June 27, 1933. M. D. YORK ET AL 1,915,844

ROAD GRADING MACHINE

Original Filed July 24, 1930 4 Sheets-Sheet 1

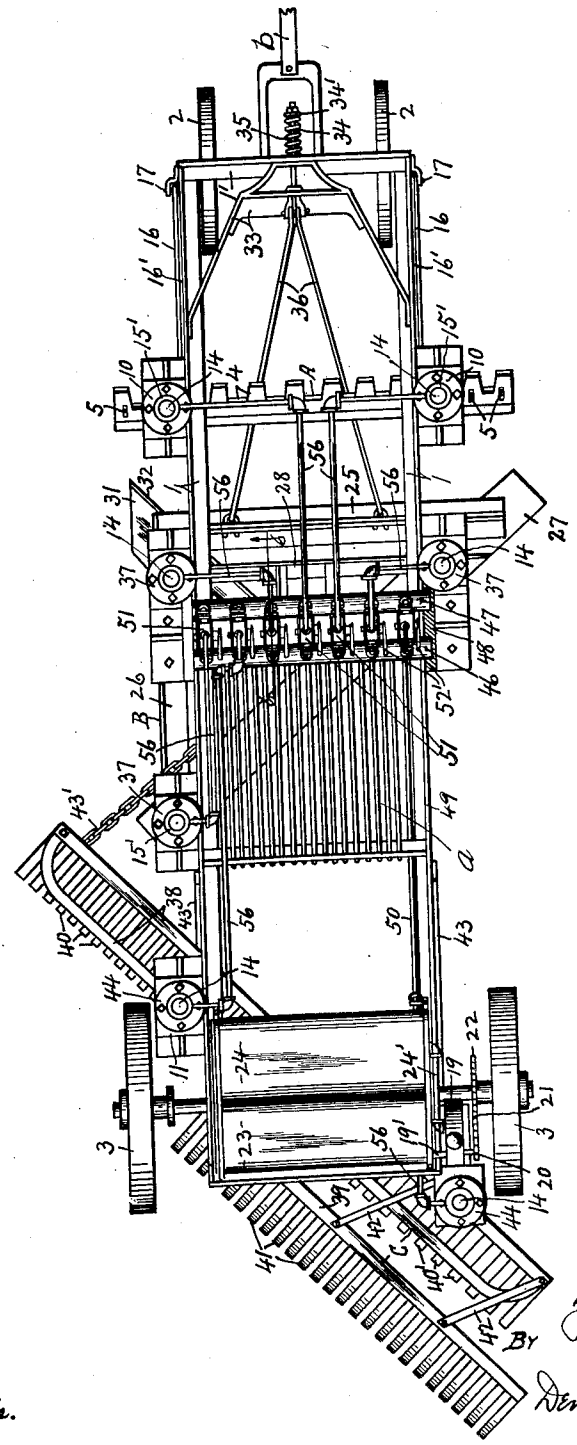


FIG. 1.

WITNESS
H. L. Meade.

