

July 7, 1959

R. A. GURRIES
FINISH LEVELER

2,893,140

Filed Nov. 18, 1955

2 Sheets-Sheet 1

Fig. 1

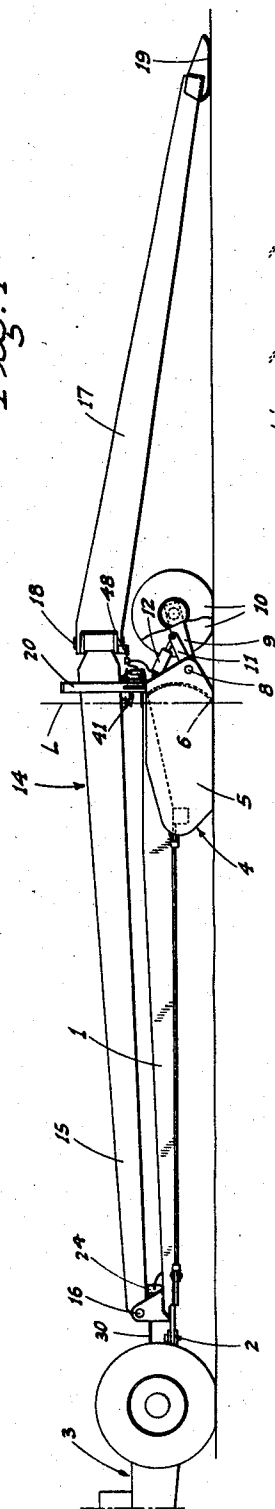
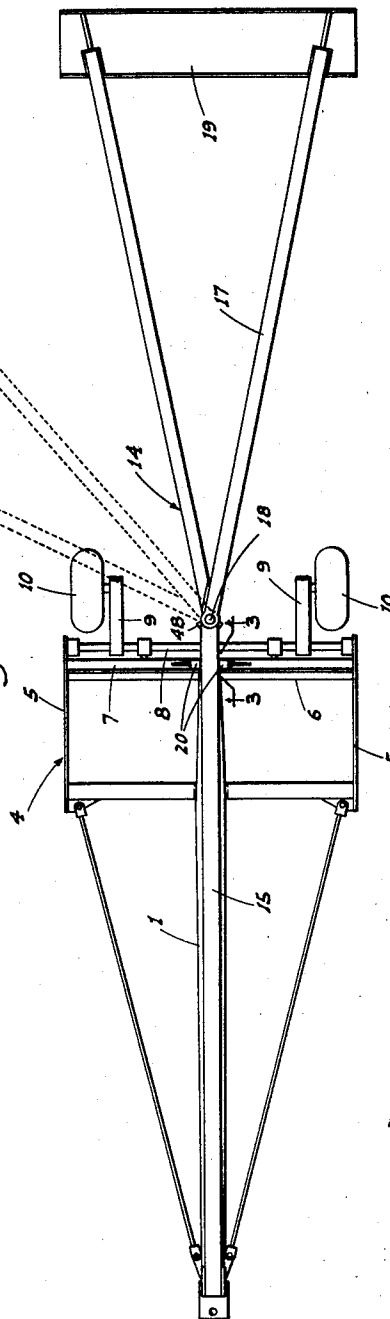


