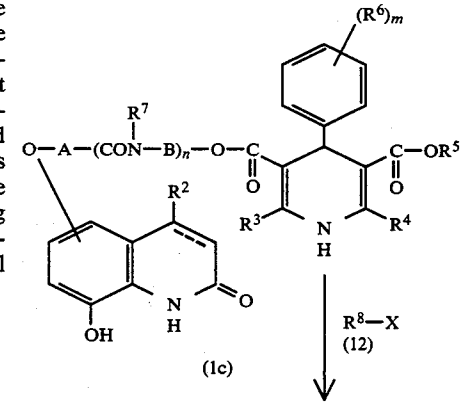
Carbostyril derivative or a pharmaceutically acceptable acid addition salt thereof, having excellent platelate aggregation inhibitory effect, calcium antagonism, hypotensive effect and phosphodiesterase inhibitory effect are useful as prophylactic or treating agents for thrombosis, circulation improving agents for coronary blood flow such as coronary vasodilators, hypotensive agents and phosphodiesterase inhibitors. Furthermore, the carbostyril derivatives are weak in heart rate increasing activity and also in cardiac muscle contraction increasing activity, and the carbostyril derivatives are useful

8 PT.



Carbostyril derivative or a pharmaceutically acceptable acid addition salt thereof, having excellent platelate aggregation inhibitory effect, calcium antagonism, hypotensive effect and phosphodiesterase inhibitory effect are useful as prophylactic or treating agents for thrombosis, circulation improving agents for coronary blood flow such as coronary vasodilators, hypotensive agents and phosphodiesterase inhibitors. Furthermore, the carbostyril derivatives are weak in heart rate increasing activity and also in cardiac muscle contraction increasing activity, and the carbostyril derivatives are useful

6 PT.

$$\cos\beta^* = \frac{K_2 - n\frac{T''}{\nu''}}{\sqrt{K_1^2 + \left(K_2 - n\frac{T'}{\nu''}\right)^2 + K_3^2}}$$

Carbostyril derivative or a pharmaceutically acceptable acid addition salt thereof, having excellent platelate aggregation inhibitory effect, calcium antagonism, hypotensive effect and phosphodiesterase inhibitory effect are useful as prophylactic or treating agents for thrombosis, circulation improving agents for coronary blood flow such as coronary vasodilators, hypotensive agents and phosphodiesterase inhibitors. Furthermore, the carbostyril derivatives are weak in heart rate increasing activity and also in cardiac muscle contraction increasing activity, and the carbostyril derivatives are useful

4 PT.

$$v'_{refl}(t) = K\,r\,\delta\left(t - \frac{2L - 2d_s}{v_w}\right) + K(1 - r^2)e^{-2\alpha_s d_s}$$

8 PT.

Carbostyril derivative or a pharmaceutically acceptable acid addition salt thereof, having excellent platelate aggregation inhibitory effect, calcium antagonism, hypotensive effect and phosphodiesterase inhibitory effect are useful as prophylactic or treating agents for thrombosis, circulation improving agents for coronary blood flow such as coronary vasodilators, hypotensive agents and phosphodiesterase inhibitors. Furthermore, the carbostyril derivatives are weak in heart rate increasing activity and also in cardiac muscle contraction increasing activity, and the carbostyril derivatives are useful

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Carbostyril derivative or a pharmaceutically acceptable acid addition salt thereof, having excellent platelate aggregation inhibitory effect, calcium antagonism, hypotensive effect and phosphodiesterase inhibitory effect are useful as prophylactic or treating agents for thrombosis, circulation improving agents for coronary blood flow such as coronary vasodilators, hypotensive agents and phosphodiesterase inhibitors. Furthermore, the carbostyril derivatives are weak in heart rate increasing activity and also in cardiac muscle contraction increasing activity, and the carbostyril derivatives are useful

4 PT.

$$(K_1x + K_2y + K_3z + T) + n(K''_1x + K''_2y + K''_3z + T') = 0$$

r_1 (L_1)	r_6 (L_3)	r_7 (L_4)
K = 1.0	K = 1.0	K = 0.0
C_2 = 0.0	C_2 = 0.0	C_2 = 0.0
C_4 = −0.15691 × 10^{-6}	C_4 = +0.95381 × 10^{-7}	C_4 = −0.22891 × 10^{-5}
C_6 = −0.40068 × 10^{-10}	C_6 = −0.73871 × 10^{-10}	C_6 = +0.12283 × 10^{-9}
C_8 = +0.21016 × 10^{-13}	C_8 = +0.12280 × 10^{-13}	C_8 = +0.84230 × 10^{-13}
C_{10} = −0.37685 × 10^{-17}	C_{10} = −0.33177 × 10^{-17}	C_{10} = −0.20592 × 10^{-16}
f_1 = 314.6		
f_2 = 88.0		
f_3 = −481.2		
f_4 = −99.6		

