Aug. 10, 1937. E. C. BROWN ET AL 2,089,730

ROAD GRADING MACHINE

Filed Aug. 17, 1935 4 Sheets-Sheet 1

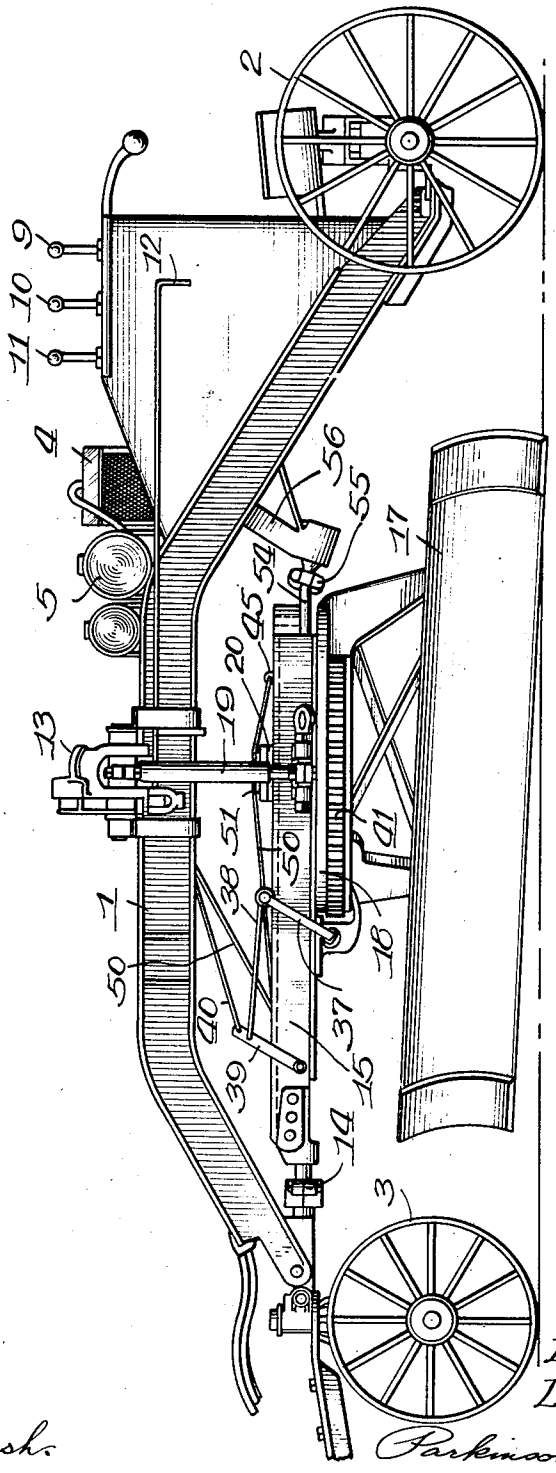


Fig. 1

Witness:
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ROAD GRADING MACHINE

