wheels are kept in their rearmost position, this result being attained automatically without any effort on the part of the operator. Any forward push of one of the foot levers, as 56, tends to lift its part 95, but also tends to cause the other lever 57 to move backward which is prevented by the contact of the other part 95 with the frame bar 34.

So far as I am aware, no one in the art has heretofore provided means for automatically locking the wheels of this type of machine against angling or the gangs against lateral shifting when the gangs are raised, and the claims are therefore to be construed accordingly.

What I claim as my invention and desire to secure by Letters Patent is:—

1. In a cultivator, the combination of a frame, an axle extending from each side of the frame,—each of said axles comprising a horizontal portion, a vertical portion integral therewith, and a forwardly-extending portion integral with said vertical portion,—carrying wheels journaled on said axles, sleeves in said frame into which the vertical portions of said axles are inserted, said sleeves being cut away for a part of their length at one side to enable said axles to be placed in position therein, means carried by said sleeves for securing said axles in position, and means pivotally connected with the front ends of said forwardly-extending portions adapted to angle said wheels relative to said frame.

2. In a cultivator, the combination of a frame, an axle extending from each side of the frame,—each of said axles comprising a horizontal portion, a vertical portion integral therewith, and a forwardly-extending portion integral with said vertical portion,—carrying wheels journaled on said axles, sleeves in said frame into which the vertical portions of said axles are inserted, said sleeves being cut away for a part of their length at one side to enable said axles to be placed in position therein, blocks adapted to be inserted in said sleeves at their lower ends after said axles are in position and adapted to bear at their upper ends against the forwardly-extending portions of said axles, means for securing the upper ends of said blocks in position, and means pivotally connected with the front ends of said forwardly-extending portions adapted to angle said wheels relative to said frame.

3. In a cultivator, the combination with a rigid frame, a bracket revoluble on and slidable transversely of said frame at each side, an axle carried by each bracket, and a wheel journaled on each axle, of a vertical rib on said frame at each side adjacent to each bracket, a block provided with a groove adapted to engage said rib and hold said block against lateral movement and adapted to permit a swinging movement of said block relative to said frame, and means for securing said block at different points to said bracket.

4. In a cultivator, the combination with a transverse bar, two brackets each comprising a sleeve revolubly mounted on said bar, and a horizontal portion provided with a plurality of holes, an axle carried by each bracket, and a wheel journaled on each axle, of a circumferential rib on said bar at each end, blocks each provided with a groove adapted to engage one of said ribs and to hold the block against movement longitudinally of the bar, and means for securing said blocks to said horizontal portions of said brackets opposite any of said holes therein.

5. In a cultivator, the combination with a tubular bar, two brackets each comprising a sleeve revolubly mounted on said bar, a rod carried by each bracket adapted to telescope into the end of the tubular bar, an axle carried by each bracket, and a carrying wheel journaled on each axle, of means for securing said brackets against movement longitudinally of said bar and adapted to permit swinging movement of said brackets relative to said bar.

6. In a cultivator, the combination with a tubular bar, two brackets each comprising a sleeve revolubly mounted on each bar, a rod carried by each bracket adapted to telescope into the end of the tubular bar, an axle carried by each bracket, and a carrying wheel journaled on each axle, of means for securing said brackets against movement longitudinally of said bar and adapted to permit swinging movement of said brackets relative to said bar, and means for imparting such swinging movement to said brackets whereby said wheels are shifted longitudinally of the machine.

7. In a cultivator, the combination with a transverse tubular bar, two brackets,—each comprising a sleeve revolubly mounted on said bar, a vertical sleeve adapted to embrace a wheel axle, and a horizontal portion provided with a plurality of holes,—a rod carried by each bracket adapted to telescope into the end of the tubular bar, axles each comprising a horizontal portion and a vertical portion, the vertical portion of each axle being journaled in the vertical sleeve of one of said brackets, and carrying wheels journaled upon the horizontal portions of said axles, of a circumferential rib carried by said tubular bar near each end, blocks each provided with a groove adapted to engage one of said ribs and to hold said block

against movement longitudinally of said tubular bar, and means for securing said blocks to the horizontal portions of said brackets opposite any of said holes therein.

8. In a cultivator, the combination with a tubular transverse bar, two brackets each comprising a sleeve revolubly mounted on said bar, a rod carried by each bracket adapted to telescope into the end of the tubular bar, two axles—each comprising a horizontal portion, a vertical portion adapted to be revolubly mounted in one of said brackets, and a forwardly-extending portion,—and carrying wheels journaled on the horizontal portions of said axles, of means for securing said brackets at different points against movement longitudinally of said tubular bar and adapted to permit swinging movement of said brackets relative to said bar, and a transverse bar adapted to be pivotally connected with the forwardly-extending portions of said axles at different points to cause said forwardly-extending portions of the axles to be parallel, and means for shifting said last-named transverse bar longitudinally of itself whereby said wheels may be correspondingly angled.