100mm

= 101.2	Aperture ratio:	1:1.10	
agnification of projection:		−7.997×	
ılf angle of view:		28.56°	
43.454	d_1 = 11.0	n_1 = 1.49380	L_1
-1542.254	d_2 = 68		
16.976	d_3 = 20.0	n_2 = 1.62286	L_2
10.914	d_4 = 2.87		
-89.375	d_5 = 5.0	n_3 = 1.59501	L_3
-127.071	d_6 = 58.8		
-48.609	d_7 = 5	n_4 = 1.49380	L_4
	d_8 = 5	n_5 = 1.45000	S
∞	d_9 = 8	n_6 = 1.51872	G

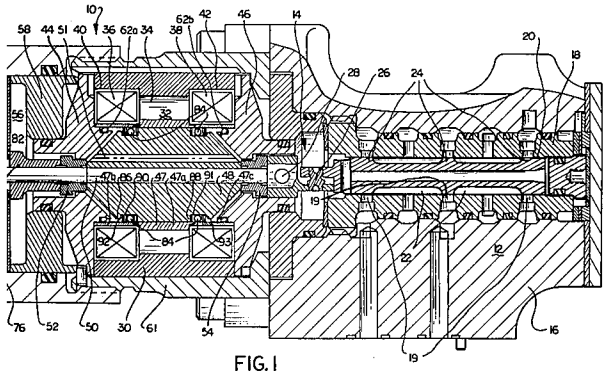


FIG. 1

IMAGE SYSTEM
TEST TARGET
A
U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

(No Model.)

3 Sheets—Sheet 2.

B. F. HARFORD.

CULTIVATOR.

No. 532,055. Patented Jan. 8, 1895.

FIG. 2.

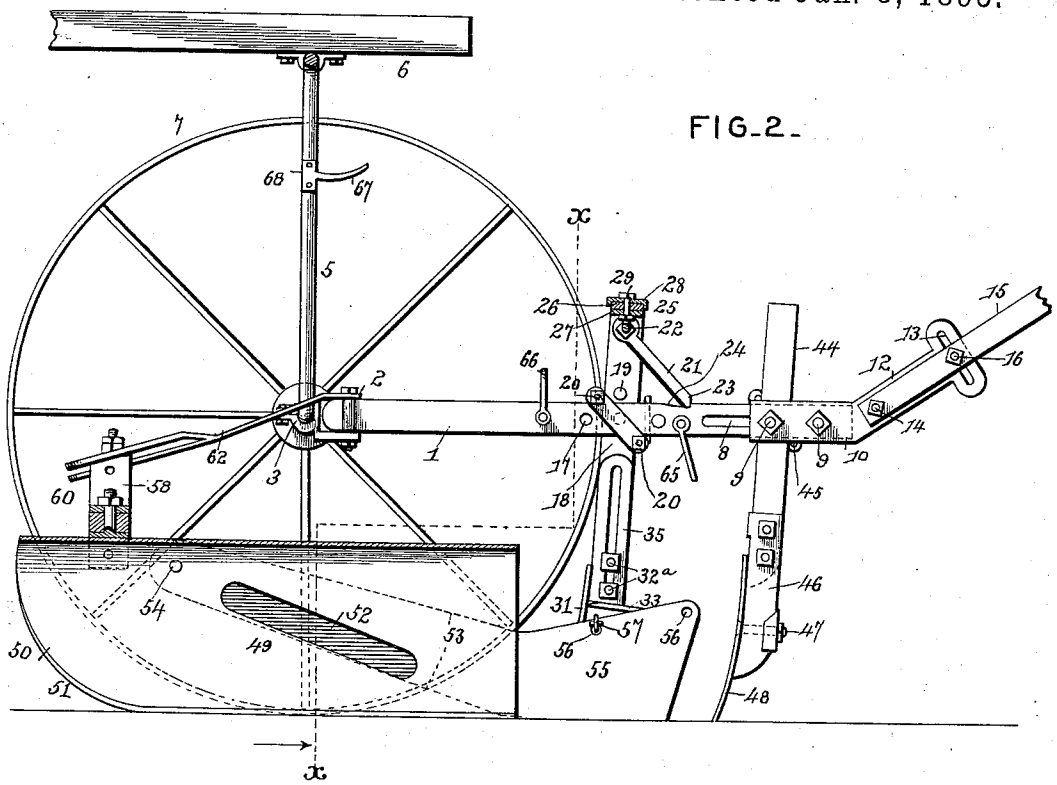
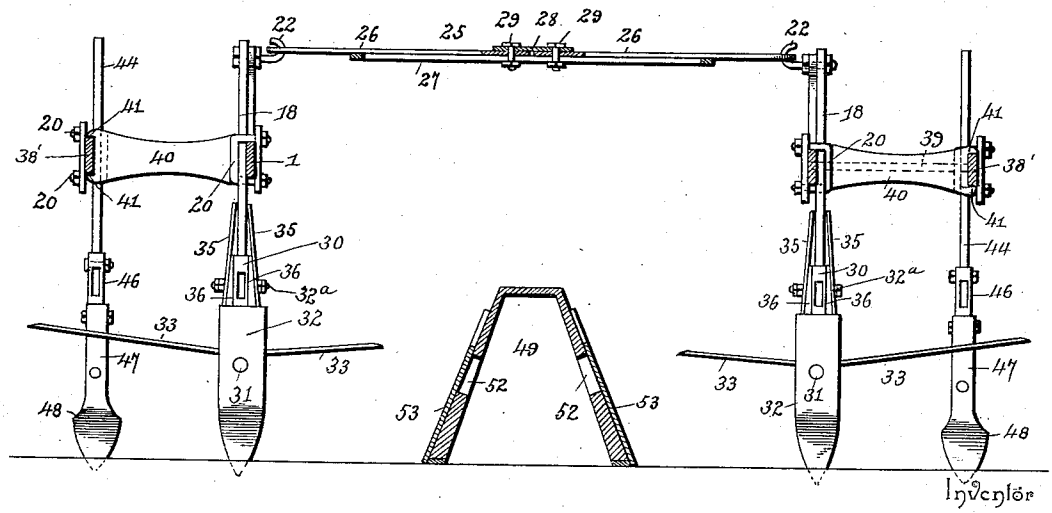