Fig. 2



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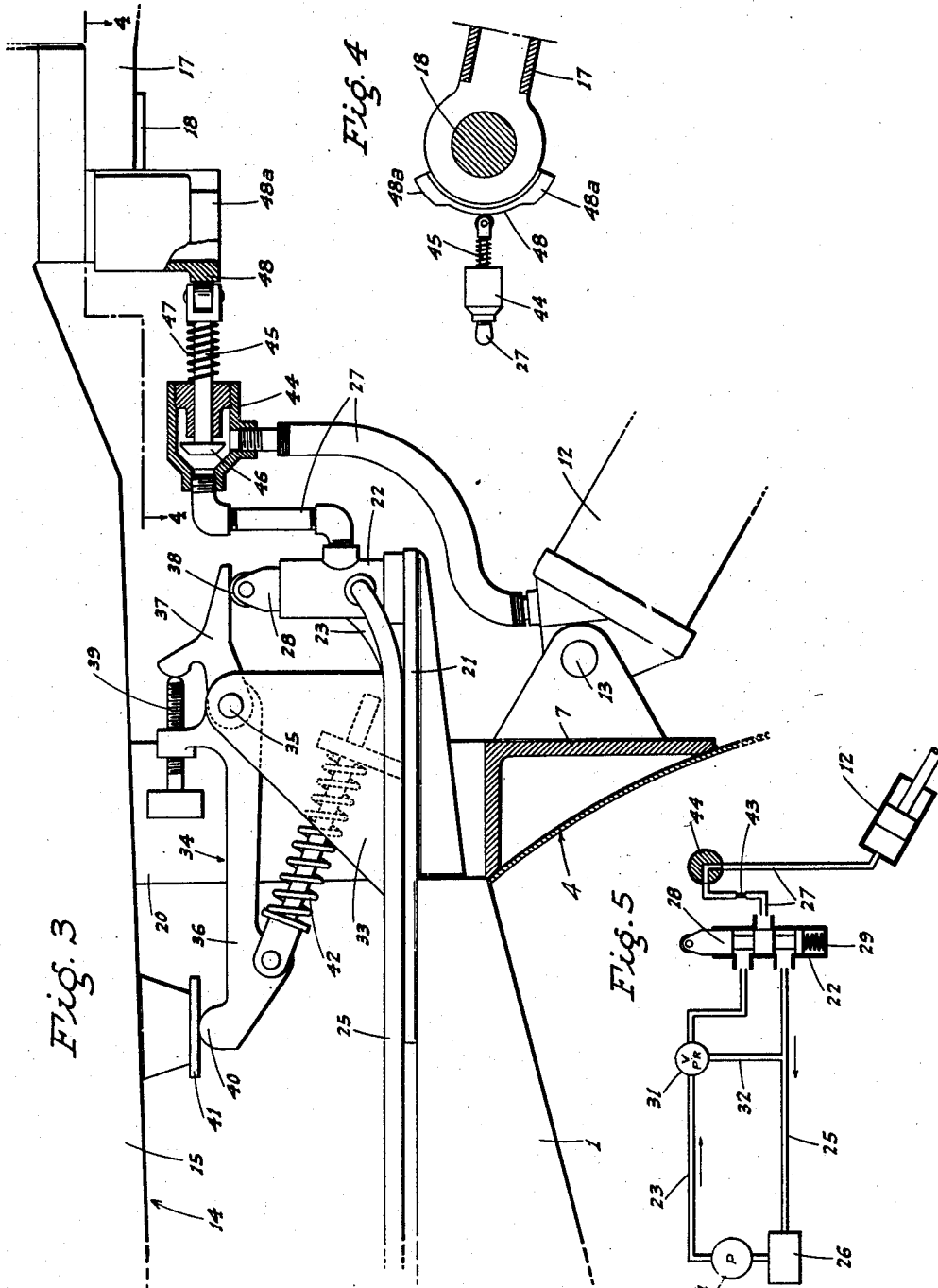
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FINISH LEVELER

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9 Claims. (Cl. 37—165)

This invention relates in general to that type of agricultural implement known as a "finish leveler."

In particular, the invention is directed to—and it is a major object to provide in such an implement—an automatically functioning mechanism for maintaining the blade of the bowl at a predetermined level relative to the ground-contact points at the ends of the leveler boom or longitudinal frame.

A further object of this invention is to provide a finish leveler—particularly of a medium-length—type which comprises a novel structural combination including a full-length, vertically rigid boom whose ends are always a fixed distance from the ground; a draft beam or tongue, under and vertically adjustable relative to the boom, which provides the mount for the bowl, its blade, and the adjustable supporting wheels thereon; and an automatic wheel adjusting and blade leveling mechanism arranged to function without the necessity of the tongue and bowl mounted directly on and carried by the boom. By reason of this arrangement the relatively movable components of the structure are used to the best advantage; the boom accurately registers the ground-contact points for straight line cut; and, as the boom does not carry any working load, it can be made very light without danger of sagging or vertical deflection.