Filed Aug. 17, 1935 4 Sheets-Sheet 2

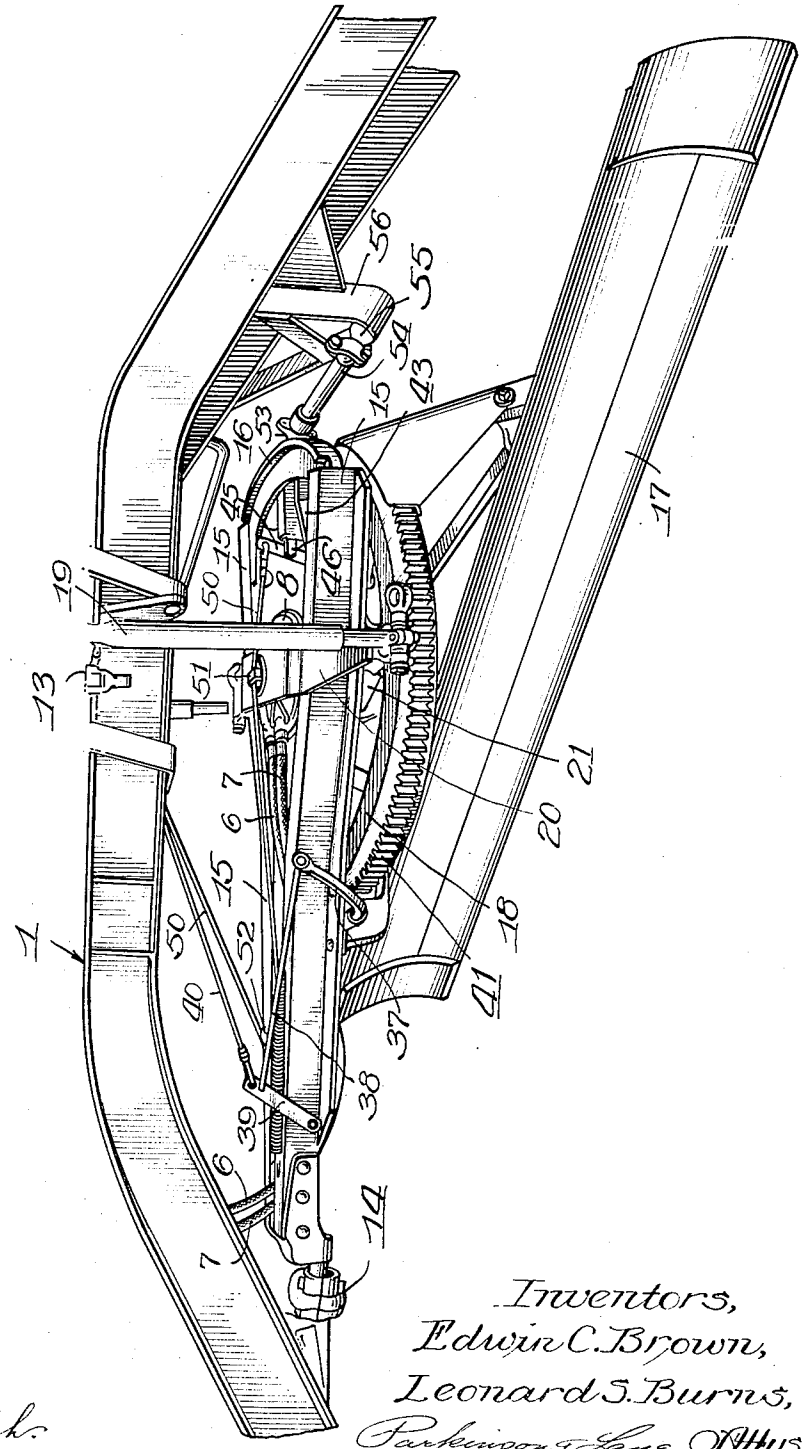


Fig. 2

Witness:
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ROAD GRADING MACHINE