INVENTOR
M. D. York and
P. J. Newton
BY
Dennison & Thompson
ATTORNEYS

June 27, 1933. M. D. YORK ET AL 1,915,844

ROAD GRADING MACHINE

Original Filed July 24, 1930 4 Sheets-Sheet 2

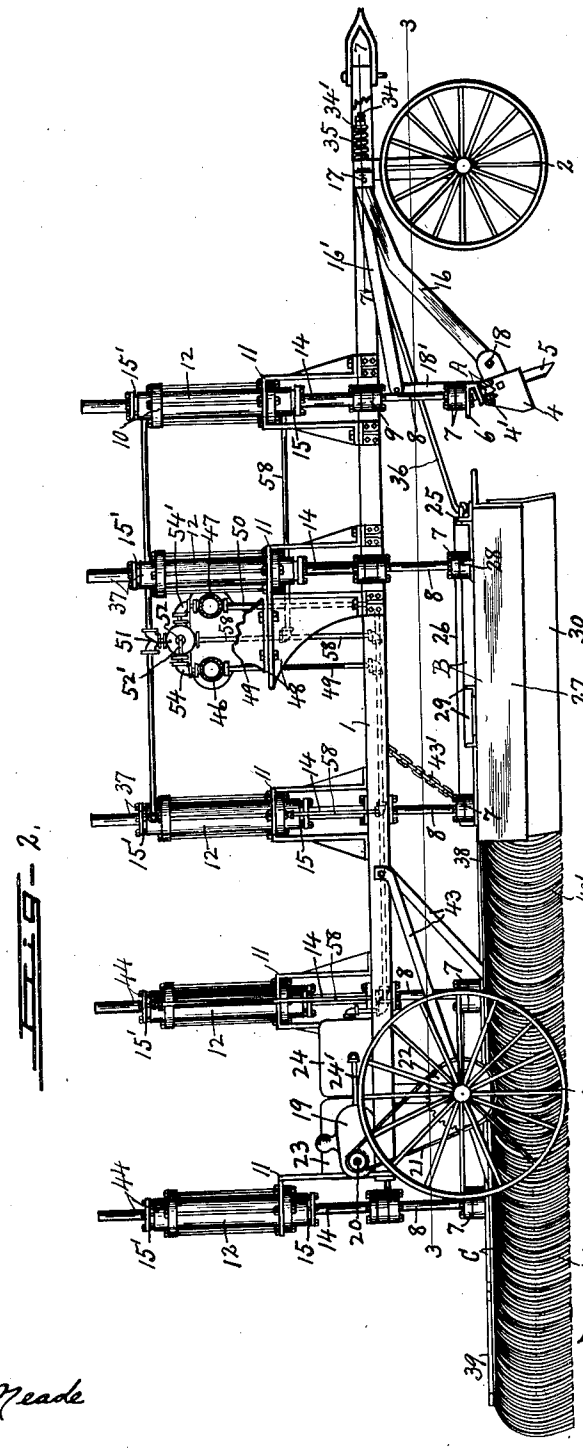


Fig. 2.

WITNESS
H. L. Meade

INVENTOR
M. D. York and
By P. J. Newton
Denison & Thompson
ATTORNEYS

June 27, 1933. M. D. YORK ET AL 1,915,844

ROAD GRADING MACHINE

Original Filed July 24, 1930 4 Sheets-Sheet 3

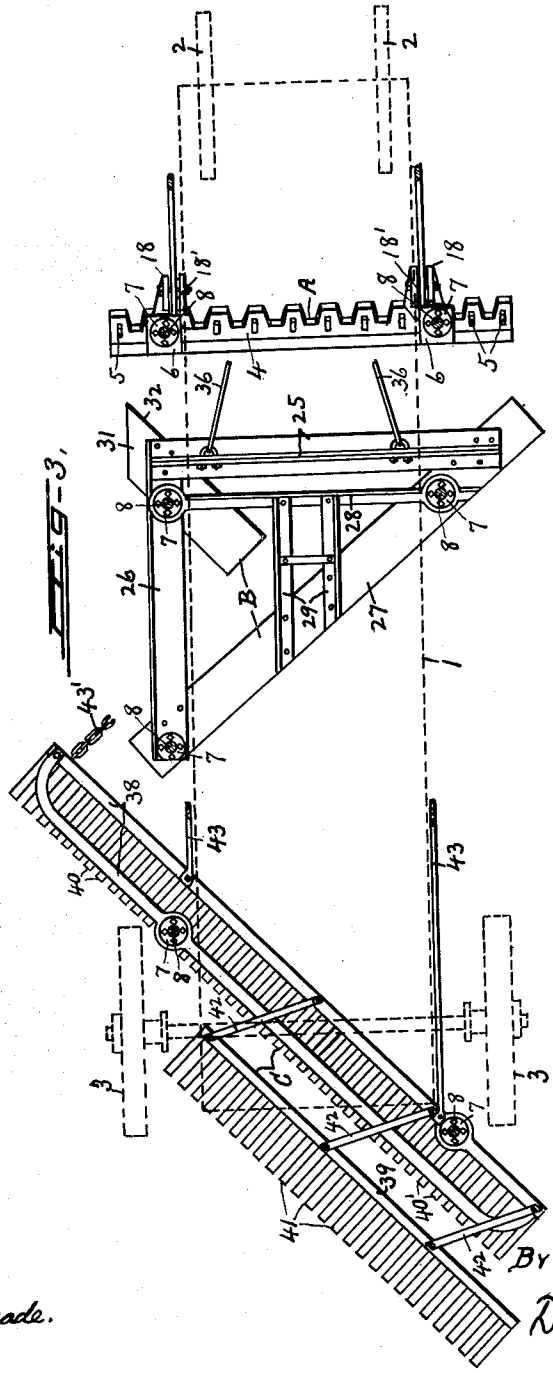


FIG-3.

WITNESS
H. L. Meade.

INVENTOR
M. D. York and
By P. J. Newton
Dennison & Thompson
ATTORNEYS

June 27, 1933. M. D. YORK ET AL 1,915,844

ROAD GRADING MACHINE

Original Filed July 24, 1930 4 Sheets-Sheet 4

Fig. 4.