A still further object of the invention is to provide a finish leveler, as above, in which the boom is articulated for swinging in a horizontal plane so that relatively sharp turns may be made. In connection with this feature novel means are provided which—while allowing the automatic leveling mechanism to function upon normal or relatively small articulating movement of the boom—prevents functioning of such mechanism upon excessive articulating movement of said boom, as when sharp turns of the implement are made.

It is also an object of the invention to provide a practical, reliable, and durable finish leveler, and one which will be exceedingly effective for the purpose for which it is designed.

These objects are accomplished by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

In the drawings:

Fig. 1 is a side elevation of the improved finish leveler, partly broken out.

Fig. 2 is a top plan view of the leveler.

Fig. 3 is a fragmentary enlarged sectional elevation, taken substantially on line 3—3 of Fig. 2, and showing particularly the hydraulic control mechanism.

Fig. 4 is a fragmentary sectional plan on line 4—4 of Fig. 3.

Fig. 5 is a diagram of the hydraulic control system.

Referring now more particularly to the drawings, and to the characters of reference marked thereon, the leveler, includes a rigid draft beam or tongue 1 adapted at its forward end for connection with the drawbar 2 of a tractor 3, so that said end of the tongue is maintained at a fixed level relative to the ground at that point. The

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tongue at its rear end is rigidly connected to a bowl 4 which includes side plates 5, a blade 6 therebetween, and a stiffening cross beam 7 at the back and top of the bowl.

A cross shaft 8 is journaled in connection with, and supported by, the side plates and back of the bowl some distance below the beam 7. Radial arms 9 are rigid with, and project rearwardly from, the shaft 8 and at their rear end support ground engaging wheels 10. Another radial arm 11 (see Fig. 1) projects rearwardly from, and is rigid with, shaft 8 centrally of the width of the leveler, and is engaged at its rear by the rear end of a hydraulic ram 12, which at its forward end is pivotally anchored to the cross beam 7, as at 13 (see Fig. 3).

It will therefore be seen that as the ram is extended or contracted, the blade 6 will be raised or lowered relative to the ground, the tongue 1 being capable of limited vertical swinging movement at the drawbar.

A boom 14 is disposed over the draft beam, and includes a front section 15 pivoted at its forward end on beam 1, for vertical swinging movement relative thereto, as at 16, and a rear section 17 pivotally connected at its forward end to the rear end of the front section, as at 18, for relative lateral swinging in a horizontal plane. The boom section 17 at its rear end supports a ground engaging skid 19 or the like. Such skid is quite wide, so that the boom is well stabilized.

The pivot 18 is a short distance rearwardly of the bowl 4, and said bowl and tongue 1 are maintained in transverse alinement with the front boom section by guide members 20 upstanding from the cross beam 7 to the sides of said boom section.

The pivot 16, while preferably at the front end of the tongue for best or most efficient results, may be disposed at a rearward point along the tongue. In any case, however, the tongue and boom are so proportioned—as to the overall-length of the implement—that the point of contact of the blade 6 with the ground is substantially half way between the drawbar 2 and the skid 19.

Vertical deviation of either end of the leveler from normal, due to ground deviations at the points of contact of the tractor and skid with the ground, and which alters the level of a straight line drawn between such points, causes a compensating vertical movement of the blade in one direction or the other by a mechanism which controls the feeding of hydraulic fluid to—or the exhausting of the fluid from—the ram 12. This mechanism, shown specifically in Fig. 3, is arranged as follows:

Secured on a platform 21 mounted on the rear end of the boom 1 is an upstanding three-way valve 22, preferably of the piston type, as shown in Fig. 5. This valve is interposed in a hydraulic system which comprises essentially a supply conduit 23 leading to the valve from a pump 24, a return conduit 25 leading from the valve to a tank 26, and a ram feeding and exhausting conduit 27 leading from the valve to the ram 12.

The valve piston or plunger 28 is arranged so that when it lifts from a normal neutral position fluid will be exhausted from the ram, and when the plunger is lowered from such position the fluid will be fed to the ram. A spring 29 is associated with the valve 22 (see Fig. 5) to lift the plunger.