Filed Aug. 17, 1935 4 Sheets-Sheet 3

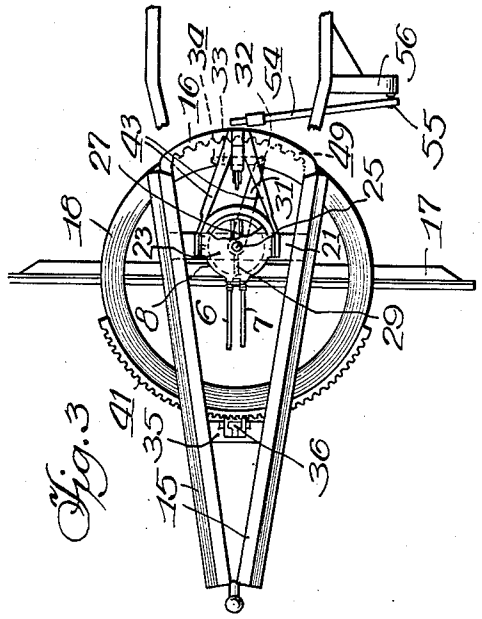


Fig. 3

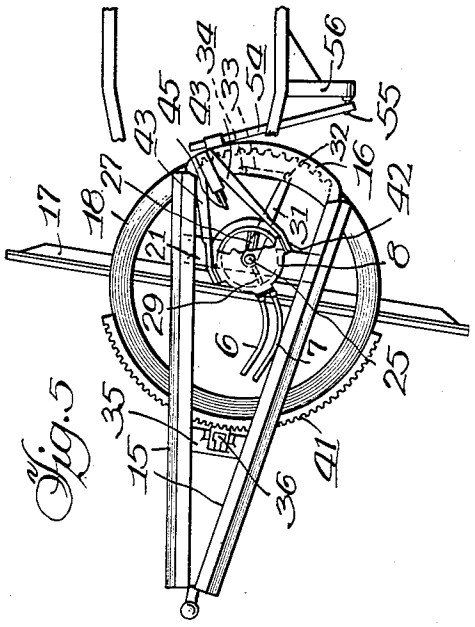


Fig. 5

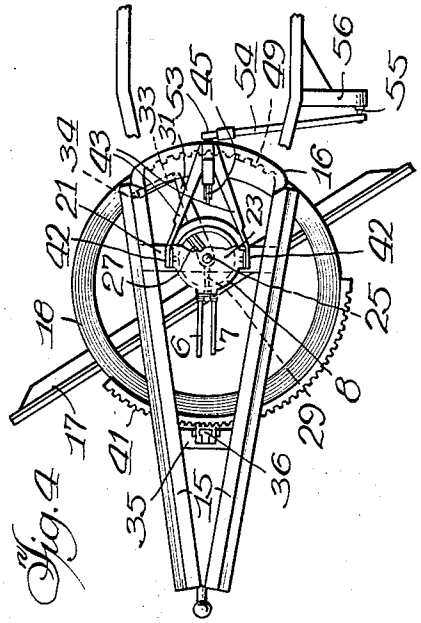


Fig. 4

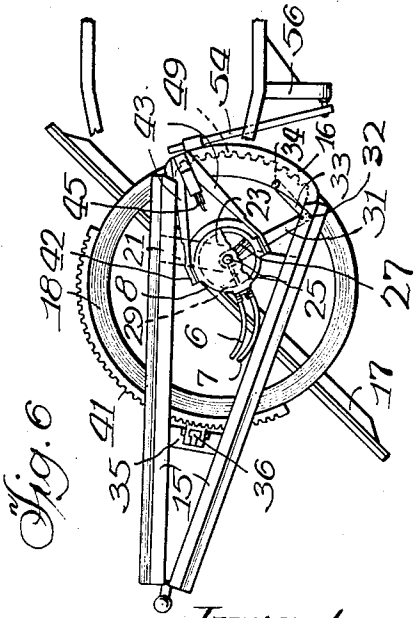


Fig. 6

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ROAD GRADING MACHINE

Filed Aug. 17, 1935 4 Sheets-Sheet 4

Fig. 7

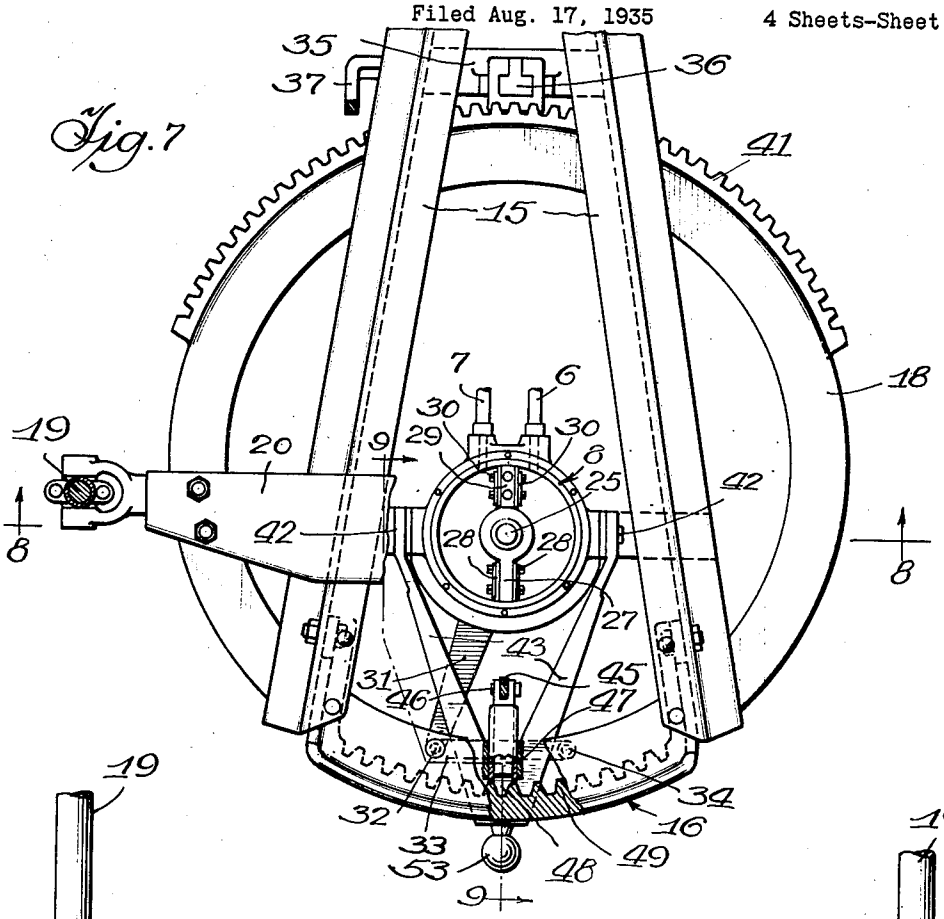
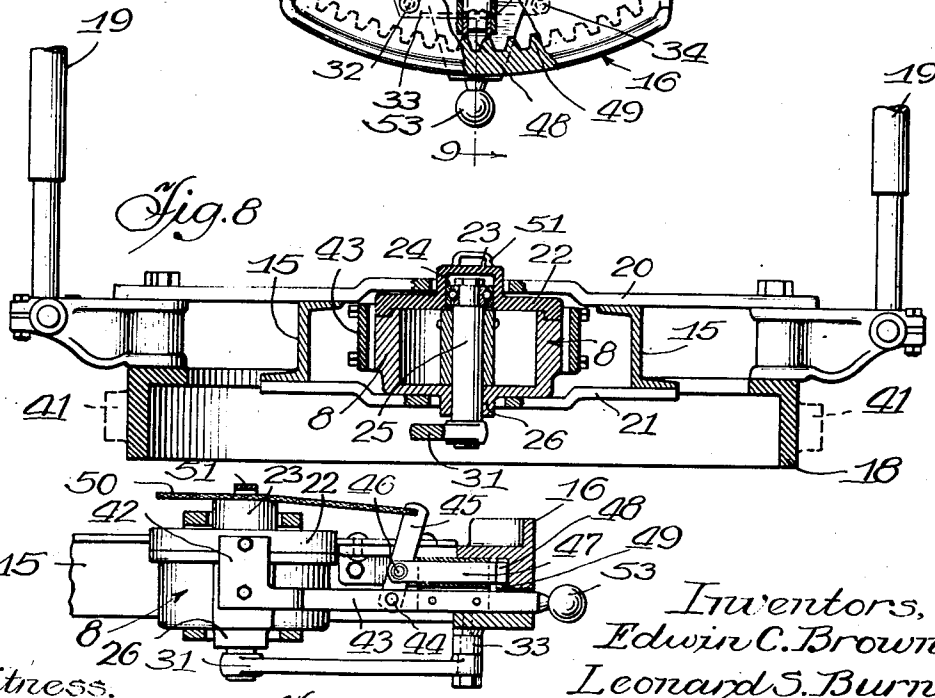