9. In a cultivator, the combination of a frame, carrying wheels mounted thereon, an arch supported from said frame by rods pivotally connected thereto at its base, beams connected at their forward ends to said arch, shovels carried by said beams, a transverse bar movable transversely of said frame, and a plate connected with said bar and with said arch serving to hold the upper end of said arch against movement backward and forward and serving to cause said arch to move transversely of the machine on said swinging rods in unison with said bar.

10. In a cultivator, the combination of a frame, carrying wheels mounted thereon, an arch, two rods at each side of the machine each pivotally connected at its lower end to the lower end of said arch, said two rods at each side of the machine being pivotally connected at their upper ends to said frame one a distance in rear of the other, beams connected at their forward ends to said arch, shovels carried by said beams, a transverse bar movable transversely of said frame, and a plate connected with said bar and with said arch serving to hold the upper end of said arch against movement backward and forward and serving to cause said arch to move transversely of the machine on said swinging rods in unison with said bar.

11. In a cultivator, the combination with a frame, brackets carried thereby and adapted to swing relatively thereto, axles each comprising a horizontal portion a vertical portion and a forwardly-extending portion, said vertical portions being revolubly mounted in said brackets, wheels mounted on said horizontal portions, a transverse bar connecting the forward ends of said forwardly-extending portions, means for shifting said transverse bar longitudinally of itself whereby said wheels are angled relative to the frame, and means for moving said brackets relative to said frame whereby said wheels are shifted longitudinally of the machine and the forwardly-extending portions of said axles are moved downward, of an arch mounted on said frame and adapted to be shifted laterally relative thereto, gangs connected at their forward ends to said arch, shovels carried by said gangs, and a plate connected at its rear end with said transverse bar and at its front end with said arch, the connections between said plate and said bar and arch being horizontal pivotal connections whereby said arch is shifted laterally with said bar and whereby at the same time said bar may be also lowered when said wheels are shifted longitudinally of the machine.

12. In a cultivator, the combination of a frame, carrying wheels mounted thereon adapted to be angled and to be shifted backward and forward relative to said frame, shovel-gangs mounted in said frame and adapted to be shifted laterally relative thereto, means for shifting said wheels backward and by the same operation for raising said gangs, means for angling said wheels and by the same operation for shifting said gangs laterally, and means for preventing the simultaneous operation of said wheel-shifting means and said wheel-angling means.

13. In a cultivator, the combination with a frame, carrying wheels mounted thereon, shovel-gangs mounted in said frame and adapted to be shifted laterally relative thereto, two revoluble members by the rotation of which in opposite directions from their normal position said shovel-gangs are adapted to be shifted laterally, and means for raising said shovel-gangs, of arms projecting from said revoluble members adapted to be brought into contact with the frame to prevent the rotation of said revoluble members when said shovel-gangs are raised.

14. In a cultivator, the combination of a frame, carrying wheels mounted thereon adapted to be angled relative thereto, shovel-gangs mounted on said frame and adapted to be shifted laterally relative thereto, two revoluble members by the rotation of which in opposite directions from their normal position said wheels are adapted to be angled and said gangs are adapted to be shifted laterally, means for raising said shovel-gangs, and additional means cooperating therewith for automatically forcing said gangs laterally to their normal po-

sition and for forcing said wheels into their normal unangled position when said gangs are raised.

15. In a cultivator, the combination of a frame, carrying wheels mounted thereon adapted to be angled relative thereto, shovel-gangs mounted on said frame and adapted to be shifted laterally relative thereto, two revoluble members by the rotation of which in opposite directions from their normal position said wheels are adapted to be angled and said gangs are adapted to be shifted laterally relative to said frame, means for raising said gangs, and arms projecting from said revoluble members adapted to be brought into contact with the frame to prevent the rotation of said revoluble members when said gangs are raised.

16. In a cultivator, the combination with a frame, carrying wheels mounted thereon and adapted to be angled relative thereto, shovel-gangs mounted in said frame and adapted to be shifted laterally relative thereto, and shovel-gang raising means comprising means for raising said gangs separately and means for raising said gangs in pairs, of automatically-operating means adapted to hold said wheels against angling when said gangs are being held in raised position by the means for raising the gangs in pairs.