FIG. 3.



Inventor

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Witnesses

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(No Model.) 3 Sheets—Sheet 3.

B. F. HARFORD.

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FIG. 4.

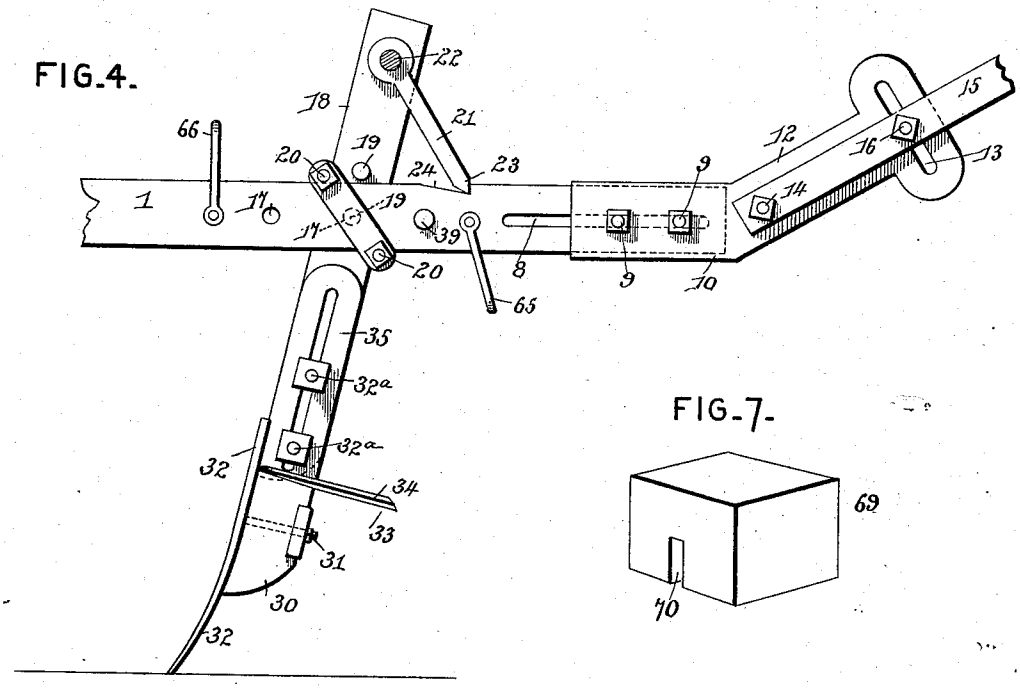


FIG. 7.