Fig. 8



Witness.
Chas. L. Hourah.

Fig. 9

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Patented Aug. 10, 1937

2,089,730

UNITED STATES PATENT OFFICE

2,089,730

ROAD GRADING MACHINE

Edwin C. Brown, Chicago, and Leonard S. Burns, Harvey, Ill., assignors to Western-Austin Company, Aurora, Ill., a corporation of Illinois

Application August 17, 1935, Serial No. 36,736

19 Claims. (Cl. 37—156)

This invention relates to a road grading machine and more particularly to mechanism for controlling the adjustment of the blade carrying frame.

Among the objects of our invention is the provision of novel mechanism for adjusting the position of the blade carrying frame of a road grading machine.

Another object is the controlling of the adjustment of the position of the blade carrying frame of a road grading machine by fluid pressure means.

A further object is the provision of means for varying both the angular or circular adjustment of the blade carrying frame of a road grading machine as well as the side shifting of said frame.

A still further object is to provide for the circular and side shifting adjustment of the blade carrying frame of a road grading machine with greater ease, positiveness, selectivity and quickness.

Another object is the provision of means adapted to be actuated by fluid pressure, and to selectively apply the power from such pressure to effect either circular or side shifting of the blade carrying frame.

A further object is to provide a combination of latch means and fluid pressure means to control the circular and side shifting of the blade carrying frame.

A still further object is to provide a cylinder with fluid operated piston to adjust the position of the blade.

An additional object is the provision of a reversibly rotatable blade carrying circle, and means for selectively rotating the circle or shifting it sidewise.

Another object is the provision of a novel rotatable cylinder having a vane movable with relation to the cylinder for changing the rotary position of the blade carrying circle, and a vane fixed with relation to the cylinder for adjusting the frame laterally.

A further object is the provision of a hydraulic system and controls for selectively adjusting the blade of a road grader angularly and laterally.

Other objects, advantages and capabilities will later more fully appear.

Our invention further resides in the combination, construction and arrangement of parts illustrated in the accompanying drawings, and while we have shown therein a preferred embodiment we wish it to be understood that the same is susceptible of modification and change without departing from the spirit of our invention.

In the drawings:—

Fig. 1 is a side elevation of a road grader equipped with our invention.

Fig. 2 is a fragmentary perspective view of the grader blade, the adjusting means embodying our invention and associated parts.

Fig. 3 is a more or less diagrammatic plan view of a scraper blade and control parts embodying our invention, with the length of the blade positioned at right angles to the longitudinal axis of the machine and without any side shifting of the blade.

Fig. 4 is a view similar to Fig. 3 but showing the blade and blade circle as having been revolved in a counterclockwise direction to place the blade at an angle with relation to its position shown in Fig. 3.

Fig. 5 is a view similar to Fig. 3 but showing the blade carrying frame as having been swung to shift the blade laterally as compared to its position shown in Fig. 3.