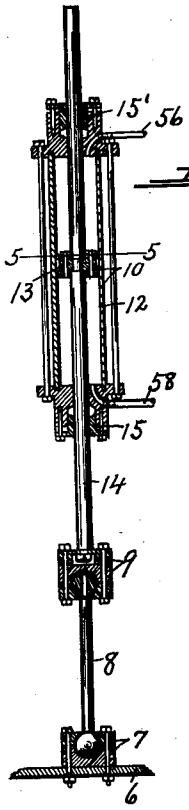


Fig. 5.

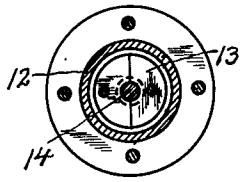


Fig. 6.

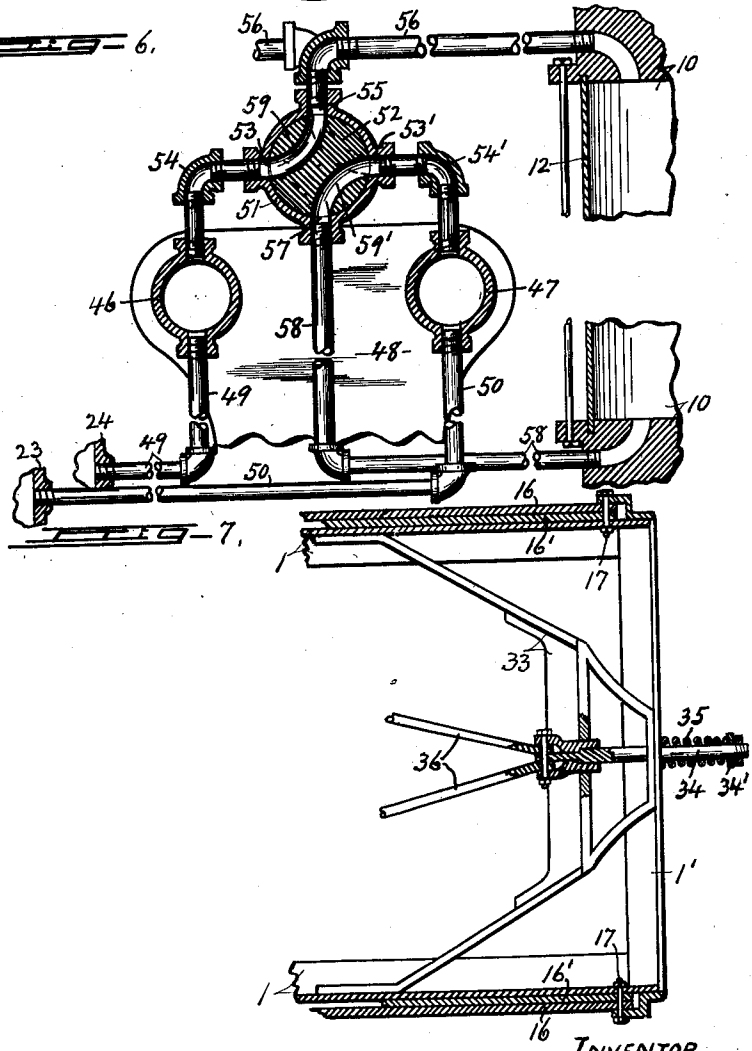


Fig. 7.

INVENTOR
M. D. York and
P. J. Newton
By
Dennison & Thompson
ATTORNEYS

WITNESS
H. L. Meade.

Patented June 27, 1933 1,915,844

UNITED STATES PATENT OFFICE

MAHLON D. YORK, AND PAUL J. NEWTON, OF UNADILLA, NEW YORK, ASSIGNORS TO YORK MODERN CORPORATION, OF UNADILLA, NEW YORK, A CORPORATION OF NEW YORK

ROAD GRADING MACHINE

Application filed July 24, 1930, Serial No. 470,255. Renewed May 18, 1933.

This invention relates to a road grading machine of the class set forth in the patent to F. E. York, 1,540,729, June 2, 1925, insofar as it involves broadly the use of a scarifying unit, a hone or scraper unit and a rake unit mounted in sequence from front to rear upon a four-wheel chassis adapted to be propelled by animal or mechanical power for the purpose of successively loosening the surface soil and stones, grading the loosened soil and removing the loosened stones from the graded surface as the machine is propelled forwardly so that the portion of the roadbed traversed by the machine may be substantially finished in one and the same operation.