The pump is preferably mounted on the tongue 1 at the forward end thereof so that it may be conveniently driven from the power take-off of the tractor by a suitable shaft connection 30 (see Fig. 1). The tank 26 may be incorporated with or enclosed in the tongue, which is preferably of box-beam construction. Since the pump is ordinarily constantly driven, a bypass or pressure relief valve 31 is interposed in the conduit 23, with a bypass conduit 32 connecting the valve and return conduit 25.

Upstanding from platform 21 ahead of a valve 22 is a bracket 33 on which a generally horizontal articulated lever unit 34 is pivoted intermediate its ends, as at 35. This unit extends lengthwise of the implement, and comprises a front section 36 and a relatively short rear section 37 which overhangs and engages a roller 38 on the upper end of valve plunger 28. The point of articulation of the lever unit is the transverse pivot 35, which is common to both sections of said unit, and said sections are adjustably held against articulation in an upward direction by suitable means, such as a manually adjustable screw 39 mounted in the front section 36 and exerting a downward pressure on the section 37. The forward end of the front section 36 is formed with an upstanding nose 40 which bears against a pad 41 on the under side of the boom section 15.

A compression spring 42, stronger than spring 29, acts on the lever unit 34 to maintain the nose 40 in constant contact with the pad 41.

In operation, with the blade 6 initially set to cut or scrape at any desired depth, any variation or deviation of the ground surface at the rear tractor wheels, as for instance an appreciable drop in such surface, immediately causes the front end of the implement to be correspondingly lowered. Such lowering is of course accompanied by a decrease in the vertical distance between the pad 41 and the blade 6, which is at the time held rigid with the ground engaging wheels 10. It may be stated here that in order to obtain the most sensitive and accurate results it is desirable that the cutting edge of the blade 6 shall be in the same vertical plane as the nose 40, as indicated by the vertical line L in Fig. 1. Undesired valve actuation, should the tongue be distorted or sprung temporarily by dirt pressure against the bowl, is thus prevented.

The downward movement of pad 41 depresses the adjacent end of the lever unit 34 against the resistance of the spring 42. This of course lifts the rear section 37 of the lever unit from the roller 38, allowing the spring 29 to move the valve plunger from a neutral or passage closing position to one which places the conduit 25 in communication with the conduit 27. This relieves some of the fluid from the ram 12, causing the blade to drop, and thus maintain the blade on the line between the rear skid 19 and the tractor wheels. Similarly, if the boom is raised at its forward end, the spring 42 acts to swing the lever unit 34 in a direction to cause the valve piston or plunger 28 to be depressed, establishing communication between the feed or pressure conduit 23 and the ram conduit 27. The blade 6 will therefore be raised to be on a level with the line extending between the rear skid and the tractor wheels.

In either case, the adjustment of the blade, as above described, is accompanied by a raising or lowering of the tongue 1 on which the control mechanism is mounted. This causes the lever unit to be swung to restore the valve plunger to its normal neutral position, so that said blade is maintained in its adjusted position.

For initial adjustment of the blade to any desired setting while the implement is stationary, it is only necessary to adjust the screw 39 so as to raise or lower the lever section 37 and thus relieve or depress the valve plunger 28, with the same results and action as described in connection with the automatic functioning of the control mechanism.

In order that the control mechanism will not be actuated if the tractor wheels drop into a short depression, or ride over a small hump, the conduit 27 is formed with a restriction 43 (see Fig. 5) which retards passage of fluid therethrough so that the ram will not be materially affected by any short duration of change in the level of the tractor wheels, or of course of the skid 19.

Thus, if the boom lowers adjacent the valve 22 by the dropping of the rear tractor wheels into a short depression and so allows the valve plunger 28 to lift, there is of course a tendency for the fluid to discharge from the ram

and thus cause the wheels 10 to relatively lift and the blade 6 to drop. However, because of the restriction 43 in the combination feed and discharge conduit 27, and the short length of time the tractor wheel is in any such incidental depression, and the valve is open, the naturally somewhat sluggish and slow-flowing fluid used in such a system as usual, does not materially start to flow before the tractor wheels leave the depression and the valve 22 again closes. The presence of any such small depressions in a field does not therefore affect the actual practical operation of the implement as a leveler, whose functioning for that purpose is based on the fact that the blade should be maintained on a line drawn between the rear skid 19 or similar member, and the tractor wheels.