Fig. 6 is a view similar to Fig. 5 but also showing the blade and blade circle as having been rotated through a certain angle in a clockwise direction.

Fig. 7 is a fragmentary plan view of the blade circle, the carrying frame for the same, and associated parts, parts being broken away to show the interior of the hydraulic rotary cylinder for controlling the angular movement and side shifting of the grader blade.

Fig. 8 is a vertical transverse cross-section taken on the line 8—8 of Fig. 7.

Fig. 9 is a fragmentary vertical longitudinal section taken on the line 9—9 of Fig. 7.

Referring more in detail to the drawings, Figs. 1 and 2 show the application of our invention to a road grader comprising the main frame 1, supported at its rear end by a pair of rear wheels 2 and at the front end by a pair of front wheels 3. Upon this frame 1 is mounted a motor 4 for operating any suitable pump (not shown) for pumping oil from the oil tank 5 through the tubing or piping 6 and 7 for the purpose of furnishing hydraulic power to the rotary hydraulic control cylinder 8, which will be more fully described hereinafter.

Also mounted on the main frame 1 are the control handles 9, 10 and 11 (there being also any desired number of similar handles on the other side of the machine) for controlling the various operations of the road grader, these control handles being within convenient reach

of the operator who stands upon a suitable platform at the rear of the machine. Any other suitable number and arrangement of control handles such as handle 12 (there being a similar handle on the other side of the machine) may also be positioned accessible for operation by the operator standing at the rear of the machine.

The handles 9, 10 and 11 and similar handles on the other side of the machine are preferably connected up for operating the valves which control the flow of oil from the oil pump to the rotary hydraulic control cylinder. The specific construction and operation of these valves need not be gone into, it being sufficient to point out that the necessary valves are provided for controlling and regulating the flow of oil into and out of the rotary hydraulic control cylinder, this oil sometimes flowing into this cylinder through the oil line 6 and out of the same through oil line 7, and sometimes vice versa depending upon the particular movement of the grader blade desired. Suitable mechanism, indicated generally at 13, is also provided for raising or lowering either end of the grader blade, but this will not be gone into in detail as our invention primarily resides in the movement of the blade through various horizontal angles and lateral or side shifting of the same.

Swivelly connected to the front end of the frame 1 at 14 are the frame members 15, which are rigidly secured together at their front end and diverge rearwardly, and at their rear end are rigidly secured to the arc-shaped member 16, thus forming a rigid triangular framework for supporting the blade 17, the blade circle 18 and other associated parts. As noted in Fig. 1, the frame 15—16 is supported to the elevating means 13 by the connecting rod 19, there being one of these at each side of the machine. Extending across and secured to the top of the frame members 15 is the cross member 20, and secured across the bottom of the frame members is a similar cross member 21, the latter also being suitably secured to the frame members 15.

Positioned between the cross members 20 and 21 is the bowl or cylinder 8 of the rotary hydraulic control cylinder, which is held between these cross plates against lateral shifting but is permitted to have horizontal rotary movement when required. This bowl or cylinder is provided with a cap member 22 suitably secured thereto by bolts or the like, this cap member having an upwardly extending portion 23 which houses suitable bearing members 24 provided at the top of the shaft 25, which shaft extends downwardly through the cylinder through bearing 26 and to a position below the bottom of the cylinder or bowl. Fixed to the shaft 25 to rotate therewith is the vertical vane 27, which vane is faced with leather facing 28 on each of its sides, so as to completely fill the space between the shaft and the inside circumference of the bowl to prevent undue leakage of oil during operation of the device. In other words, this vane 27 fits the inside of the bowl in an oil tight manner. Opposite this vane on the other side of shaft 25 is a partition 29, which instead of being secured to the shaft is secured in an oil tight manner to the inside of the bowl so as to be rigid with the bowl and immovable with relation thereto, but movable therewith. This partition 29 is faced with leather facing 30 to seal against oil leakage on all of its four edges.

As noted in Fig. 7, the oil lines 6 and 7 enter the interior of bowl or cylinder 8 on opposite sides, respectively, of partition 29 for a purpose that will hereinafter be more readily understood. As stated above, shaft 25 extends below the bottom of bowl 8 as seen in Fig. 8. Fixedly secured to the bottom end of shaft 25 is arm 31 which, when shaft 25 rotates, is carried therewith. This arm 31 is pivoted at 32 to link 33, which link in turn is pivotally connected at 34 to circle 18, so that when shaft 25 is rotated with relation to bowl 8, the circle 18 will be rotated in a horizontal plane unless held against such rotation by the latch hereinafter described.