The main object of the present invention as distinguished from the patent referred to is to equip the machine with fluid-pressure-operated means under the control of the operator for raising and lowering the several units independently of each other and also for effecting the vertical adjustment of different portions of each unit relatively to other portions thereof.

Another object is to provide the scraper unit with separate hones or blades arranged diagonally to the line of draft of the machine and at substantially right angles to each other so that the supplemental hone may travel slightly ahead of the main hone for deflecting the material agitated thereby in the path of the main hone.

Another object is to extend these hones across the path travelled by the scarifier so that all of the soil and stones loosened by the scarifier may be spread out more or less evenly over the road bed surface traversed by the machine and while the loosened stones will be automatically collected and deflected to one side of the traversed path and into the path of travel of the forwardly moving rakes.

A further object is to arrange the rake unit diagonally across the path traversed by the scraper unit but at a reverse angle to the line of draft so as to collect and automatically deflect the loose stones to one side of the road bed traversed by the machine.

Another object is to provide simple and efficient means actuated by one or more of the wheels of the vehicle for placing a fluid under pressure in suitable reservoirs or storage tanks to be delivered therefrom to the several piston motors employed in the operation of the several units and parts thereof.

Other objects and uses relating to specific parts of the machine will be brought out in the following description.

In the drawings:—

Figure 1 is a top plan of a road grading machine embodying the various features of the invention.

Figure 2 is a side elevation of the same machine.

Figure 3 is a horizontal sectional view taken in the plane of line 3—3, Figure 2.

Figure 4 is an enlarged vertical sectional view through one of the piston motors showing its connection with one of the several units.

Figure 5 is an enlarged horizontal sectional view taken in the plane of line 5—5, Figure 4.

Figure 6 is an enlarged detail sectional view taken in the plane of line 6—6, Figure 1.

Figure 7 is an an enlarged horizontal sectional view taken in the plane of line 7—7, Figure 2.

As illustrated this road grading machine comprises a four-wheel chassis having a substantially rectangular main supporting frame —1— mounted in a horizontal plane upon front and rear supporting wheels —2— and —3— for receiving and supporting a scarifier unit —A—, a honing or scraping unit —B— and a raking unit —C—, together with a plurality of upright fluid-pressure-operated piston motors and means for producing and distributing the pressure-fluid to the several cylinders in a manner hereinafter described.

These several units are arranged in sequence from front to rear of the machine to extend transversely across the path of travel of the machine and are free to be raised and lowered at will through the medium of their respective piston motors as may be required to bring them into engagement with the roadbed when in operative position or some dis-

tance above the roadbed when the machine is being transported from place to place.

The scarifier unit comprises a rigid bar —4— extending transversely of and beneath the frame —1— in a plane at substantially right angles thereto, the length of the bar being somewhat greater than the transverse width of the frame to extend some distance beyond opposite sides thereof when adjusted for use, said bar being provided with a series of upwardly and rearwardly inclined apertures —4'— arranged in uniformly spaced relation lengthwise of the bar for receiving a corresponding number of teeth —5— which project uniform distances below the bar —4— for engagement with the ground or roadbed and are suitably secured to said bar against accidental displacement.

The upper side of the bar —4— is provided with a substantially horizontal ledge —6— to which is secured a pair of bearing blocks —7— located near the opposite ends thereof close to the vertical planes of the outer faces of the side bars of the frame —1—.

These blocks are provided with spherical sockets for receiving corresponding balls on the lower ends of a pair of upright connecting rods —8— having their upper ends provided with similar spherical balls seated in corresponding sockets of a superposed pair of bearing blocks —9— as shown more clearly in Figure 4.

A pair of upright piston motors —10— are mounted upon brackets —11— on the opposite sides of the frame —1— in vertical alignment with the connecting rods or links —8— and each comprising a cylinder —12—, a piston —13— and a piston rod —14— which is movable through glands —15— and —15'— in the lower and upper ends of the cylinders.

The lower ends of the piston rods —14— are secured to the upper bearing blocks —9— which, together with the links —8— constitute connections between the piston rods —14— and scarifier bar —4— for raising and lowering the latter as the corresponding pistons are reciprocated vertically.

Each of the opposite ends of the bar —4— is connected to the front portion of the frame —1— by a pair of links —16— and —16'— having their front ends pivoted at —17— to the corresponding sides of the frame and their rear ends pivotally connected respectively to a forwardly projecting lug —18— and an upwardly projecting arm —18'— as shown more clearly in Figures 2 and 7.

