(No Model.) 3 Sheets—Sheet 1.

F. M. PENNOCK.

ROAD SCRAPING AND DITCHING MACHINE.

No. 390,035. Patented Sept. 25, 1888.

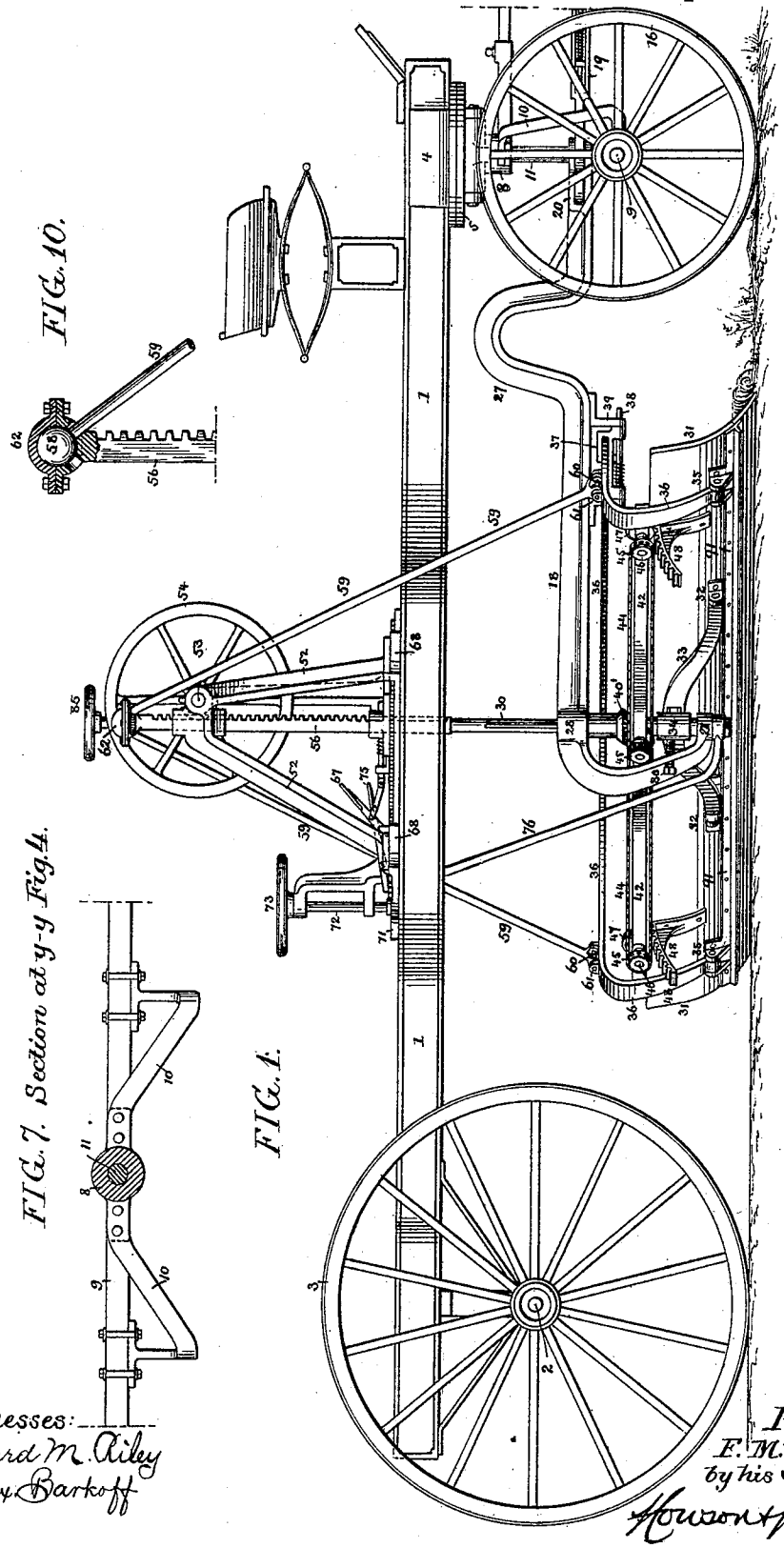


FIG. 1.

FIG. 10.

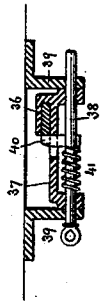


FIG. 8.

FIG. 7. Section at y-y Fig. 4.

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(No Model.) 3 Sheets—Sheet 2.

F. M. PENNOCK.

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FIG. 1.

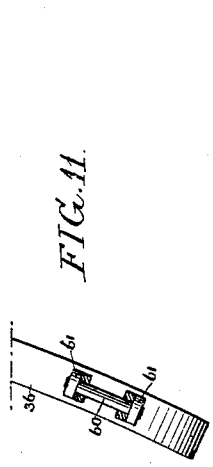


FIG. 6. Section at w-w Fig 4.