In order to hold circle 18 against rotation with relation to frame members 15, there is provided the bracket 35, which extends transversely between the two frame members 15 and is rigidly secured thereto, upon which bracket is mounted the latch 36 having lever arm 37, which is at its outer end connected by connecting rod 38 to the swinging arm 39, which in turn is operated by a cable or the like 40 from the operator's seat. A pull upon cable 40 by the operator will move lever arm 37 and latch member 36 in one direction, and when said pull is released suitable spring mechanism will move the same in the opposite direction, the spring holding latch 36 in latching position except when released therefrom by the operator pulling upon cable 40. When latch 36 is in engagement with the gear teeth 41, the circle 18 is held against rotation. When this latch 36 is moved out of engagement with gear teeth 41, circle 18 is then free to rotate with relation to frame members 15.

Pivotally mounted at 42 on each side of bowl or cylinder 8 is the triangular-shaped frame 43, comprising two members which converge toward the rear of the machine, which members at their rearward end have pivotally connected thereto at 44 the lever 45, which lever in turn has pivoted thereto at 46 the longitudinal slidable latch tooth 47, the tooth-shaped forward end 48 of which engages in an appropriate space between the teeth 49 formed on the arcuate member 16. Connected to the upper end of lever 45 is the cable 50, which passes through a suitable eye or slideway 51 in the top of the bowl cover 22, and from thence forwardly and over the pulley 52, and thence rearwardly over suitable pulleys or guideways to the operator's platform for operation as desired. As will be understood, a pull by the operator upon cable 50 will cause latch tooth 47 to move out of engagement with teeth 49 for a purpose to be hereinafter set forth.

Fixed upon the rear end of converging arms 43 and projecting outwardly beyond the arcuate member 16 is the ball 53, to which (as seen in Figs. 3–6) is universally connected the connecting rod 54, which at 55 is connected by a similar ball and socket connection to the main frame 56.

The operation of our device is as follows:

Assuming the blade to stand at right angles to the longitudinal axis of the machine as shown in Fig. 3, and desiring to move the blade angularly to the position shown in Fig. 4, oil under pressure will be forced through oil tube 7 upon suitable manipulation of the control valves, this pressure causing the movable vane 27 to rotate shaft 25 and move to the position shown in Fig. 4, it being understood that prior to this the latch 36 has been released or placed in unlatched position out of engagement with teeth 41, but latch 48 remaining in engagement with teeth 49. This rotation of shaft 25 carries its fixed arm 31 in a counterclockwise direction as viewed in Figs. 3 and 4, and thus rotates the circle 18 and blade 17 from

the position shown in Fig. 3 to the position shown in Fig. 4.

If instead of rotating the blade from the position shown in Fig. 3 to that shown in Fig. 4, it is desired to shift the blade laterally from the position shown in Fig. 3 to that shown in Fig. 5, all that is necessary is to see that latch 36 is in engagement with teeth 41 and latch 48 out of engagement with teeth 49, and permit oil under pressure to flow through tubing 6 into the cylinder, which will by virtue of vane 27 being held stationary through latch 36 and circle 18, cause the partition 29 (which is fixed to the bowl or cylinder 8) to move in a counterclockwise direction from the position shown in Fig. 3 to that shown in Fig. 5. This partition 29 being fixed to the bowl or cylinder 8 will cause the same to move with the partition, and thus rotate between the upper and lower cross members 20 and 21.

This rotation of bowl 8 also moves triangular frame 43 with it it being kept in mind that latch 48 is out of engagement with teeth 49) in a counterclockwise direction, and due to the outer end of frame 43 being connected to connecting rod 54 will shift the frame 15 laterally from the position shown in Fig. 3 to that shown in Fig. 5. If in addition to this lateral shifting movement it is also desired to further rotate the blade 17 and circle 18, all that is necessary is to also unlatch latch 36 after the blade has reached the position shown in Fig. 5 and latch 48 is again in engagement with teeth 49, and introduce further oil under pressure through tubing 6 so as to cause the movable vane 27 to move in a clockwise direction from the position shown in Fig. 5 to that shown in Fig. 6, which will also, as will be readily understood, cause rotation of circle 18 and blade 17 carrying the same from the position shown in Fig. 5 to that shown in Fig. 6. This rotation of circle 18 and blade 17, as described earlier in this specification, is caused by the fact that as the movable vane 27 is forced under pressure of the oil to move in a clockwise direction as viewed in Fig. 5, it will also move the fixed arm 31 in a clockwise direction and through link 33 will impart such movement to ring 18.

We claim:—

1. An apparatus of the class described, a support, a blade-carrying circle rotatably mounted with relation to said support, unitary fluid-operated means and suitable connections for causing rotation of said circle and side shifting of said circle, and releasable holding means whereby said rotation and side shifting of said circle by said unitary fluid-operated means may be selectively effected.