The freely swingable rear boom section 17 enables the implement to turn in a relatively short radius, and with any relatively small arc of turning does not affect the operation of the automatic blade control mechanism. When, however, the boom section 17 swings through a large arc—as indicated in Fig. 2, and as may occur when the implement is making a short turn at the end of a run, and when the skid 19 may encounter abnormal rises or depressions in the ground—it is not desirable that the control mechanism shall be actuated by such abnormal change of level of the skid. Feeding of fluid to the ram, regardless of movement of the valve piston 28, is prevented upon great arcuate movement of the boom section 17, by the following means:

Interposed in the conduit 27 is a valve 44 which includes a slidable actuating stem 45 connected to the valve head 46 and disposed radially of the pivot pin 18 of the boom sections.

The valve is normally held open by a spring 47 so as not to interfere with the normal flow of fluid through the conduit 27. The stem 45 at its rear end engages a cam 48 concentric with pivot 18 and fixed in connection with the rear boom section 17. The central portion of the cam does not affect the stem 45 or the open position of the valve 44. The end portions 48a of the cam however have a greater radius than the central portion, as clearly shown in Fig. 4, sufficient to cause the stem 45 to be pushed in so as to close the valve. Since these end portions only engage the stem 45 when the boom section 17 is turned through a relatively large arc to one side or the other of a straight-line position, the valve will remain open during normal swinging movement of said boom section.

From the foregoing description it will be readily seen that there has been produced such a device as substantially fulfills the objects of the invention, as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations therefrom may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described the invention the following is claimed as new and useful, and upon which Letters Patent are desired:

1. A finish leveler comprising a draft tongue arranged at its forward end for connection to a tractor at a fixed distance from the ground, a scraper blade rigid with the tongue at its rear end, a boom over the tongue and blade and projecting rearwardly therefrom, means pivoting the boom at its forward end on the tongue, a ground engaging member supporting the rear end of the boom, ground engaging wheels supporting the blade from the ground for vertical adjustment of said blade relative to the wheels, a power device connected between the wheels and blade to thus vertically adjust the latter, and means mounted on the tongue and functioning upon upward or downward movement of the boom from a predetermined level at a point adjacent the blade to place said device in operation to cause the blade to correspondingly move up or down.

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2. A finish leveler comprising a draft tongue arranged at its forward end for connection to a tractor at a fixed distance from the ground, a scraper blade rigid with the tongue at its rear end, a boom over the tongue and blade and projecting rearwardly therefrom, means pivoting the boom at its forward end on the tongue, a ground engaging member supporting the rear end of the boom, ground engaging wheels supporting the blade from the ground for vertical adjustment of said blade relative to the wheels, a hydraulic ram mounted in connection with the blade and wheels to so vertically adjust the blade upon operation of the ram, normally inactive control mechanism mounted on the tongue to place the ram in operation to raise or lower the blade, and actuating means for the control mechanism mounted on the boom and functioning upon corresponding vertical movement of the boom relative to the blade at a point in its length adjacent the vertical plane of the blade.

3. A finish leveler comprising a draft tongue arranged at its forward end for connection to a tractor at a fixed distance from the ground, a scraper blade rigid with the tongue at its rear end, a boom over the tongue and blade and projecting rearwardly therefrom, means pivoting the boom at its forward end on the tongue, a ground engaging member supporting the rear end of the boom, ground engaging wheels supporting the blade from the ground for vertical adjustment of said blade relative to the wheels, a hydraulic ram mounted in connection with the blade and wheels to so vertically adjust the blade upon operation of the ram, a fluid supply system for the ram including a normally closed valve mounted on the implement, and means mounted on the boom and functioning upon upward and downward movement of the boom relative to the blade at a point in its length adjacent the vertical plane of the blade to actuate the valve so as to cause the fluid to operate the ram to correspondingly raise or lower the blade; the fluid supply system including a flow restricting conduit extending between the valve and ram.