FIG. 5.

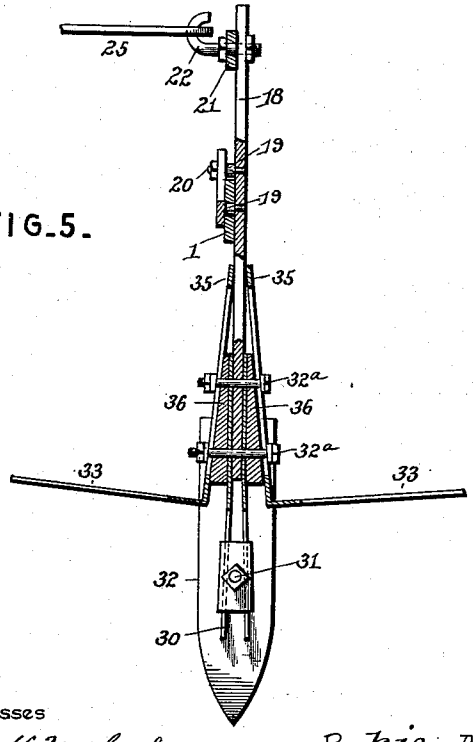
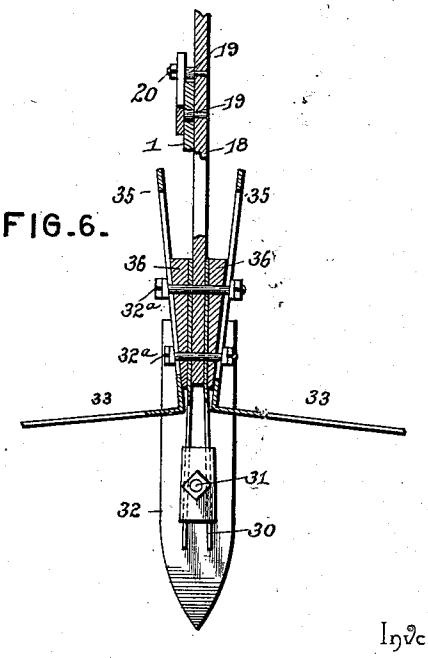


FIG. 6.



Witnesses

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UNITED STATES PATENT OFFICE.

BENONI F. HARFORD, OF RANDALL, KANSAS.

CULTIVATOR.

SPECIFICATION forming part of Letters Patent No. 532,055, dated January 8, 1895.

Application filed February 10, 1894. Serial No. 499,808. (No model.)

To all whom it may concern:

Be it known that I, BENONI F. HARFORD, a citizen of the United States, residing at Randall, in the county of Jewell and State of Kansas, have invented a new and useful Cultivator, of which the following is a specification.

This invention relates to cultivators and especially to an improvement in that class of cultivators known as parallel or straddle-row cultivators, which are adapted to span a row and travel at both sides thereof to effect a proper cultivation of the soil.

To this end the main and primary object of the invention is to construct an improved straddle-row cultivator, which, while especially adapted for use in cultivating listed or young corn, at the same time may be adapted for different kinds of cultivation, and in such different uses may well be used as simply a surface cultivator to gently roll or move the dirt up to the row, or may be used in cultivating wet heavy soil in which most of the ordinary types of plows and cultivators cannot be used. In all of the several uses enumerated the cultivator is constructed with special reference to the thorough and complete removal of weeds which may have grown up in the field being cultivated.

With these and other objects in view, which will readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination, and arrangement of parts hereinafter more fully described, illustrated, and claimed.

In the accompanying drawings:—Figure 1 is a perspective view of my improved cultivator showing all the attachments properly positioned. Fig. 2 is a central vertical longitudinal sectional view of the same. Fig. 3 is a transverse sectional view on the line *x*—*x* of Fig. 2. Fig. 4 is an enlarged detail elevation at the inner side of one of the cultivator beams. Fig. 5 is an enlarged vertical sectional view of the construction shown in Fig. 4. Fig. 6 is a view similar to Fig. 5 showing a reversal of the position of the cutter blade adjusting wedge washers. Fig. 7 is a detail in perspective of one of the beam weights.