2. In apparatus of the class described, a support carrying a pair of latches and a blade-carrying circle, means operable when one of said latches is latched and the other one is unlatched to rotate said circle, and means operable when said one of said latches is unlatched and said other one is latched to shift said circle sideways.

3. In apparatus of the class described, a main frame having a movable support, a blade-carrying circle rotatably mounted with relation to said support, a fluid-operated cylinder carried by said support, means connecting said cylinder and said circle to cause rotation of the circle when the cylinder is operated, said cylinder including a swingable vane, and means connecting said cylinder with the main frame to cause side shifting of said circle when the cylinder is operated.

4. In apparatus of the class described, a main frame having a movable support, a blade-carrying circle rotatably mounted with relation to said support, a latch on said support, a fluid-operated cylinder carried by said support, said cylinder operating to rotate said circle when fluid pressure is introduced into the cylinder and the latch is unlatched, said cylinder including a rotatably mounted vane, means connecting said cylinder with the main frame, said cylinder operating to shift said circle sidewise when fluid pressure is introduced into the cylinder and the latch is latched.

5. In apparatus of the class described, a support, a blade-carrying circle rotatably mounted with relation to said support, a pair of latches carried on said support, a fluid-operated cylinder carried by said support, said cylinder operating to rotate the said circle when the first latch is unlatched and the second latch is latched, and to cause side shifting of said circle when said first latch is latched and the second latch is unlatched.

6. In a road grader, a supporting frame, a blade-carrying circle rotatably mounted with relation to the supporting frame, a blade carried by said circle, a fluid-operated cylinder rotatably carried by said support, means rotatable within said cylinder and having pivotal connection with said circle, said means causing rotation of said circle when fluid power is applied to said cylinder, and means for causing side shifting of said circle when fluid power is applied to said cylinder.

7. In a road working machine, a support, a blade, a blade carrying element rotatably mounted on said support, means for releasably locking said blade-carrying element against rotation, a fluid-operated power cylinder mounted on said support, and means operatively connecting the power cylinder and the blade carrying element to cause rotation of the latter when the locking means is released, said cylinder including power transmitting means rotatably mounted therein, and means for causing side shifting of said blade carrying element when fluid power is applied to said cylinder.

8. In a road working machine, a main frame, an auxiliary blade-supporting frame pivotally attached to the main frame, a blade having a circular head fixed thereto, said head being rotatably mounted in said auxiliary frame, unitary fluid-operated power means for causing rotation of said head and also side shifting of said auxiliary frame and blade, and means for selectively controlling said rotation and side shifting.

9. In apparatus of the class described, a blade-supporting frame mounted for sidewise swinging movement, a blade mounted on said frame for rotation in a substantially horizontal plane, and unitary fluid-operated means for rotating said blade and for swinging said frame, and means for selectively controlling said rotation and swinging.

10. In apparatus of the class described a main frame, a blade-supporting frame adapted to have a limited side-wise swinging movement, a blade mounted on said supporting frame for rotation in a substantially horizontal plane, a fluid-operated cylinder rotatably mounted on said supporting frame, said cylinder containing a central rotatable shaft having fixed thereon a vane, a partition fixed to the interior of the cylinder, means connecting the shaft with the blade mounting so that when the shaft rotates the

blade will be rotated therewith, means for holding the shaft against rotation, means connecting the cylinder with the main frame, and means for causing the supporting frame to swing sidewise when the shaft is held against rotation and the cylinder is rotated.

11. In a road working machine, a main frame, an auxiliary frame swingably supported thereon, a blade having a head mounted in said auxiliary frame for rotation in substantially a horizontal plane, a fluid-operated power cylinder rotatably mounted in said auxiliary frame but adapted to be held against rotation with relation thereto when desired, said power cylinder having connections with the blade head for rotating the head and blade when desired, said power cylinder also having connections with the main frame whereby the auxiliary frame may be swung sidewise when desired.

12. In a road working machine, a main frame, an auxiliary frame swingably mounted thereon, a blade having a circle member mounted in said auxiliary frame for rotation therein, a hydraulic power cylinder rotatably mounted in said auxiliary frame but capable of being held against rotation therein, said power cylinder containing a shaft having a vane fixed thereon and movable therewith, said cylinder also having on its interior a fixed partition, means connecting the shaft with the circle member to cause rotary movement of the latter when the shaft rotates, means connecting the cylinder with the main frame to cause swinging movement of the auxiliary frame when the cylinder rotates, a releasable latch for holding the circle member against rotation with relation to the auxiliary frame, a releasable latch for holding the power cylinder against rotation with relation to the auxiliary frame, the second mentioned latch being in latching engagement and the first mentioned latch out of latching engagement when the circle member is caused to rotate, and the first mentioned latch being in latching engagement and the second mentioned latch member being out of latching engagement when the auxiliary frame is caused to swing sidewise.