17. In a cultivator, the combination of a frame, carrying wheels mounted thereon adapted to be angled relative thereto, shovel-gangs mounted on said frame, two revoluble members by the rotation of which in opposite directions from their normal position said wheels are adapted to be angled relative to said frame, means for raising said gangs, and arms projecting from said revoluble members adapted to be brought into contact with the frame to prevent the rotation of said revoluble members when said gangs are raised.

18. In a cultivator, the combination with a frame, axle members each comprising a vertical portion a transversely-extending portion and a portion extending longitudinally of the machine, a bracket in which the vertical portion of each axle-member is mounted so as to oscillate therein, said brackets being pivoted on said frame and adapted to swing backward and forward relative thereto, a carrying wheel mounted on the transversely-extending portion of each axle-member, a cross bar connecting the ends of the longitudinally-extending portions of said axle-members, and means for swinging said brackets backward so as to shift said wheels relative to said frame and thus move said cross bar downward, of means connected with said cross bar whereby when it is moved downward it is held against movement longitudinally of itself and said wheels are held against angling.

19. In a cultivator, the combination with a frame, axle members each comprising a vertical portion a transversely-extending portion and a portion extending longitudinally of the machine, a bracket in which the vertical portion of each axle-member is mounted so as to oscillate therein, said brackets being pivoted on said frame and adapted to swing backward and forward relative thereto, a carrying wheel mounted on the transversely-extending portion of each axle-member, a cross bar connecting the ends of the longitudinally-extending portions of said axle-members, and means for swinging said brackets backward so as to shift said wheels relative to said frame and thus move said cross bar downward, of a pair of revoluble members mounted on said frame, links connecting said cross bar with said revoluble members whereby said revoluble members are rotated relative to said frame when said crossbar is moved downward, and arms carried by said revoluble members adapted to be brought into contact with said frame when said revoluble members are rotated by the downward movement of said cross bar, such links extending diagonally so as to prevent sidewise movement of said cross bar when it is in its lowered position.

20. In a cultivator, the combination with a frame, carrying wheels mounted thereon adapted to be angled relative thereto and to be shifted forward and backward relative thereto, shovel-gangs pivotally mounted in said frame so as to be raised and lowered relative thereto, and means for shifting said wheels backward relative to said frame and by the same operation for raising said gangs, of automatically-operating means adapted to hold said wheels against angling when said gangs are held in their raised position and said wheels are in their rearmost position.

21. In a cultivator, the combination with a frame, carrying wheels mounted thereon and adapted to be shifted backward and forward relative thereto, an arch mounted in said frame and adapted to be shifted laterally relative thereto, shovel-gangs pivoted on said arch and adapted to be moved laterally therewith and to be raised or lowered relative thereto, and means adapted by one operation to raise said gangs and shift said wheels backward, of means actuated by said same operation for preventing said arch from moving laterally.

22. In a cultivator, the combination with a frame, shovel-gangs movable laterally in said frame, axle-members each comprising a vertical portion a transversely-extending portion and a portion extending longitudinally of the machine, a bracket in which the vertical portion of each axle-member is mounted so as to oscillate therein, said brackets being pivoted on said frame and

adapted to swing backward and forward relative thereto, a carrying wheel mounted on the transversely-extending portion of each axle-member, a cross bar connecting the ends of the longitudinally-extending portions of said axle-members, connections between said shovel-gangs and said cross bar whereby said shovel-gangs are moved laterally as said cross bar is moved longitudinally of itself, and means for swinging said brackets backward so as to shift said wheels relative to said frame and thus move said cross bar downward, of means for moving said crossbar longitudinally of itself and additional means cooperating therewith whereby when said crossbar is moved downward it is held against movement longitudinally of itself and said gangs are held against lateral movement and said wheels are held against angling.

23. In a cultivator, the combination with a frame, carrying wheels mounted thereon and adapted to be angled relative thereto, shovel-gangs, means for raising said gangs, and means for angling said wheels and shifting said gangs laterally, of a stop carried by said wheel-angling and gang-shifting mechanism adapted to be brought into contact with a fixed part of said frame by the operation of said gang-raising mechanism whereby when said gangs are in raised position said gangs are held against lateral shifting and said wheels are held against angling.

24. In a cultivator, the combination with a frame, carrying wheels mounted thereon adapted to be angled relative thereto and to be shifted backward and forward relative to said frame, shovel-gangs pivotally mounted in said frame so as to be raised and lowered relative thereto and adapted to be shifted laterally relative to said frame, means for raising said gangs and by the said operation shifting said wheels backward relative to said frame, and other means for angling said wheels and by the said operation shifting said gangs laterally, of automatically-operating means adapted to hold said wheels against angling and said gangs against being shifted laterally when said wheels are shifted backward and said gangs are raised.