Referring to the accompanying drawings, the numerals 1, 1, designate a pair of connected cultivator beams adapted to be used alone or in connection with a riding cultivator frame such as is ordinarily employed in connection with cultivators of this type, and when used in connection with the riding frame the front ends of the cultivator beams 1, have bolted thereto the inner pair of jaws of the double coupling knuckle 2. The double coupling knuckle 2, comprises the separate U-shaped clip portions 3, the wider of which is bolted to the front ends of the cultivator beams, while the other clip portion is adjustably bolted to the horizontal or angled axle ends 4, of the arched axle beam 5, on which is supported an ordinary riding frame 6, from which extends the usual draft tongue, and on the axles 4, thereof, are mounted the riding or ground wheels 7, which support the advance or front end of the cultivator and provide for the easy draft thereof over the ground.

The knuckle connection of the front ends of the cultivator beams with the horizontal axles 4, of the riding frame not only serves to connect the beams to this frame, but at the same time provides a lateral adjustment for the front ends of the beam so that the cultivator can be adjusted to different widths of rows, which the same is adapted to straddle while in operation.

Both of the cultivator beams 1, are provided at their rear extremities with the longitudinally disposed adjustment slots 8, which are adapted to receive for longitudinal adjustment the handle adjusting bolts 9. The handle adjusting bolts 9, pass through the inner end of the off-standing attaching arms 10, and also through the washers 11, held at one side of the beams to strengthen the attachment of the arms 10, thereto, and said arms 10 are provided beyond the portions clamped to the cultivator beams with the upwardly and angularly disposed plates 12, provided at their outer ends with the vertically disposed slots 13, and adapted to have pivotally clamped thereto on the pivot bolts 14, the inner ends of the cultivator handles 15, which handles also receive at a point beyond the bolts 14, the adjustment bolts 16, which pass through the vertically disposed slots 13, and provide means for the vertical adjustment of the cultivator handles to suit the height of the operator. These two adjustments for the cultivator handles 15, provide

simple and efficient means for quickly adjusting or positioning the cultivator handles as the requirements of the work may demand.

The beams 1, are further provided at a point intermediate of their front and rear ends with a longitudinal series of adjustment perforations 17, which provide for the longitudinal and vertical adjustment of the main cultivator standards 18. The cultivator standards 18, are provided at one side near their upper ends with two or more engaging studs 19, any one of which is adapted to engage one of the perforations 17 in the cultivator beams to provide for the forward, rearward, or vertical adjustment of the standards to accommodate the same to the particular work required of them, and the cultivator standards 18, are held detachably clamped to the beams, with the studs 19, in engagement with the perforations therein, by means of the U-shaped clamping bolts or clips 20, diagonally embracing the cultivator beams and also the standards, to insure a firm connection. The cultivator standards 18 may be moved forward or backward and up and down, after loosening the bolts 20, to regulate the depth at which the shovels shall travel, and are firmly braced in these or other adjustments by means of the upper locking dogs 21. The upper locking dogs 21, are pivotally clamped at their upper ends to the upper extremities of the standards above the beams on the hook bolts 22, and are provided with lower pointed ends 23, adapted to have a locking engagement with the beam notches 24, cut in the upper edge of the cultivator beams, and by adjusting the locking dogs 21, in engagement with the notches in the beams, after the adjustment of the standards, such standards will be firmly braced and firmly strengthened against loosening or being otherwise displaced.

While the beams 1 are illustrated as provided with single notches 24 in their upper edges, it will of course be understood that two or more of such notches may be formed in the beams for the purpose of admitting of different adjustments thereof. At this point attention is directed to the fact that the dogs 21, act as braces for the cultivator standards to hold the same in proper position for work when lowered down to the ground to avoid the necessity of readjusting the standards. When turning the cultivator at the ends of the rows, the cultivator beams are lifted up and suspended above the ground by engaging the hooks 66 with the supporting arms or hooks 67. Now it will be understood that considerable strain is placed on the bolts or clips 20, and the same naturally loosen up somewhat, so that if this happened to be the case when the cultivator beams were lifted up, the weight of the shovels or cultivating devices carried by the standards would cause the same to incline forwardly up under the beams, so that when the beams were again lowered, the standards would necessarily have to be readjusted before commencing work again with the cultivator. The dogs 21 prevent this forward movement of the standards which would otherwise occur, which will be readily understood.