That is, the lower links —16— extend downwardly and rearwardly from the pivots —17— to the lugs —18— while the links —16'— extend rearwardly nearer in a horizontal plane from their pivots —17— to the upwardly projecting arms —18'—.

The object of these links is not only to draw the scarifier bar forwardly by corresponding movement of the vehicle but also to brace the scarifier against undue rocking movement about the centers of the universal joints —7— and —9—.

The object of the universal joints —7— and —9— between the scarifier bar —4— and piston rods —14— is to compensate for the more or less irregular vertical movements of opposite ends of the bar —4— when reciprocated by the corresponding piston motors —10— in a manner hereinafter more fully explained.

The piston motors —10— are preferably of the hydraulic type adapted to be operated by oil or equivalent liquid under pressure and for this purpose a hydraulic pump —19—, preferably of the rotary gear type, is mounted upon the rear end of the frame —1— and has one of its rotary members provided with a sprocket wheel —20— connected by a chain belt —21— to a relatively larger sprocket wheel —22— on one of the rear wheels —3— of the vehicle —1—, which when propelled along the roadbed, causes the operation of the pump —19—.

The oil or other liquid is supplied through a pipe —19'— to the pump from a supply tank —23— which, together with a pressure tank —24— are mounted upon the rear end of the frame —1— in close proximity to the pump which has its delivery pipe —24'— connected to the pressure tank —24—.

Each of the three units —A—, —B— and —C— is raised and lowered by a plurality of piston motors similar to the piston motor —10—, two motors for the scarifying unit, three motors for the honing or scraping unit, and two motors for the raking unit, making seven in all although the number is subject to variation without departing from the spirit of this invention.

The honing or scraping unit —B— extends transversely of and beneath the main frame —1— for vertical movement relatively thereto just at the rear of the scarifier and preferably comprises a rigid triangular frame having a cross bar —25—, a lengthwise bar —26— and a diagonally disposed bar —27—, said bars having their ends arranged in overlapping relation and bolted or otherwise rigidly secured to each other as shown more clearly in Figure 3.

The cross bar —25— is disposed at right angles to the frame —1— and therefore at right angles to the line of draft of the machine, while the lengthwise bar —26— extends rearwardly from the lefthand end of the cross bar —25— along the outside of the adjacent side of the frame —1— so that the diagonal bar —27— extends transversely from the right hand end of the cross bar —25— to the rear end of the lengthwise bar —26— and therefore diagonally to the line

of draft of the machine at an angle of about 45 degrees thereto.

The lengthwise bar —26— is also connected to the diagonal bar —27— by an additional cross bar —28— which is at the rear of and parallel with the cross bar —25—, said additional bar —28— being also connected intermediate its ends to the intermediate portion of the diagonal bar —27— by brace bars —29—, Figure 3.

The diagonal bar —27— preferably consists of an angle iron having one of its flanges projecting horizontally and forwardly from its upper edge and its other flange disposed in a vertical plane.

A scraper blade —30— is bolted or otherwise secured to the front face of the vertical flange of the diagonal bar —27— to project some distance below the same with its lower edge substantially parallel therewith. An additional but relatively short angle iron —31— of substantially the same cross sectional form as the diagonal bar —27— is bolted or otherwise secured to the underside of the triangular frame at the junction of the cross bar —25— and lengthwise bar —26— to extend diagonally across and beneath the adjacent side of the frame —1— at substantially right angles to the intermediate portion of the diagonal bar —27— for receiving and supporting a supplemental scraper blade —32— which is bolted or otherwise secured to the vertical flange thereof as shown more clearly in Figure 1.

That is, the blade —32— is disposed directly in front of and at right angles to the intermediate portion of the diagonal blade —30— and therefore at an angle of approximately 45 degrees to the longitudinal center line of the frame —1— with its forward end in about the same transverse vertical plane as that of the blade —30— so that the forward ends of both blades are in relatively close proximity to corresponding ends of the scarifier —A—.

It therefore follows that the main scraper blade —30— will traverse the entire path of movement of the scarifier for gradually spreading out the loosened soil and also gradually deflecting it laterally and rearwardly to the rake-unit presently described, while the supplemental scraper blade —32— will gradually level off the loosened soil from the lefthand end of the scarifier and deflect the same inwardly and rearwardly against the main blade —30— which in turn functions to spread out the additional soil deflected thereto by the supplemental scraper rearwardly and outwardly to be again leveled off by the trailing rake unit.

The front ends of the side bars of the main frame —1— are connected by a cross bar —1'— and a forwardly tapered brace frame —33— having central lengthwise apertures for receiving a draft bolt —34—, shown more clearly in Figures 1 and 7.