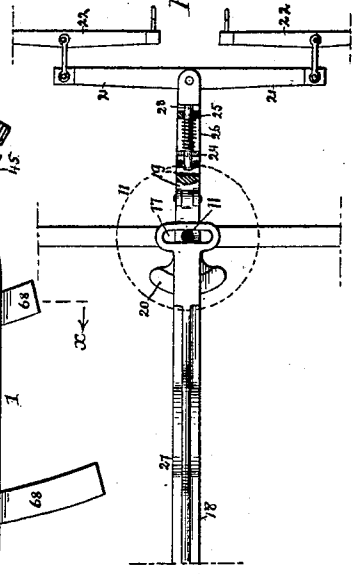


FIG. 2

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ROAD SCRAPING AND DITCHING MACHINE.

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FIG. 5.

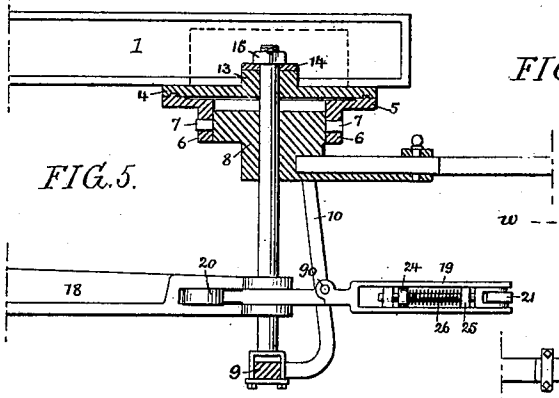


FIG. 4.

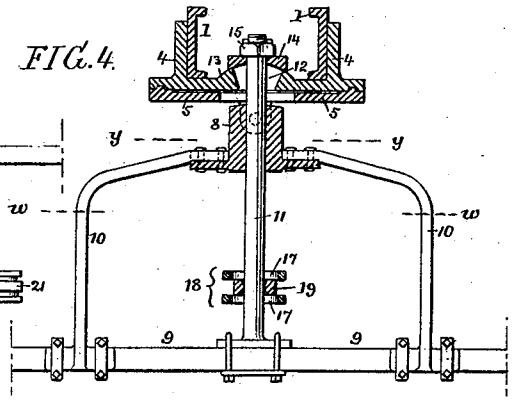


FIG. 14.

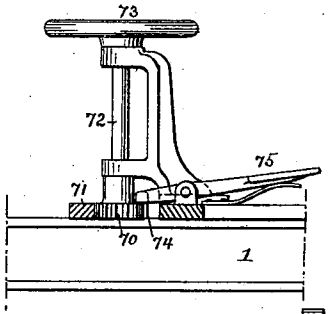


FIG. 3.

FIG. 12

FIG. 13

FIG. 9.

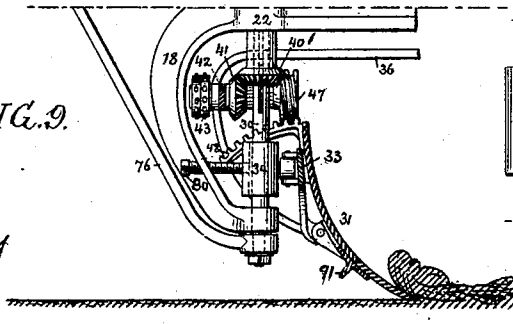
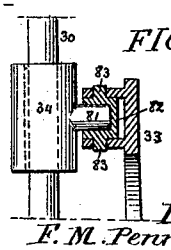


FIG. 15.



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UNITED STATES PATENT OFFICE.

FREDERICK M. PENNOCK, OF KENNETT SQUARE, PENNSYLVANIA.

ROAD SCRAPING AND DITCHING MACHINE.

SPECIFICATION forming part of Letters Patent No. 390,035, dated September 25, 1888.

Application filed March 29, 1888. Serial No. 268,883. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK M. PENNOCK, a citizen of the United States, and a resident of Kennett Square, Chester county, Pennsylvania, have invented certain Improvements in Road Scraping and Ditching Machines, of which the following is a specification.

My invention relates to that class of road-machines in which the scraping or plowing blade is adjustable in different ways to best adapt it for the particular class of work which it has to perform, one of the objects of my invention being to provide for the adjustment of the blade for the various classes of work in road construction—repair or surface ditching—without resorting to the use of complicated adjusting mechanism, a further object being to securely lock and hold the blade in the various positions to which it may be adjusted, thereby insuring accuracy and uniformity of work, and a still further object being to insure direct and effective draft upon the blade whatever the position to which it may have been adjusted. With these objects in view my invention comprises certain detailed constructions and combinations of parts fully set forth and claimed hereinafter, reference being had to the accompanying drawings, in which—

Figure 1 is a side view of a road machine or ditcher constructed in accordance with my invention. Fig. 2 is a plan view of the same. Fig. 3 is a transverse section on the line *x x*, Fig. 1, looking in the direction indicated; and Figs. 4 to 15 are detached views of parts of the machine, illustrating special details of construction or features of invention.