The hook bolts 22, referred to, have their hook extremities disposed inwardly and loosely receive the perforated ends of the sectional top brace 25. The top brace 25, comprises the perforated members 26, one of which is further provided with a projected slot plate 27, and the said members 26, are adjustably coupled together by means of the coupling plate 28, which accommodates the adjusting bolts 29, one of which engages the perforations or slot plate of one of the members, while the other bolt engages the slot plate of the same member and the perforations of the other member, thereby providing means for the lateral adjustment of the cultivators to accommodate the same to different widths of rows.

Each cultivator standard 18, has detachably coupled to its lower end a slotted attaching foot 30, to the lower end of which is removably bolted, on the bolt 31, the narrow cultivator shovel 32, of the ordinary construction, and which is employed when it is desirable for the cultivator to throw a less quantity of soil onto the row being cultivated. The attaching shoes 30, are secured to the standards 18, on the bolts 32^a, and these same bolts 32^a, detachably and adjustably clamp on both sides of the said cultivator standards the inner and outer laterally extending cultivator cutter blades 33. The inner of said cultivator blades 33, traveling next to the row being cultivated, are shorter than the other outer blades, and both of said cultivator blades extend laterally and rearwardly at an angle from the standards 18, and are intended to be used with or without the shovels 32, according to the requirements of the soil and the row being cultivated.

The laterally and rearwardly extending cultivator blades 33, are slightly concaved to form a curved cross section, and are provided with beveled cutting edges 34, which serve to cut down weeds, whether standing high or low, while at the same time providing a construction of cultivator blade, which, when adjusted to the lowest extremity of the standards may be employed for surface cultivation in cultivating garden truck and the like. The said inner and outer cutter blades 33, are provided at their inner ends with vertically slotted attaching arms 35, through which pass the bolts 32^a, to provide for clamping the said cutter blades in position and for the vertical adjustment thereof.

It will be apparent that the laterally extending cutter blades 33, are primarily intended to remove the weeds as the cultivator advances, but, if the work demands it, the inner shorter cutter blades may be adjusted down to the full depth of the furrow when cultivating listed corn if so desired. In order to dispose the outer point ends of the said

cutter blades 33 up or down as may be required, I employ adjusting washers 36. The adjusting washers 36, are of a wedge shape and are adapted to be clamped by the bolts 32ª, between the slotted blade arms 35, and the sides of the standards 18, and it will be obvious that when the pointed ends of the said wedge washers are disposed upwardly, an upward pitch will be given to the blades 33, to dispose their points upwardly, while a reversal of the position of said washers will correspondingly lower the pitch of the said blades to adapt the same to the work.

The cultivator constructed as described is complete for ordinary cultivating purposes, but in certain classes of work it is necessary to employ a separate shovel, and for this purpose I have provided means for converting the machine into a double-shovel cultivator without affecting the operation thereof as a straddle-row cultivator, and in cultivating listed corn.

In adapting the cultivator into a double-shovel cultivator, I employ the supplemental side beams 37. The supplemental side beams 37 are bolted at 38, to one side of the main beams 1, near their front ends, and are provided with outer angled ends 38′, which are held off from and connected to the beams 1, in rear of the standards 18, by the tie bolts 39, and the outer angled ends of said side beams are firmly braced in position by means of the interposed spacing plates 40, having notched ends 41, embracing the beams 1, and the side beams 37, respectively. The extreme rear ends of the said supplemental side beams 37, are provided with a longitudinal series of adjustment perforations 42, adapted to receive the studs 43, projected from one side of the supplemental standards 44. The supplemental standards 44, are longitudinally and vertically adjustable on the rear ends of the beams 37, by reason of the engagement of the studs 43, with the perforations 42, and in this respect are identical with the construction and adjustment of the standards 18, and are also firmly clamped onto the supplemental side beams by the U-shaped clamping bolts or clips 45, diagonally embracing the said side beams and the supplemental standards.

The supplemental standards 44, have bolted to their lower ends the slotted attaching feet 46, to which are bolted on the bolts 47, the narrow cultivator shovels 48, which are adapted to supplement the shovels 32, in order to provide for a thorough cultivation of the soil in certain work, and although the supplemental shovel attachments just described may be used to good advantage with all the other attachments of the cultivator, still the same are preferably detached from the main beams when cultivating listed corn.