25. In a cultivator, the combination with a frame, carrying wheels mounted thereon and adapted to be angled relative thereto, and also adapted to be shifted backward and forward relative thereto, shovel-gangs, means for raising said gangs and shifting said wheels backward, and other means for angling said wheels and shifting said gangs laterally, of stops carried by said wheel-angling and gang-shifting mechanism adapted to be brought into contact with a fixed part of said frame by the backward shifting of said wheels when said gangs are raised, whereby when said gangs are in raised position said gangs are held against lateral shifting and said wheels are held against angling.

26. In a cultivator, the combination of a frame, a wheel-arch pivotally mounted on said frame, carrying wheels mounted on said wheel-arch and adapted to be angled relative to the frame, means carried by said wheel-arch and movable therewith relative to said frame for angling said wheels, means for swinging said wheel-arch relative to the frame for shifting said wheels backward and forward relative thereto, and stops brought into contact with the frame by the operation of said wheel-arch swinging means adapted to prevent the angling of said wheels.

27. In a cultivator, the combination of a frame, a wheel-arch pivotally mounted thereon, carrying wheels mounted on said wheel-arch, shovel-gangs mounted on said frame, means for raising said shovel-gangs relative to said frame, by the operation of which gang-raising means the wheel-arch is swung backward, means carried by the wheel-arch and movable therewith relative to said frame for angling said wheels relative to said frame, and stops brought into contact with said frame by said wheel-arch swinging means adapted to prevent angling of said wheels.

28. In a cultivator, the combination of a frame, a wheel-arch pivotally mounted thereon, carrying wheels mounted on said wheel-arch, shovel-gangs mounted on said frame and adapted to be shifted laterally relative thereto, means carried by said wheel-arch and movable therewith relative to said frame for shifting the gangs laterally, means for swinging said wheel-arch relative to said frame for shifting the wheels backward and forward, and stops brought into contact with said frame by the operation of said wheel-arch swinging means adapted to prevent lateral shifting of the gangs.

29. In a cultivator, the combination of a frame, a wheel-arch pivotally mounted thereon, carrying wheels mounted on said wheel-arch, gangs adapted to be raised and lowered and to be shifted laterally relative to said frame, means carried by said wheel-arch and movable therewith relative to said frame for shifting the gangs laterally, means for raising the gangs, by the operation of which gang-raising means the wheel-arch is swung backward, and stops brought into contact with the frame by the operation of the wheel-arch swinging means adapted to prevent shifting of the gangs.

30. In a cultivator, the combination of a frame, a wheel-arch pivotally mounted thereon, carrying wheels mounted on said wheel-arch adapted to be angled relative thereto and adapted to be shifted backward relative to said frame upon said wheel-arch,

hovel-gangs mounted on said frame adapted o be raised and to be shifted laterally relative thereto, means carried by said wheel-arch and movable therewith relative to said frame for shifting said gangs laterally and for angling said wheels, means for swinging said wheel-arch relative to said frame for raising said gangs and shifting said wheels backward, and stops brought into contact with said frame by the operation of said wheel-arch swinging means adapted to prevent angling of said wheels and lateral shifting of said gangs.

31. In a cultivator, the combination of a frame, a wheel-arch pivotally mounted thereon, carrying wheels mounted on said wheel-arch adapted to be angled relative thereto and adapted to be shifted backward and forward thereon relative to said frame, shovel-gangs mounted on said frame adapted to be shifted laterally relative thereto, means carried by said wheel-arch and movable therewith relative to said frame for shifting said gangs laterally and for angling said wheels, means for swinging said wheel-arch relative to said frame for shifting said wheels, and stops brought into contact with said frame by the operation of said wheel-arch swinging means adapted to prevent angling of said wheels and shifting of said gangs.

32. In a cultivator, the combination of a frame, a cross-bar mounted therein adapted to be shifted laterally thereof, means for shifting said cross-bar laterally, means for moving said cross-bar downward relative to said frame, and means for preventing lateral movement of said cross-bar when the cross-bar is moved to its lowermost position.

33. In a cultivator, the combination of a frame, a cross-bar mounted therein adapted to be shifted laterally thereof, revoluble members, connections between said revoluble members and said cross-bar whereby by the operation of said revoluble members in opposite directions said cross-bar is shifted laterally of said frame, means for moving said cross-bar downward relative to said frame, and arms projecting from said revoluble members adapted to be brought into contact with said frame when said cross-bar is moved downward whereby the cross-bar is held against its said lateral movement relative to the frame.