The rigid longitudinal frame or carriage 1 of the machine is mounted at the rear end upon a suitable axle, 2, provided with wheels 3 3, the front end of said frame being carried by a saddle, 4, which is mounted upon a fifth-wheel, 5, and on the latter are lugs or ears 6, to which is hung by means of longitudinal pins 7, or by a longitudinal pivot-bolt, a swinging block, 8, mounted upon the front axle, 9, by means of an arch having opposite bars 10 10 secured at their lower ends to said axle and serving to support the block 8 at the proper distance above the same. (See Figs. 4 and 5.)

Secured to the axle 9 midway of its length is a king-bolt, 11, which passes vertically through the swinging block 8, through an opening in the fifth-wheel 5, and through a laterally-flared opening, 12, in the saddle 4, as shown in Fig. 4, this opening being formed in a central boss, 13, on the saddle, and said boss having a convex upper surface, upon which bears the concave under surface of a washer-plate, 14, which is confined vertically by means of a nut, 15, at the upper end of the king-bolt. By this means the front axle is free to swing upon the longitudinal pivots 7 as the center, so as to permit the front wheels, 16, to rise and fall to accommodate themselves to inequalities in the road, and said axle is also free to turn upon the king-bolt 11 as a pivot, in order that the machine may be drawn to one side or the other or turned around, both the swinging and turning movement of the front axle being entirely independent of the main frame 1 of the machine, but these movements, owing to the connection described, being effected without any risk of looseness or play in the various joints forming the connection between said frame and the axle.

The king-bolt 11 is adapted to a lateral slot, 17, in the expanded front end of a draft-bar, 18, as shown in Fig. 6, this front end of the draft-bar being forked for the reception of a whiffletree-bar, 19, which is likewise hung to the king-bolt, and has a portion, 20, extending in the rear of the same and laterally expanded, as shown in Fig. 6, so that by its bearing in the forked front end of the draft-bar it will serve to maintain the whiffletree-bar always in the horizontal position, while the king-bolt is at liberty to vary laterally from the vertical as the wheels rise and fall in passing over inequalities in the road.

In the whiffletree-bar 19 is guided in the present instance a stem, 23, within the forked head of which is pivoted a doubletree, 21, to which are hung the singletrees 22 for the team, the stem 23 having at or near the rear end a collar, 24, between which and a fixed bearing or abutment, 25, in the whiffletree-bar is interposed a spring, 26, so that the pull of the team is exerted on the whiffletree-bar through the medium of this spring, and an elastic or yielding draft is insured (see Figs. 5 and 6) to prevent sudden strain upon the team when the

scraper-bar of the machine meets with undue obstructions. In the whiffletree-bar is a joint, 90, similar to an ordinary rule-joint, so that the outer end of said bar may remain at the proper height for the team when the draft-bar is lowered below said point, the outer portion of the bar in any case being prevented from dropping below the level of the draft-bar.

The draft-bar 18 has at the proper point a goose-neck, 27, as shown in Fig. 1, so that the front wheels, 16, can pass under the same in order to permit a short turn of the front axle, and for the same reason the opposite bars 10, forming the supporting-arch for the swinging block 8, project in advance of the axle, as shown in Figs. 2, 5, and 7. The rear end of the draft-bar 18 is bent downward and forward, so as to form upper and lower bearings 28, which are adapted to a vertical bolt, 30, which I term the "body-bolt." On this bolt is a sleeve, 34, which is free to rise and fall on the bolt, but is prevented from turning thereon by means of a set-screw, 80, carried by the rear portion of the draft-bar 18, and from the sleeve 34 projects forward or in a line with the draft-bar a stud, 81, Fig. 15, to which is hung a sleeve, 82, having projecting pivot-pins 83, adapted to brackets on a bar, 33, which carries the scraping-blade 31, the pins 83 thus forming the axis on which the scraper-bar 31 has its movement of partial rotation in a horizontal plane, so as to assume different angles in respect to the central longitudinal line of the machine, this movement, for convenience, being hereinafter referred to as the "horizontal angular adjustment."

The scraping-blade is made in two parts, comprising the lower cutting or scraping blade and the upper or mold-board portion, and these two portions of the blade are connected by a longitudinal bar, 91, which serves not only as a joint-bar, but also to stiffen the entire blade in the direction of its length.

The bearings for the ends of the bar 33, referred to hereinafter, are preferably so constructed as to bear on this brace-bar 91, and thus render the construction more rigid and unyielding than it otherwise would be.

The stud 81 serves as the axis for the vertical vibration of the scraping-blade for the purpose of raising or lowering the opposite ends of the same, this being known as the "vertical end adjustment."