In connection with the cultivating devices described and particularly the main cultivators 32 and 33, when cultivating listed corn, I employ the V-shaped shoe 49. The V-shaped shoe 49, is adapted to straddle a row of young corn, and is provided on its opposite lower edges with the smooth runner plates 50, which admit of the easy draft of said shoe over the row, and the opposite diverging sides of the said shoe are rounded at their front ends as at 51, and are provided therein with the angularly disposed dirt openings or slots 52, which are designed to admit fine dirt to pass into the young corn which is straddled by the shoe. The quantity of earth which is admitted through the dirt openings or slots 52, is regulated by means of the adjustable shield plates 53. The adjustable shield plates 53, are pivoted at 54, to opposite sides of the shoe 49, and are adapted to work over the openings or slots 52, to regulate the size of opening through which the dirt shall pass, and the rear ends of said shield plates extend in rear of the shoe 49, to form the runner portions 55, which travel freely over the ground at the rear of the shoe when it is desired to cut off or prevent the dirt from being admitted to the young plants. The rear extended ends of said shield plates are further provided at their upper edges with a series of perforations 56, which are adapted to be engaged by the opposite ends of the adjusting link 57. By moving the adjusting link 57, in the perforations 56, to or from the rear end of the shoe 49, the plates 53, will be adjusted up and down to cover and uncover the openings 52, as may be required.

In attaching the listed corn devices to the cultivator, I employ a transverse attaching bar 58, which is pivotally secured to the top of the shoe 49 at its front end on the bolt 59, and said attaching bar 58, extends to either side of the shoe 49 and is provided in its ends with a series of perforations 60, to adjustably receive the connecting bolt 61, which passes through the inner bifurcated end of the link arms 62, adjustably connected to the opposite ends of the bar 58. The inner bifurcated ends of the link arms 62, are provided with a series of perforations 63, in order that the proper adjustment may be had with the bar 58, and the outer swinging ends of the said link arms are slotted as at 64, to loosely engage over the vertical side portions of the arched axle beam 5, in order to permit the connections with the shoe to freely adjust themselves. The connections 62, and 58, provide a flexible coupling which serves to hold the shoe 49, perfectly straight as it travels over the row inasmuch as the said shoe is not permitted to yield to any uneven movements of the cultivators traveling at each side of the same.

It has already been stated that the cultivator may be used with or without a riding frame such as described, and when employed in connection with the riding frame, U-shaped feet stirrups 65, are bolted to the beams 1, in rear of the standards 18, to receive the operator's feet at any time it is necessary to assist in handling the cultivator members, and when it is desired to lift the cultivators up off the ground and hang the same out of oper-

ative position, the engaging hooks 66, which are bolted to the beams 1, in advance of the standards 18, are brought into engagement with the supporting arms or hooks 67, clamped onto the riding frame by suitable clamps 68.

When the cultivator is used simply as a surface cultivator with the horizontally disposed cultivator cutter blades 33, it is usually necessary to hold such blades down to the work, and to provide for this I employ a suitably heavy beam-weight 69. The beam-weight 69, is made of a suitable sized block of metal, and is provided in its under side with a notch or groove 70, adapted to removably engage over the cultivator beam, as clearly shown in the drawings.

From the foregoing description it will now be clear to those skilled in the art that the cultivator, while especially useful while cultivating listed corn, at the same time is capable of a variety of uses in different classes of work, and since the same may be adapted and modified in several ways according to the work required of it, I will also have it understood that changes in the form, proportion and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Having thus described the invention, what is claimed, and desired to be secured by Letters Patent, is—

1. In a cultivator, the combination of the beam having a longitudinally disposed slot at its rear end, an off-standing attaching arm receiving bolts adjustably engaging said longitudinal slot, said attaching arm being provided with an upwardly and angularly disposed plate having at its outer end a vertically disposed slot, the cultivator handle pivoted at its inner end to said upwardly disposed plate, and an adjustment bolt engaging said handle and the vertically disposed slot of said plate, substantially as set forth.

2. In a cultivator, the combination with the beam, of the standards detachably clamped to said beam and longitudinally and vertically adjustable thereon, a shovel bolted to the lower end of said standard, and a pair of different length cutter blades having attaching arms vertically adjustable on each side of the standard and extending laterally and rearwardly therefrom, said attaching arms being disposed at an angle to the length of the standards to give the blades a vertical inclination or pitch substantially as set forth.

3. In a cultivator, the combination with the beam; of the standard detachably clamped to said beam and provided with an attaching shoe at its lower end, the shovel bolted to said shoe, laterally and rearwardly extending cutter blades having inner attaching arms vertically adjustable at one side of the standard, and means for adjusting the vertical pitch or inclination of said cutter blades, to dispose their points upward or downward substantially as set forth.