13. In a road working machine, a main frame, an auxiliary frame supported thereon for sidewise swinging movement, fluid power producing means on the main frame, a blade mounted on the auxiliary frame for rotation thereon, a fluid power operated cylinder on the auxiliary frame, a vane in said cylinder connections from the power producing means to the cylinder, means operated by said vane for causing rotation of the blade from the cylinder, and means operated by the cylinder for causing sidewise shifting of the auxiliary frame from the cylinder, and means for selectively controlling said rotation and sidewise shifting.

14. In combination in a road working machine, a main frame, an auxiliary frame supported thereon for sidewise swinging movement, a blade rotatably mounted on the auxiliary frame, a fluid-operated cylinder rotatably mounted on the auxiliary frame, said cylinder comprising a covered bowl, a shaft rotatably mounted in the bowl and projecting through the bottom thereof, a vane fixed to the shaft to rotate therewith and having a substantially fluid tight sliding engagement with the inner surfaces of the bowl, a partition normally opposite from the vane and fixed to the bowl, a port on one side of the partition for the entry into the bowl of fluid under pressure, a port on the other side of the partition for the escape of fluid from the bowl, and means connecting the shaft with the blade mounting for rotating the blade when the shaft rotates and the bowl remains stationary, and means connecting the bowl with the main frame for shifting the auxiliary frame sidewise when the bowl rotates and the shaft remains stationary.

15. In combination in a road working machine, a main frame, an auxiliary frame supported thereon for sidewise swinging movement, a blade rotatably mounted on the auxiliary frame, a fluid-operated cylinder rotatably mounted on the auxiliary frame, said cylinder comprising a covered bowl, a shaft rotatably mounted in the bowl and projecting through the bottom thereof, a vane fixed to the shaft to rotate therewith and having a substantially fluid tight sliding engagement with the inner surfaces of the bowl, a partition normally opposite from the vane and fixed to the bowl, a port on one side of the partition for the entry into the bowl of fluid under pressure, a port on the other side of the partition for the escape of fluid from the bowl, and means connecting the shaft with the blade mounting for rotating the blade when the shaft rotates and the bowl remains stationary, and means connecting the bowl with the main frame for shifting the auxiliary frame sidewise when the bowl rotates and the shaft remains stationary, and latches for controlling said movements.

16. In combination in a road working machine, a main frame, an auxiliary frame supported thereon for sidewise swinging movement, a blade having a circle member rotatably mounted in said auxiliary frame, a fluid power cylinder mounted on said auxiliary frame, said cylinder having therein a movable vane and a fixed partition, the latter when moved while the movable vane is held stationary also moving the cylinder with it, connections for rotating the circle member and blade when the movable vane is moved and connections for shifting the auxiliary frame sidewise when the fixed partition and cylinder is moved.

17. In combination in a road working machine, a main frame, an auxiliary frame supported thereon for sidewise swinging movement and having teeth at one end, a blade having a circle member rotatably mounted in said auxiliary frame, a fluid-operated cylinder rotatably mounted in said auxiliary frame, a frame pivotally connected with the cylinder and carrying at its free end a latch adapted to engage with said teeth on the auxiliary frame, said cylinder being rotatable with relation to the auxiliary frame when the latch is unlatched, but held against such rotation when the latch is engaged.

18. In combination in a road working machine, a main frame, an auxiliary frame supported thereon for sidewise swinging movement, a blade having a circle element rotatably mounted in the auxiliary frame and having teeth formed around part of its circumference, a latch carried by the auxiliary frame and adapted to releasably engage said teeth, and a fluid power cylinder on said auxiliary frame having a movable vane connected with said circle element to cause rotation of said circle element when said latch is disengaged from said teeth, and means operated by said cylinder for swinging said auxiliary frame sidewise when said latch is engaged with said teeth.

19. In combination in a road working machine, a main frame, an auxiliary frame supported thereon for sidewise swinging movement and formed at once end with notches, a blade having

a circle element rotatably mounted in the auxiliary frame, the circle element having notches around part of its circumference, a fluid power cylinder rotatably mounted in the auxiliary frame and having a frame projecting therefrom, said last mentioned frame having at its free end a latch to engage one or more of the notches in the auxiliary frame, a latch mounted on the auxiliary frame adapted to engage one or more of the notches in the circle member, said cylinder having a movable element connected with the circle element to rotate the circle element when the first mentioned latch is in latching engagement and the second mentioned latch is out of latching engagement, and the rotation of said cylinder causing side shifting of the auxiliary frame and blade when the first mentioned latch is out of latching engagement and the second mentioned latch is in latching engagement.

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