The scraper-bar is pivoted in the rear at the points 32 to the opposite ends of the bar 33, and said blade is also hung at points 35, near its opposite ends and in line horizontally with the pivots 32 to the downwardly and forwardly projecting ends of a semicircle-bar, 36, which is suitably supported, as described hereinafter, and passes through a guide, 37, hung by a longitudinal bolt, 38, to suitable brackets, 39, on the under side of the draft-bar 18, the pivot-bolt being moved longitudinally in the brackets 39 and being provided with a locking-stud, 40, Fig. 8, which is caused by means of a spring, 41, to engage with one of a series of notches, 42, in the edge of the semicircle-bar 36, so as to lock the same in any circumferential position which it may assume. By raising and lowering the semicircle-bar bodily, therefore, the draft-bar and scraper-blade will be raised and lowered with the same, this movement being termed the "general vertical adjustment;" but owing to the longitudinal pivot-stud 81 and rocking guide and locking-block 40 either end of the blade may be raised or lowered, the other end being simultaneously lowered or raised to a like extent, this movement, as before stated, being known as the "vertical end adjustment," the pivots 81 and 38 being always in line with the draft-bar whatever the horizontal angular adjustment of the scraper-blade may be.

There is still another adjustment of the blade, known as the "pitch adjustment," which consists in swinging the blade forward or backward upon the horizontal pivots 32 35, this adjustment being effected by the rotation of the body-bolt 30, the latter having a bevel-wheel, 40', splined thereon, so that it can slide vertically on but is compelled to turn with the bolt, this bevel-wheel meshing into a pinion, 41, which is carried by a short shaft having its bearings in a transverse bar, 42, connecting the rear ends of the semicircle-bar 36, said shaft having at its rear end sprocket-wheels 43, receiving endless chains 44, which drive other sprocket-wheels, 45, carried by short shafts 46, adapted to bearings in the bar 42 near the opposite ends of the same, these shafts 46 having worms 47, which engage with segmental racks 48, secured to and projecting rearwardly from the scraper-blade 31, as shown in Figs. 1 and 9, so that by turning the body-bolt 30 in one direction or the other by means of the hand-wheel 85 the scraper-blade may be caused to swing in one direction or the other upon its pivots 32 35, and the vertical angle or pitch adjustment of the blade will be thereby effected and maintained.

It will be observed that all of the adjustments of the scraper-blade which I have described are accomplished without in any way affecting the direct horizontal draft of the bar 18, so that the power of the team is exerted with full effect upon the scraper-blade whatever the adjustment of the latter.

The body-bolt 30 is adapted in the present instance to bearings in a frame, 50, and in a post, 51, carried by said frame, and to bearings in said post and in opposite standards, 52, on the frame 50 are adapted short shafts 53, having hand-wheels 54, the hubs of which form or are secured to pinions 55, engaging with vertical rack-bars 56, guided in the frame 50 and in brackets 57 at the upper ends of the standards 52. The upper end of each of the rack-bars 56 forms the lower half of a socket for the reception of a ball, 58, at the upper end of a rod, 59, which constitutes the supporting-rod for one end of the semicircle-bar 36, the lower end of said rod being forked and adapted to a bolt, 60, carried by lugs 61

near the rear ends of the semicircle-bar, as shown in Figs. 2 and 11, so that while the joint between the suspension-rod and the semicircle-bar is rigid in the direction in which strain is exerted upon the scraper-blade it possesses such lateral flexibility as is required by the changing angles of the semicircle-bar, due to the vertical end adjustment of the scraper-blade, the ball-and-socket connection between the upper end of each rod 59 and the upper end of the lifting rack-bar 56 providing not only for the rise and fall of the opposite ends of the scraper-bar, but also for the circumferential swinging of the same in effecting its horizontal angular adjustment, a single joint at each end of the supporting-rod only being thus employed, and a rigid vertical support for the opposite ends of the semicircle-bar and scraper being insured.

The ball 58 at the upper end of each suspension rod 59 is confined to the socket at the upper end of the bar 56 by a cap, 62, which has a flange or lugs bolted to a similar flange or lugs on the socket below, so that by adjusting this cap the wear of the parts can be readily taken up and the joint always kept tight.

The rack-bars 56 are maintained in the various vertical positions to which they may have been adjusted by means of locking-bolts 63, guided in the bearings 64 of the racks, each bolt being held in engagement with the rack by means of a spring, 65, and the rear end of each bolt being connected by a link, 66, to a treadle, 67, on depressing which the bolt is withdrawn from engagement with the rack, whereupon the latter can be raised or lowered, as required. (See Figs. 12 and 13.)

It is frequently necessary in machines of this class to laterally shift the entire scraper-blade without changing the angle of the same, for a purpose set forth at length hereinafter. To provide for thus adjusting the scraper-blade bodily in a lateral direction, the frame 50, which carries the body-bolt and the scraper-blade-adjusting devices, has projecting arms or bars 68, which are adapted to suitable bearings on the main frame 1, so that the frame 50 can slide laterally in either direction within the limits of said main frame, the central portion of which is expanded laterally, as shown in Fig. 2, so as to permit this adjustment.