This draft bolt —34— is reciprocally movable endwise in the registering openings in the front cross bar —1'— and brace frame —33— and is provided at its forward end with a shoulder —34'— forming a seat for one end of a coil spring —35— having its other end seated against the cross bar —1'— to form a resilient connection between the draft bolt —34— and main frame —1—.

The front cross bar —25— of the scraper unit —B— is connected by links —36— to the rear end of the draft bolt —34— and through said bolt with the main frame —1— thereby establishing a resilient connection between the scraper unit and frame to relieve said scraper unit from excessive shock when encountering more or less heavy obstructions in the roadbed.

A plurality of, in this instance three, upright piston motors —37— are mounted upon the frame —1— directly over the angles of the triangular frame of the scraper unit and are adapted to be operated by fluid under pressure for raising and lowering the underlying portions of the scraper frame in a manner hereinafter more fully explained.

These motors are identical with the motor —10—, previously described, and are connected to the underlying portions of the scraper unit by links similar to the link —8— and universal joints similar to the joints —7— and —9—, previously described, and shown more clearly in Figure 4.

The rake-unit —C— extends transversely of and beneath the main frame —1— at substantially right angles to and mainly at the rear of the main scraper blade —30— and therefore sub tantially parallel with the supplemental scraper blade —32— and at an angle of approximately 45 degrees to the longitudinal center line of the frame —1— and comprises a main tooth supporting frame —38— and a supplemental tooth supporting frame —39—.

The tooth-supporting frame —38— extends diagonally over and beneath the main frame —1— some distance to opposite sides thereof and preferably between the rear wheels —3— as shown in Figure 1 so that its left hand end extends across the rear end of the main scraper blade —30— in somewhat close spaced relation thereto for receiving the material deflected rearwardly and laterally from the main scraper blade.

This frame —38— is adapted to receive and support separate sets of spring harrow teeth —40— and —40'—, the teeth —40— extending rearwardly from the lefthand end of the frame —38— being relatively close together while the remaining teeth are relatively coarse or farther apart, the object of which is to cause the finer teeth to engage and deflect practically all of the stones of

any material size rearwardly and laterally toward the righthand side of the machine and to allow the finer stones to pass between the coarser teeth as they approach the rear end of the machine while the coarser stones will be deflected wholly to the right hand side of the path of travel of the machine and some distance to the rear end thereof.

The supplemental frame —39— extends diagonally across and beneath the rear end of the main frame —1— a relatively short distance to the rear of and parallel with the main rake frame —38— and is provided with a series of teeth —41— which are relatively closer together than those on the righthand end of the rake-frame —38— for collecting and deflecting the stones which may pass through the main rake rearwardly to the outside of the path of travel of the machine.

The supplemental frame —39— is connected by bars —42— to the frame —38— to cause said supplemental rake to move in unison and in parallelism with the main rake.

The rake frame —38— is connected by draft links —43— to the main frame —1— as shown more clearly in Figures 2 and 3, said links being pivoted to the main frame to enable the rakes to be moved vertically as shown more clearly in Figure 2.

If desired the left hand end of the main rake frame —38— may be additionally connected to the main frame —1— by means of a chain —43'— or equivalent flexible connecting means.

A pair of upright piston motors —44— similar to the motor —10—, previously described, are mounted upon the rear end of the main frame —1— directly over the underlying parts of the rake frame —38— to which the lower ends of the pistons of both motors are connected by links and universal joints similar to the links —8— and universal joints —7— and —9— for the motor —10— shown in Figure 4.

It will also be observed upon reference to Figure 2 that the several motors —37— and —44— are mounted upon brackets —11— similar to those which support the cylinders —10—, previously described.

A pair of header pipes —46— and —47— are mounted upon a bracket —48— on the intermediate portion of the main supporting frame —1— to extend transversely of said frame in parallel spaced relation, the header —46— being connected by a pipe —49— to the pressure tank —24— while the header —47— is connected by a similar pipe —50— to the supply tank —23—.

The fluid under pressure is conducted from the reservoir —24— through the pipe —49— to the header —46— so that the latter may be termed the pressure supply header from which the fluid under pressure may be fed, in a manner hereinafter described, to the several cylinders —10—, —37— and —44—.

The header —47— serves to receive the exhaust from the several motors while the pipe —50— serves to return the exhaust to the supply tank —23— to complete the cycle of operation of each motor.

The headers —46— and —47— are connected to each other through the medium of a series of, in this instance seven, co-axial valve casings —51—, one for each of the motors, each valve case containing a rotary valve —52— having an operating lever —52'— by which it may be turned as shown more clearly in Figures 1, 2 and 6.