34. In a cultivator, the combination of a frame, a cross-bar mounted therein adapted to be shifted laterally thereof, foot levers, connections between said foot levers and said cross-bar whereby by a stroke of said levers in opposite directions said cross-bar is shifted laterally of said frame, means for moving said cross-bar downward relative to said frame, and arms projecting from said foot levers adapted to be brought into contact with said frame when said cross-bar is moved downward whereby the cross-bar is held against its said lateral movement relative to said frame.

35. In a cultivator, the combination of a frame, a cross-bar mounted therein adapted to be shifted laterally thereof, foot levers, diagonally-positioned links connecting said levers with said cross-bar whereby by a stroke of said levers in opposite directions said cross-bar is shifted laterally of said frame, means for moving said cross-bar downward relative to said frame whereby said foot levers are caused to swing in the same direction relative to said frame, and arms projecting from said foot levers adapted to be brought into contact with said frame when said cross-bar is moved downward whereby the foot levers are held against moving in opposite directions and said cross-bar is held against lateral movement relative to said frame.

36. In a cultivator, the combination of a frame, a wheel-arch pivotally mounted relative to said frame, carrying wheels mounted on said wheel-arch, a cross-bar carried by said wheel-arch and movable laterally relative to the frame, means for moving said cross-bar laterally, means for swinging said wheel-arch relative to said frame whereby said cross-bar is moved downward, and means for preventing lateral movement of said cross-bar when the cross-bar is moved downward by the swinging of said wheel-arch.

37. In a cultivator, the combination of a frame, a wheel-arch pivotally mounted relative to said frame, said wheel-arch comprising spindles pivoted on vertical axes, carrying wheels mounted on said spindles, a cross-bar connecting said spindles adapted by its movement laterally of the frame to rock said spindles about their vertical axes to angle said wheels relative to said frame, means for moving said cross-bar laterally of the frame, means for swinging said wheel-arch relative to said frame whereby said cross-bar is moved downward, and means for preventing lateral movement of said cross-bar when the cross-bar is moved downward by the swinging of said wheel-arch.

38. In a cultivator, the combination of a frame, a wheel-arch pivotally mounted relative to said frame, said wheel-arch comprising spindles pivoted on vertical axes, carrying wheels mounted on said spindles, a cross-bar connecting said spindles adapted by its movement laterally of the frame to rock said spindles about their vertical axes to angle said wheels relative to said frame, foot levers, connections between said foot levers and said cross-bar whereby by a stroke of said levers in opposite directions said cross-bar is shifted laterally of said frame, means for swinging said wheel-arch relative to said frame whereby said cross-

bar is moved downward, and arms projecting from said foot levers adapted to be brought into contact with said frame when said wheel-arch is swung and said cross-bar is moved downward whereby the cross-bar is held against lateral movement relative to said frame.

39. In a cultivator, the combination of a frame, a wheel-arch pivotally mounted relative to said frame, said wheel-arch comprising spindles pivoted on vertical axes, carrying wheels mounted on said spindles, a cross-bar connecting said spindles adapted by its movement laterally of the frame to rock said spindles about their vertical axes to angle said wheels relative to said frame, foot levers, diagonally-positioned links connecting said foot levers with said cross-bar whereby by a stroke of said levers in opposite directions said cross-bar is shifted laterally of said frame, means for swinging said wheel-arch relative to said frame whereby said cross-bar is moved downward relative to said frame and said foot levers are caused to swing in the same direction relative to said frame, and arms projecting from said foot levers adapted to be brought into contact with said frame when said wheel-arch is swung whereby the foot levers are held against moving in opposite directions and said cross-bar is held against lateral movement relative to said frame.

40. In a cultivator, the combination of a frame, carrying wheels mounted thereon adapted to be angled relative thereto, shovel-gangs mounted on said frame and adapted to be shifted laterally relative thereto, two revoluble members by the rotation of which in opposite directions from their normal position said wheels are adapted to be angled and said wheels are adapted to be shifted laterally relative to said frame, means for raising said gangs, and arms projecting from said revoluble members adapted to be brought into contact with the frame whereby when the gangs are raised said gangs are automatically forced into normal position laterally and said wheels are forced into their normal unangled position.

41. In a cultivator, the combination of a frame, carrying wheels mounted thereon adapted to be angled relative thereto, shovel-gangs mounted on said frame, two revoluble members by the rotation of which in opposite directions from their normal position said wheels are adapted to be angled relative to said frame, means for raising said gangs, and arms projecting from said revoluble members adapted to be brought into contact with the frame whereby when said gangs are raised said wheels are forced into their normal unangled position.

WILLIAM S. GRAHAM.

Witnesses:
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