The adjustment is effected by means of a pinion, 70, engaging with a segmental rack, 71, on the fixed frame, this pinion being carried by a shaft, 72, which has a suitable hand-wheel, 73, as shown in Figs. 1, 2, and 14, said shaft being adapted to suitable bearings on the frame 50, so that by turning the shaft the frame is caused to move either to the right or left, the king-bolt 11 serving as the center of vibration and the guide wings 68 of the frame being on segments of which said king bolt is the center, the draft-bar 18 serving as the radius-bar for this swinging movement of the frame.

The frame may be locked in any position to which it is adjusted, the pinion 70 engaging with a bolt, 74, carried by a treadle, 75, on the frame.

The attendant who is operating the machine stands or sits upon the frame 50 and moves with said frame, so that he always preserves his central position in respect to the scraper-blade, which is the one best adapted for observing and controlling the action of said blade.

The lower end of the body-bolt 30 is rigidly held in position by means of one or more brace-rods, 76, extending from said lower end of the body-bolt to a point or points near the rear of the frame 50, as shown in Figs. 1 and 9.

Having described the mechanical construction of my improved machine, I will now point out some of the practical advantages attained thereby in the performance of its work.

Mounted road-machines of various styles have been used in which the scraper-blade is susceptible of horizontal angular adjustment, thereby adapting it to perform a much larger variety of work than the earlier styles of machines, in which the angular position of the scraper-blade with regard to the road was unvarying; but in these machines the scraping or plowing blade has been usually indirectly supported and drawn either from the carriage above or from its rear axle, on which account the frame is liable to spring when the blade is subjected to severe strain, unless the carriage is extremely heavy; moreover, the necessity for a considerable space between the top of the blade and the lower line of the carriage in this class of machines further extends the lines of support of the scraper-blade, and hence increases the above objection. With the view of overcoming this defect machines have been constructed in which the scraper-blade is drawn by a frame rigidly attached thereto, the front end of the frame being attached by a hinged connection to the front truck at or near the king-bolt. This form of blade, draft, and support is stronger and more direct than the other, and is more easily controlled in vertical adjustment, because there is less chance for yielding in the drawing and supporting mechanism of the blade; but it is objectionable because as the scraper-blade is lowered into work the draft-bar, owing to its hinged connection with the front truck, is thrown more and more at an angle to the line of work—that is to say, the plane of travel of the scraper-blade. Another objection is that it interferes with uniformity in the pitch adjustment, for when the scraper-bar is raised or lowered to conform to the constantly varying requirements of practical road work the hinging of the draft-frame at its front end causes the scraper-blade to rise and fall in the arc of a circle, thus varying the pitch of the blade.

An important feature of my invention lies in adjusting means for direct and horizontal draft to work in harmony with all the adjustments of the scraper-blade required in a thoroughly complete road-worker.

In the practical working of my machine the

whiffletrees rise and fall with the scraper-blade, and the draft of the team comes primarily and directly upon the scraper-blade, even when it is most deeply engaged in the earth, the draft being exerted secondarily upon the carriage through its connections with the draft-bar and scraper-blade. This horizontal draft is valuable in connection with a machine having horizontal angular adjustment, as it permits the maintenance in a constant horizontal plane of the semicircle-bar or other means whereby the scraper-blade is reversed and maintained in different positions of angular adjustment.

It is evident that reversing is difficult in machines in which the scraper-bar and its reversing mechanism are hinged, whether the hinging be at the front or rear, and that in such machines the bar has to be raised to a certain position before reversing is easily effected—an objection which is effectually overcome in my improved machine.

As is well known by those familiar with the construction and repair of roads, the character of the work to be performed varies greatly with the soil, state of the weather, and the amount of packing the soil has been subjected to, and the pitch adjustment is for the purpose of varying the angle of the cutting-edge of the scraper-blade, so as to make it penetrate the hardest soil, and yet secure the greatest inclination to the level of the ground consistent with smooth cutting, for the greater the angle the less the draft required, the earth being plowed or lifted and not torn or scraped off.

The hardest soil can only be entered by tipping forward the top of the bar, which increases the "bite" of the cutting-edge of the blade. It is evident, then, that the pitch-adjusting mechanism is subjected to the most severe strains, and also that these strains are exerted principally at the ends of the blade, where the heaviest cutting is done, and unless the proper pitch is rigidly maintained at these points the blade will spring back and forth upon its hinges at the unsupported ends, which will rack the parts and prevent smooth work.

In my machine I secure a pitch adjustment uniform at all points of vertical adjustment, this adjustment being positively controlled and rigidly maintained by locating the adjusting devices near both ends of the blade, both of said devices being operated simultaneously by the attendant from his central position on the carriage.