These valve cases —51— are preferably located between and in a plane above the headers —46— and —47— and are each provided with diametrically opposite ports —53— and —53'— which are respectively connected by pipes —54— and —54'— to the upper sides of the headers —46— and —47—.

The several valve cases —51— are provided in their upper sides with ports —55— connected by separate pipes —56— to the upper ends of the cylinders —12— of the several motors —10—, —37— and —44—, said valve cases being also provided in their lower sides with ports —57— which are connected by separate pipes —58— to the lower ends of the cylinders —12— of the several piston motors —10— —37— and —44— as shown more clearly in Figures 4 and 6.

Each of the valves —52— is provided with a pair of reversely curved passages —59— and —59'—, said passages being adapted to connect separate pairs of ports when the valve is turned to one position as shown in Figure 6, or, when turned to another position, serve to connect other ports.

It will be observed, however, upon reference to Figure 6 that the ports of each valve and the ends of the passages —59— and —59'— are spaced a sufficient distance apart to permit all the ports of that valve to be closed when the valve is turned to a certain position.

In Figure 6 is shown somewhat diagrammatically, portions of the supply tank —23— and pressure tank —24— and one of the piston motors, together with their connections with one of the controlling valves in which the valve is shown in position to permit the flow of the pressure fluid to the upper end of the cylinder and return flow of the exhaust to the supply tank and under these conditions the fluid under pressure will flow from the pressure tank —24— through the pipe —49— and into the header —46— where the pressure for all of the piston motors is maintained so that when either of the valves —52— is adjusted to the position shown by full lines in Figure 6 the fluid under pressure from the header —46— will pass through the pipe —54— and thence through the passage —59— into the pipe —56— and to the upper end of the corresponding cylinder as,

for example, one of the cylinders of the motor —10—.

This inflow of the pressure fluid to the upper end of the motor will depress the corresponding piston —13— and its rod —14— for effecting downward pressure upon the particular portion of the unit, in this instance the scarifying unit, to which the piston is connected through the medium of the link —8—.

During this downward movement of the piston the liquid will be exhausted from the lower side thereof through the pipe —58— and valve passage —59'— and thence through the pipe —54— to the head —47— to be returned through the pipe —50— to the supply tank —23—, thus completing the circulation of the fluid for effecting the downward movement of the piston and portion of the unit connected thereto.

When it is desired to operate any one of the motors to raise the corresponding portion of the unit controlled thereby the regulating valve —52— for that motor will be adjusted to the position shown by dotted lines in Figure 6 to cause the passage —59— to connect the ports —53'— and —55— while at the same time the passage —59'— will connect the ports —57— and —53—.

It therefore follows that the pressure fluid in the header pipe —46— will pass through the conduit —54— from which it passes into the lower end of the cylinder of the corresponding motor to raise the piston and parts of the unit to which it is connected.

At the same time the fluid in the upper portion of the cylinder will be exhausted through the pipe —56— and registering valve passage —59— and pipe —54'— to the other header —47— to be returned through the pipe —50— to the supply tank —23—, thus completing the cycle of operation of the motor.

It will be understood from the foregoing description that a similar adjustment of any one of the valves —52— will cause the operation of the corresponding motor and parts of the unit connected thereto.

These several valves —52— and their operating members —52'— are arranged within easy reaching distance of the operator when standing upon a grid platform as —*a*— which is secured to the main supporting frame as shown more clearly in Figure 1, the platform —*a*— being disposed in about the same horizontal plane as the frame —1— and therefore some distance below the plane of the valve casings —51—.

Under these conditions it will be evident that the operator may easily and quickly adjust any one or more of the valves —52— through the medium of their handles —52'— to cause the operation of the corresponding motor or motors and portion or portions of the particular units to which the piston rods of those motors may be connected.

For example, if it should be desired to lower the scarifying unit it is simply necessary to adjust the two valves —52— controlling the two motors —10— to the position shown by full lines in Figure 6 or, the reverse operation of the motors for raising the scarifier unit may be effected by simply adjusting the valves —52— corresponding to both motors to the position shown by dotted lines in Figure 6, or, the reverse movements of either one of the valves —52— will cause the operation of the corresponding motor to raise or lower the end of the scarifier unit connected to that motor according to the particular position of the controlling valve —52— thereby causing the scarifier to assume a more or less tilting position.

In like manner the three valves controlling the three motors —37— may be similarly adjusted to cause the scraper unit to be raised and lowered or either one of said valves may be adjusted independently of the others to cause the scraper unit to assume a more or less tilted position.