4. In a cultivator of the class described, the combination with the connected beams; of the detachable and adjustable standards, a pair of different length cutter blades provided at their inner ends with vertically slotted attaching arms adjustably bolted to the sides of the standards, said cutter blades being slightly curved in cross section and extending outwardly and rearwardly from the standards, and reversible wedge-shaped washers interposed between the attaching arms of said blades and said standards to change the pitch of the blades, substantially as set forth.

5. In a cultivator, the combination of the connected beams having a longitudinal series of adjustment perforations intermediate of their ends, the detachable standards carrying the shovels and provided at one side with a series of short studs adapted to engage the perforations in the beams to provide for the vertical and longitudinal adjustment of the standards, the U-shaped clamping clips diagonally embracing the cultivator beams and the standards, means for supporting the beams above the ground, and brace connections with the upper ends of the standards to hold the same properly in position when the beams are elevated, substantially as set forth.

6. In a cultivator, the beams having notches, in their upper edges, the shovel carrying standards detachably clamped to the beams and longitudinally and vertically adjustable thereon, and the locking dogs pivotally clamped at their upper ends to the upper extremities of the standards above the beams and adapted to engage with said beam notches, substantially as set forth.

7. In a cultivator, the combination of the separated beams connected at their front ends for lateral adjustment, to and from each other the shovel standards clamped to the beams intermediate of their ends, hook bolts detachably fitted in the upper ends of the standards above the beams, and a sectional top brace having perforated ends loosely and detachably engaging said detachable hook bolts, said top brace comprising aligned perforated members, one of which is provided with a projected slot plate underlapping the other perforated member, and a top coupling plate adjustably connecting the separate members together, substantially as set forth.

8. In a cultivator, of the class described, the combination with the connected beams and the cultivating devices carried thereby; of supplemental side beams detachably bolted to the main beams and provided with outer angled ends, tie bolts connecting the outer angled ends of the side beams with the main beams, removable interposed spacing plates 40 having notched ends detachably embracing the main beams and said side beams respectively, said plates being detachably arranged in position directly at one side of said tie bolts supplemental standards detachably bolted to the rear extremities of the side beams, and vertically and longitudinally ad-

justable thereon, and the shovels bolted to the lower ends of said supplemental standards, substantially as set forth.

9. In a cultivator of the class described, the combination of the runner shoe provided with dirt slots or openings in the sides thereof, the opposite connected cultivator beams also connected with the runner shoe, the cultivator standards, and a pair of different length horizontally disposed cutter blades adjustably bolted to said standards, and the inner shorter of which blades is capable of adjustment to the bottom of the furrows at the sides of the row straddled by said shoe, substantially as set forth.

10. In a cultivator of the class described, the combination with the front draft frame; of the opposite connected cultivator beams carrying the cultivating devices and adjustably connected at their front ends with the draft frame, of a V-shaped runner shoe adjustably and loosely connected with said draft frame and provided with angularly disposed dirt slots or openings in the sides thereof, shield plates pivotally mounted at opposite sides of said shoe and adapted to regulate the size of said dirt slots or openings, and means for adjusting said plates substantially as set forth.

11. In a cultivator of the class described, the combination with the opposite connected cultivator beams carrying the cultivating devices, of the V-shaped runner shoe arranged to travel between the cultivating devices and provided in its opposite sides with angularly disposed dirt openings or slots, and on its opposite lower edges with smooth runner plates, opposite adjustable shield plates pivoted at their inner ends to opposite sides of the shoe and working over said dirt openings or slots, said shield plates being provided with rear extended runner portions, and an adjustable connection between the rear ends of said shield plates to adjust the same over said dirt openings or slots, substantially as set forth.

12. In a cultivator of the class described, the combination with the arched axle beam of a riding frame; of a connected pair of cultivator beams carrying cultivating devices and adjustably connected at their front ends to the axles of said beam, a runner shoe arranged to travel between said beams, a transverse attaching bar pivotally bolted to the top front end of said shoe, and having a series of perforations in its extremities and link arms having perforated ends loosely and adjustably connected at one end to the extremities of said attaching bar and provided with outer slotted ends loosely engaging the vertical side portions of the arched axle beam, substantially as set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

BENONI F. HARFORD.

Witnesses:
GEO. B. CRANDALL,
WM. G. SMITH.