Numerous joints and consequent lost motion is the cause of defective work in many road-machines, the strain being so great upon the parts that any looseness of fit soon becomes greater by wear.

I have increased the working adjustments of the scraper-blade in my improved machine over those in any road-machine of which I have knowledge, and have striven to obviate, so far as possible, complication and multiplicity of loose joints. To illustrate, I would refer to the means which I have adopted for effecting lateral and vertical adjustment of the blade. The object of the lateral adjustment is to carry the blade beyond the line of the wheels and the path traveled by the team without making less acute the angle of the scraping-bar in respect to the line of draft, an acute angle being often required to cut off the projecting edge of a ditch-bank beyond the point where a team can be safely driven or a vehicle safely drawn. I am aware that this adjustment has been attempted in some other machines; but all are open to objections. Some of the machines, for instance, are stiff-angled—that is to say, machines in which the blade is not susceptible of horizontal angular adjustment—and such machines are inoperative except on one side of the road at a time, and as it sometimes happens that all the earth has to be removed from a shoulder on one side of the road, while the team is driven in the same direction, such machines are of no avail on the return. In some machines that have horizontal angular adjustment the scraper-blade is loosely connected by chains front and rear in its lateral adjustment, and the actuating means for such lateral adjustment move in a straight line at right angles to the longitudinal axis of the machines, and not, as in my machine, in the segment of a circle whose center is the king-bolt, as accurate constructinn and the best results in road-work require. In my machine, moreover, the parts are constructed to effect the rigid retention of the blade after side adjustment, thus preventing any lateral dodging of the point of the blade, and hence I secure a furrow of uniform width beyond the wheels. The central position of the attendant and of the operating devices for blade adjustment being constantly maintained during the various lateral adjustments of the blade, the attendant's view of the scraper-blade is always the same, and he is no farther from the advance point of the blade when the latter is laterally projected than at other times. The lateral adjustment of the blade, moreover, does not change its relation to the operating mechanism, so that the equilibrium of the blade is never disturbed, and uneven weighting of the opposite ends of the blade is rendered impossible.

There is very little chance for lost motion in the devices which I employ for effecting vertical end adjustment of the scraper-blade, and this is important, because lost motion in the means of vertical adjustment of the blade causes rough work and prevents accurate control of the scraper-blade in this direction, as in every change from an uplift to a pressure downward upon the blade the adjusting devices fail to act promptly and the blade is liable to become unmanageable while failure to secure the blade positively in the various positions required results in objectionable movements of the blade to the extent of the lost motion in the lifting devices.

As will appear from a comparison of my ma-

chine with other machines having anything like as many scraper-blade adjustments as mine, I have very considerably reduced the number of joints between the scraper-blade and the operator's hand by avoiding the use of unnecessary intermediate parts.

Although the ends of the scraper-blade are in my machine connected to the lifters by devices of a rigid character, the latter do not offer any material resistance to the horizontal angular adjustment of the blade, owing to the fact that said lifters are located close to the axis on which the blade swings in effecting said adjustment.

In some styles of road-machines a lateral rocking of the front axle with respect to the main frame of the machine is permitted, in order to secure a smoother action of the blade when the front wheels pass over obstructions; but this object is imperfectly attained by using a king-bolt considerably smaller than the opening therefor in the fifth-wheel and a slight vertical projection of the king-bolt, so that the rocking is done upon the bolt within the connections. This is objectionable, as in this case the front end of the main frame will be raised off its bearings on the fifth-wheel to the amount of the vertical projection of the king-bolt when in very hard or stony soil it becomes necessary for the operator to throw the weight of the machine upon the scraper-bar, and under such circumstances this vertical play interferes with proper vertical adjustment, for this raising of the front end of the frame off of its bearings prevents the weight of the front truck being used to force the scraper-bar into the compacted surface of the road. This objection has been overcome in my road-machine by the means provided for permitting the lateral rocking of the front truck upon the front end of the main frame and the means for overcoming vertical and lateral looseness in the connection and for taking up the slack caused by wear of these parts.

Former machines having a semicircle rigidly attached to the scraper-blade have been constructed to permit what I have termed "vertical end adjustment," which causes a rocking of the scraper-blade and the semicircle-bar upon the propelling parts, to which said bar is locked in its various positions of horizontal angular adjustment; but this movement has been permitted by looseness in the fit of the semicircle-bar in the guides through which it passed. This objection is overcome in my invention by the use of the pivoted and rocking guide and locking-block, through which the semicircle passes in its horizontal rotation and to which it is locked in its various positions of horizontal angular adjustment.

My machine has been devised with the view of permitting a very acute working angle of the scraping or plowing blade, for this is necessary in order to enable it to easily penetrate hard soil and to scour properly when working in adhesive material.