In a similar manner the two valves —52— controlling the motors —44— may be adjusted to cause said motors to raise and lower the rake unit —B— or by the operation of one of said valves independent of the other the rake unit may be caused to assume a more or less tilted position.

It is now clear that any one of the units may be lowered or raised under fluid pressure through the medium of the corresponding motors independently of the other units by simply adjusting the corresponding valves to effect the desired operation of the motors or all of the valves may be adjusted more or less simultaneously to effect either the raising or lowering of the several units according to the work required.

The entire machine may be propelled along the surface of the roadbed by a tractor or any other suitable power and for this purpose the front end of the machine is provided with a clevis —*b*— adapted to be connected to the source of power.

When the machine is in operation for road-grading, each of the units —A—, —B— and —C— is usually depressed or forced downwardly into engagement with the roadbed through the medium of its respective motors or when travelling from place to place the same units may be raised clear of the roadbed or other obstructions by a reversal of the operation of the several motors.

It will also be apparent from the foregoing description that the several units may be tilted transversely relatively to the roadbed as, for example, in trenching or digging along either side of the roadbed or in effecting a transversely crowned road surface.

In the use of the hydraulic motors for raising and lowering the several units in a manner described, it is obvious that these opera-

tions may be effected more expeditiously and with a lesser amount of labor than would be possible in the use of hand operated devices.

The construction and operation are particularly simple, practical and highly efficient but obviously various changes may be made in the detail construction of the machine without departing from the spirit of this invention.

What we claim is:—

1. In a road-grading machine having a frame and a road-working unit operatively connected thereto for relative vertical movement, separate piston-motors operatively connected to opposite ends of said unit for raising and lowering the same, a fluid supply tank, a fluid pressure tank, separate valve chambers one for each motor and each having a pair of ports in constantly open communication with opposite ends of the corresponding motor and an additional pair of ports in constantly open communication with the pressure tank and supply tank respectively, and separately operable valves in said chambers each adjustable rotarily to different positions for simultaneously connecting each of the ports of one pair with either of the ports of the other pair for reversing the direction of flow of the fluid to and from the selected motor.

2. In a road-grading machine having a frame and a plurality of road-working units each operatively connected to the frame for relative vertical movement independently of each other, separate piston motors, one for each end of each unit and each operatively connected to the corresponding end of its unit for raising and lowering the same independently of the other motors, a fluid supply tank, a fluid pressure tank, a plurality of valve chambers, one for each motor and each having a pair of motor-ports, a service port and an exhaust port, the motor ports of each chamber being in constantly open communication with opposite ends of the corresponding motor, means for maintaining constant communication between the pressure tank and the service ports of all of the chambers, means for maintaining constant communication between the supply tank and the exhaust ports of all of the chambers and separate valves in the several chambers each operable at will independently of the others and arranged to connect its service port with either of the motor ports and to simultaneously connect its other motor port with its exhaust port.

3. In a road-grading machine having a frame and a plurality of road-working units each operatively connected to the frame for relative vertical movement independently of each other, separate piston motors, one for each end of each unit and each operatively connected to the corresponding end of its unit for raising and lowering the same independently of the other motors, a plurality of valve chambers, one for each motor and each having a pair of motor-ports, a service port and an exhaust port, the motor ports of each chamber being connected to opposite ends of the corresponding motor, a fluid pressure pump having its pressure side in constantly open communication with all of the service ports and its suction side in constantly open communication with all of the exhaust ports, and separate valves in said chambers each operable at will independently of the others and arranged to connect its service port with either of the motor ports and to simultaneously connect its other motor port with its exhaust port.

4. In a road-grading machine having a frame and a plurality of road-working units each operatively connected to the frame for relative vertical movement independently of each other, separate piston motors, one for each end of each unit and each operatively connected to the corresponding end of its unit for raising and lowering the same independently of the other motors, a plurality of valve chambers, one for each motor and each having a pair of motor-ports, a service port and an exhaust port, the motor ports of each chamber being connected to opposite ends of the corresponding motor, a header pipe connected to all of the service ports, an additional header pipe connected to all of the exhaust ports, a fluid pressure pump having its pressure side in constantly open communication with the first named header and its suction side in constantly open communication with the second named header, and separate valves in the several chambers each operable at will independently of the others and arranged to connect its service port with either of its motor-ports and to simultaneously connect its other motor port with its exhaust port.

In witness whereof we have hereunto set our hands this 8th day of July, 1930.

MAHLON D. YORK.
PAUL J. NEWTON.