4. A finish leveler comprising a draft tongue arranged at its forward end for connection to a tractor at a fixed distance from the ground, a scraper blade rigid with the tongue at its rear end, a boom over the tongue and blade and projecting rearwardly therefrom, means pivoting the boom at its forward end on the tongue, a ground engaging member supporting the rear end of the boom, ground engaging wheels supporting the blade from the ground for vertical adjustment of said blade relative to the wheels, a hydraulic ram mounted in connection with the blade and wheels to so vertically adjust the blade upon operation of the ram, a fluid supply system for the ram including a normally closed valve mounted on the tongue, the valve including a projecting actuating member; a lever unit pivotally mounted intermediate its ends on the tongue, and an element on the boom above and engaging one end of the lever unit, the other end of the unit extending over and engaging said valve actuating member.

5. A structure, as in claim 4, in which the lever unit comprises separate sections arranged for articulating movement relative to each other in a vertical plane lengthwise of the unit, and manual adjustment means between such sections to control the articulating movement thereof.

6. A structure, as in claim 4, in which the boom mounted element is disposed substantially in the vertical plane of the ground engaging edge of the blade.

7. A finish leveler comprising a draft tongue arranged at its forward end for connection to a tractor at a fixed distance from the ground, a scraper blade rigid with the tongue at its rear end, a boom over the tongue and blade and projecting rearwardly therefrom, means pivoting the boom at its forward end on the tongue, a ground engaging member supporting the rear end of the boom, ground engaging wheels supporting the blade from the ground for vertical adjustment of said blade relative to the

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wheels, a hydraulic ram mounted in connection with the blade and wheels to so vertically adjust the blade upon operation of the ram, a fluid supply system for the ram including a normally closed valve mounted on the implement, means functioning upon vertical movement of the boom relative to the blade to open the valve, the boom comprising separate longitudinal sections, means pivotally connecting the sections together rearwardly of the blade for relative lateral swinging of the sections; and means included in part with said fluid system and in part with the boom sections and actuated upon such relative swinging of the sections through an arc of predetermined extent from a longitudinally aligned position to then prevent functioning of the ram regardless of the opening of the valve by vertical movement of the boom relative to the blade which may accompany such swinging movement.

8. A finish leveler comprising a draft tongue arranged at its forward end for connection to a tractor at a fixed distance from the ground, a scraper blade rigid with the tongue at its rear end, a boom over the tongue and blade and projecting rearwardly therefrom, means pivoting the boom at its forward end on the tongue, a ground engaging member supporting the rear end of the boom, ground engaging wheels supporting the blade from the ground for vertical adjustment of said blade relative to the wheels, a hydraulic ram mounted in connection with the blade and wheels to so vertically adjust the blade upon operation of the ram, a fluid supply system for the ram including a normally closed valve mounted on the implement, and means mounted on the boom and functioning upon upward or downward movement of the boom relative to the blade at a point in its length adjacent the vertical plane of the blade to actuate the valve so as to cause the fluid to operate the ram to correspondingly raise or lower the blade, the boom comprising separate longitudinal sections, means pivotally connecting the sections together rearwardly of the blade for relative lateral swinging of the sections; another normally open valve in the system between the first named valve and the ram, said other valve including a movable actuating member whose movement in one direction closes the valve, said member being mounted on one boom section, and means on the other boom section to engage and thus move said member upon relative swinging movement of the boom sections through an arc of predetermined extent.

9. A structure, as in claim 8, in which said last named means comprises a cam on said other boom section, said cam having a working face having a central portion concentric with the axis of the pivotal connection of the boom sections and of predetermined arcuate extent and when engaged by said valve actuating member maintaining said member in a valve opening position, and end portions on the working face of the cam of a different radius than said portion to engage said member and arranged so as to cause the member, when engaged therewith, to be moved to a valve closing position, the central portion of the working face being disposed on the other boom section to engage the valve actuating member when the boom sections are longitudinally aligned and when the boom sections are deflected relative to each other through a relatively small arc in both directions from such longitudinally aligned position.

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