In constructing surface ditches at the sides of roads and upon farms this feature is of especial value. When a machine, moreover, is so constructed as to permit an acute angle of the scraper-blade, the most severe work can be accomplished with moderate power, the displaced soil, of course, being moved laterally to but a slight extent on each trip, owing to the sharper angle of the blade.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination of a supporting frame or carriage, a direct-draft bar vertically adjustable in a constant horizontal plane, and a scraping or plowing blade hung so as to permit horizontal angular adjustment in respect to said direct horizontal draft-bar, all substantially as specified.

2. The combination of the supporting frame or carriage, a direct-draft bar vertically adjustable in a constant horizontal plane, and a plowing or scraping blade constructed for horizontal angular adjustment in respect to the draft-bar, and also for vertical end adjustment in respect thereto, all substantially as specified.

3. The combination of the supporting frame or carriage, the direct-draft bar vertically adjustable in a constant horizontal plane, and a scraping or plowing blade constructed for horizontal angular adjustment in respect to said draft-bar, and also provided with means for varying the pitch adjustment of the blade, all substantially as specified.

4. The combination of the supporting frame or carriage, the direct-draft bar vertically adjustable in a constant horizontal plane, and a scraping or plowing blade adjustable vertically with said draft-bar, all substantially as specified.

5. The combination of the supporting frame or carriage, the direct-draft bar vertically adjustable in a constant horizontal plane, the scraping or plowing blade, and the semicircle-bar, to the bent rear ends of which the scraping-blade is hung, said semicircle-bar being guided in its circumferential movement by a bearing on the draft-bar, all substantially as specified.

6. The combination of the supporting frame or carriage, the direct-draft bar vertically adjustable in a constant horizontal plane, the scraping or plowing-blade, and the semicircle-bar, to the ends of which the scraping-blade is hung, with a guide on the draft-bar for the reception of the semicircle-bar, and a bolt for locking the semicircle-bar to said guide, all substantially as specified.

7. The combination of the direct horizontal draft-bar, the scraping or plowing blade, and the semicircle-bar, to the ends of which said scraping-blade is hung, means for effecting the vertical end adjustment of the scraping-bar, and a guide carried by the draft-bar and constructed for receiving the semicircle-bar, said

guide being pivoted so as to swing as the ends of the scraper-bar are raised or lowered, all substantially as specified.

8. The combination of the supporting frame or carriage, the direct horizontal draft-bar, the scraping or plowing blade, and the semicircle-bar, to the ends of which said blade is hung, a guide carried by the draft-bar and constructed for the reception of the semicircle-bar, and a bolt serving both as a pivot for the guide and as a locking-bolt for the semicircle bar, all substantially as specified.

9. The combination of the supporting frame or carriage, the direct horizontal draft-bar, and the scraping or plowing blade, both draft-bar and blade being adjustable vertically, with the king-bolt of the forward truck serving as a guide for the vertical movement of the front end of the draft-bar, all substantially as specified.

10. The combination of the supporting frame or carriage, the direct horizontal draft-bar, a plowing or scraping blade carried thereby, and a body-bolt carrying the vertical axis of the scraping-blade and serving as a vertical guide for the rear end of the draft-bar, all substantially as specified.

11. The combination of the supporting frame or carriage, the direct-draft bar vertically adjustable in a constant horizontal plane, and a plowing or scraping blade provided with vertical and horizontal pivotal connections in line longitudinally with the draft-bar, all substantially as specified,

12. The combination of the supporting frame or carriage, the body-bolt, and the direct horizontal draft-frame hung at its rear end to said bolt, with a sleeve carried by the bolt, and a scraping or plowing blade hung to said sleeve by two pivots, one having its axis at right angles to that of the body-bolt and the other having an axis parallel therewith, all substantially as specified.

13. The combination of the semicircle-bar or equivalent rigid frame to which the scraping or plowing blade is pivoted, with pitch-adjusting devices carried by said rigid frame and acting upon the blade near the opposite ends of the same, said pitch-adjusting devices being constructed to lock the blade in the different positions to which it is adjusted, all substantially as specified.

14. The combination of the scraping or plowing blade, the semicircle-bar or equivalent rigid frame to which the blade is pivoted, pitch-adjusting devices at the opposite ends of the blade, and actuating mechanism therefor having its axis close to and parallel with that on which the blade swings in effecting horizontal angular adjustment, all substantially as specified.

15. The combination of the body-bolt, the scraping or plowing blade, the semicircle-bar to which the same is hung, the segmental racks secured to the blade, shafts having worms engaging with said racks, an intermediate shaft driven from the body-bolt, and sprocket wheels and chains whereby the shafts and their worms are driven from said intermediate shaft, all substantially as specified.

16. The combination of the supporting frame or carriage, the front truck having a pivotal connection therewith to permit deflection of the front axle from the horizontal plane of the frame, a direct horizontal draft-bar, a scraper-blade at the rear of the same, and a connection between said draft-bar and the front truck, whereby the deflection of the latter will not exert like influence upon the draft-bar, all substantially as specified.

17. The combination of the fixed frame of the carriage, the fifth-wheel, and the front axle pivoted thereto, so as to be free to swing laterally, the king-bolt, and a compensating connection between said king-bolt and the fixed frame, all substantially as specified.

18. The combination of the front axle and the king-bolt, the horizontal draft-bar, and the scraper-blade at the rear of the same, with the whiffletree-frame connected to the king-bolt and held in horizontal position by engagement with the draft-bar, all substantially as specified.

19. The combination of the supporting frame or carriage, the horizontal draft-bar free to rise and fall, the scraping or plowing blade carried by said draft-bar, and draft mechanism acting directly upon the bar and free to rise and fall with the same, all substantially as specified.

20. The combination of the supporting frame or carriage having a pivoted front truck with a direct-draft bar vertically adjustable in a constant horizontal plane, and a scraping or plowing blade at the rear of the same, said draft-bar having a goose-neck to permit the turning of the wheels of the front truck under the same, all substantially as specified.

21. The combination of the supporting frame or carriage, the pivoted front axle, the scraping or plowing blade, a direct-draft frame therefor having a goose-neck, and an arch supporting the main frame on the front axle, the opposite legs of said arch being carried in advance of the axle to permit the turning of the latter underneath the draft-bar, all substantially as specified.

22. The combination of the supporting frame or carriage, the plowing or scraping blade, supporting and lifting mechanism therefor, and a frame carrying said supporting and lifting mechanism and the operator's platform and adjustable laterally on the main frame or carriage, all substantially as specified.

23. The combination of the main frame or carriage, the scraping or plowing blade, supporting and adjusting mechanism therefor, a direct horizontal draft-bar hung to the king-bolt of the front truck, and a frame carrying the supporting and adjusting devices for the scraping-blade and having segmental guide portions concentric with the king-bolt, whereby the lateral adjustment of the frame and scraper-blade is effected without interfering with the draft, all substantially as specified.

24. The combination of the supporting frame or carriage, the scraping or plowing blade, supporting and lifting mechanism therefor, a frame carrying said mechanism and the operator's platform and adjustable laterally on the main frame or carriage, and a pinion carried by said adjustable frame and engaging with a rack on the fixed frame or carriage, all substantially as specified.

25. The combination of the supporting frame or carriage, the plowing or scraping blade, supporting and lifting mechanism therefor, a frame carrying said mechanism and laterally adjustable on the main frame, rack and pinion mechanism for effecting this lateral adjustment, and a locking-bolt for said adjusting mechanism, all substantially as specified.

26. The combination of the supporting frame or carriage, the plowing or scraping blade constructed for angular horizontal and vertical end adjustment, the semicircle-bar or equivalent rigid frame carrying said scraper-blade, and supporting and lifting rods, each having a forked lower end adapted for the reception of a pivot-rod carried by spaced brackets on said semicircle-bar, all substantially as specified.

27. The combination of the supporting frame or carriage, the scraping or plowing blade constructed for horizontal angular adjustment, opposite supporting-rods for said blade, and lifter-bars for said rods which do not partake of the horizontal rotation of the blade, but are located close to the axial line of said horizontal rotation, all substantially as specified.

28. The combination of the supporting frame or carriage, the scraping or plowing blade constructed for horizontal, angular, and vertical end adjustment, lifters for the opposite ends of the blade, and supporting-rods having ball-and-socket joints with said lifters, all substantially as specified.

29. The combination of the supporting frame or carriage, the scraping or plowing blade, lifting-racks for the opposite ends of the same, and rods extending directly from the upper ends of said racks to the blade, all substantially as specified.

30. The combination of the supporting frame or carriage, the scraping or plowing blade, lifting-racks for the opposite ends of the same, rods extending directly from the upper ends of said racks to the blade, and hand-wheels having laterally-projecting pinions engaging directly with said racks, all substantially as specified.

31. The combination of the supporting frame or carriage, the plowing or scraping blade, supporting and adjusting mechanism therefor, a frame carrying said mechanism and adjustable laterally on the main frame or carriage, a body-bolt serving as a guide for the vertical adjustment of the blade, and a brace connecting the lower end of said bolt with the laterally-adjustable frame, all substantially as specified.

32. The combination of the draft-bar, a king-bolt guiding the same in its vertical adjustment, and a whiffletree-bar moving vertically with the front end of the draft-bar, but swinging on the king-bolt and hinged close to the king-bolt to permit upward movement of its forward end, all substantially as specified.

33. The combination of the draft-bar, the king-bolt, and the whiffletree-bar, the latter having a hinge whereby its outer end is permitted to rise above the level of the draft-bar but not to fall below the same, all substantially as specified.

34. The combination of the scraper-blade made in two parts with the longitudinal bar serving both as a joint and as a brace for said blade, all substantially as specified.

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

FREDERICK M. PENNOCK.

Witnesses:

HARRY SMITH,

HENRY HOWSON.