

April 18, 1939.

H. C. FRENCH ET AL

2,154,503

SCRAPER

Filed Oct. 27, 1937

3 Sheets-Sheet 1

Fig. 1.

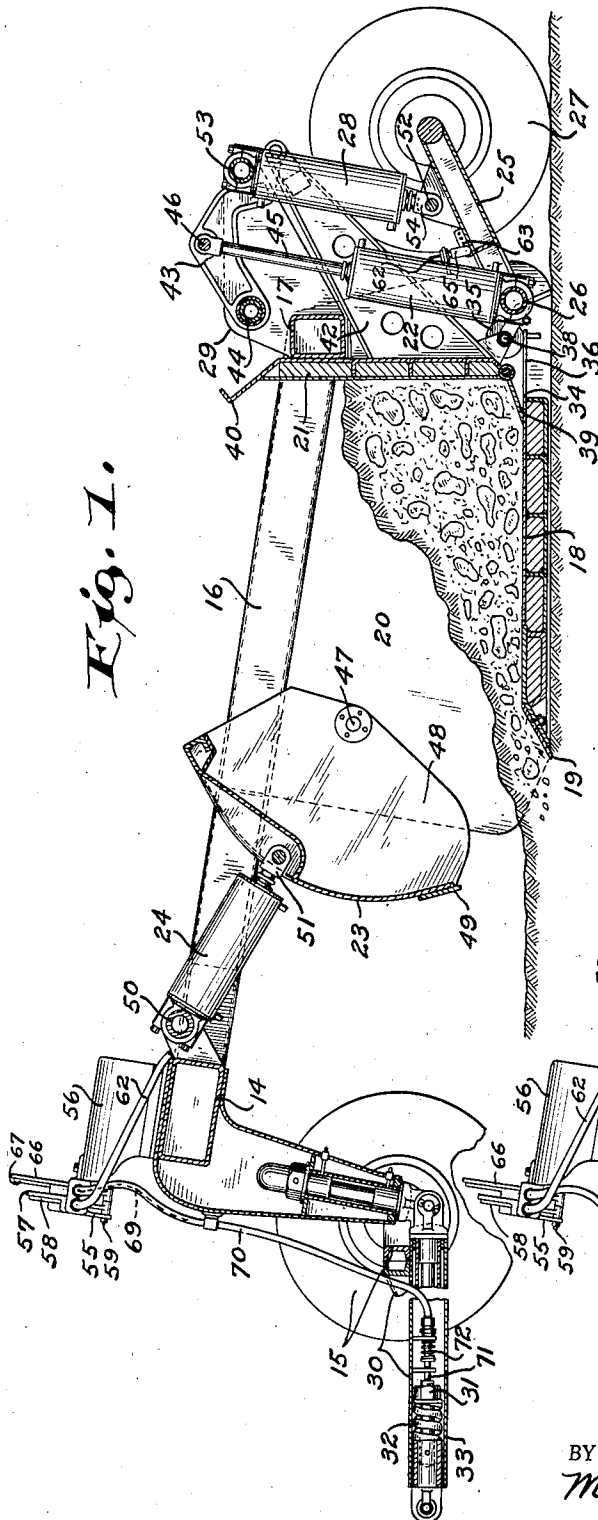
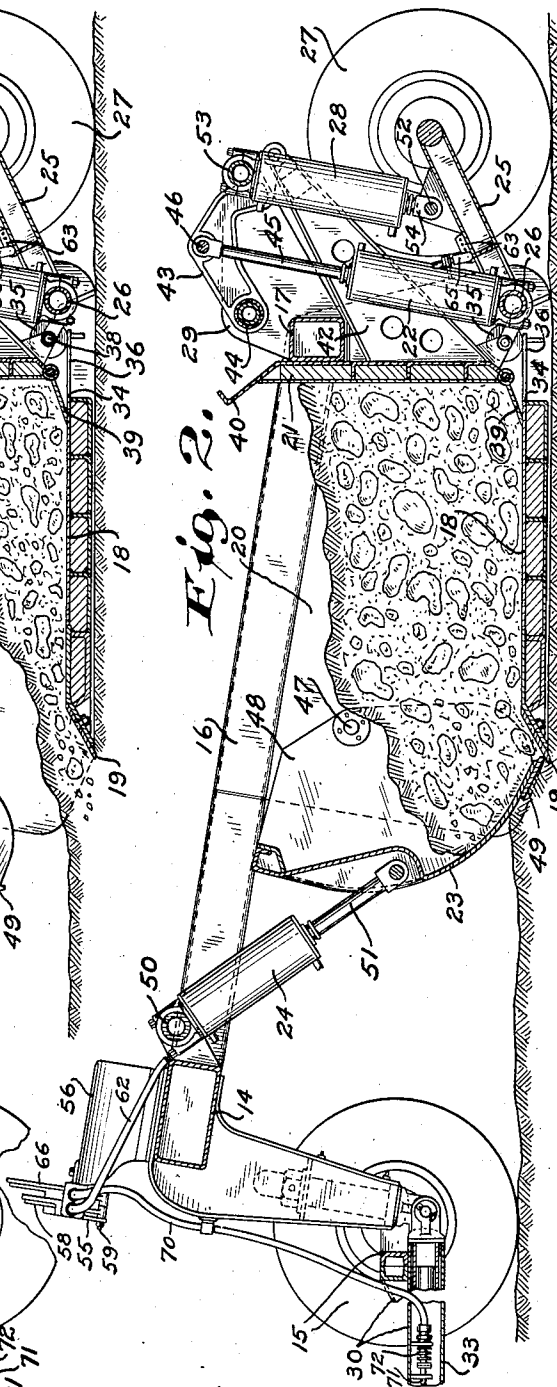


Fig. 2.



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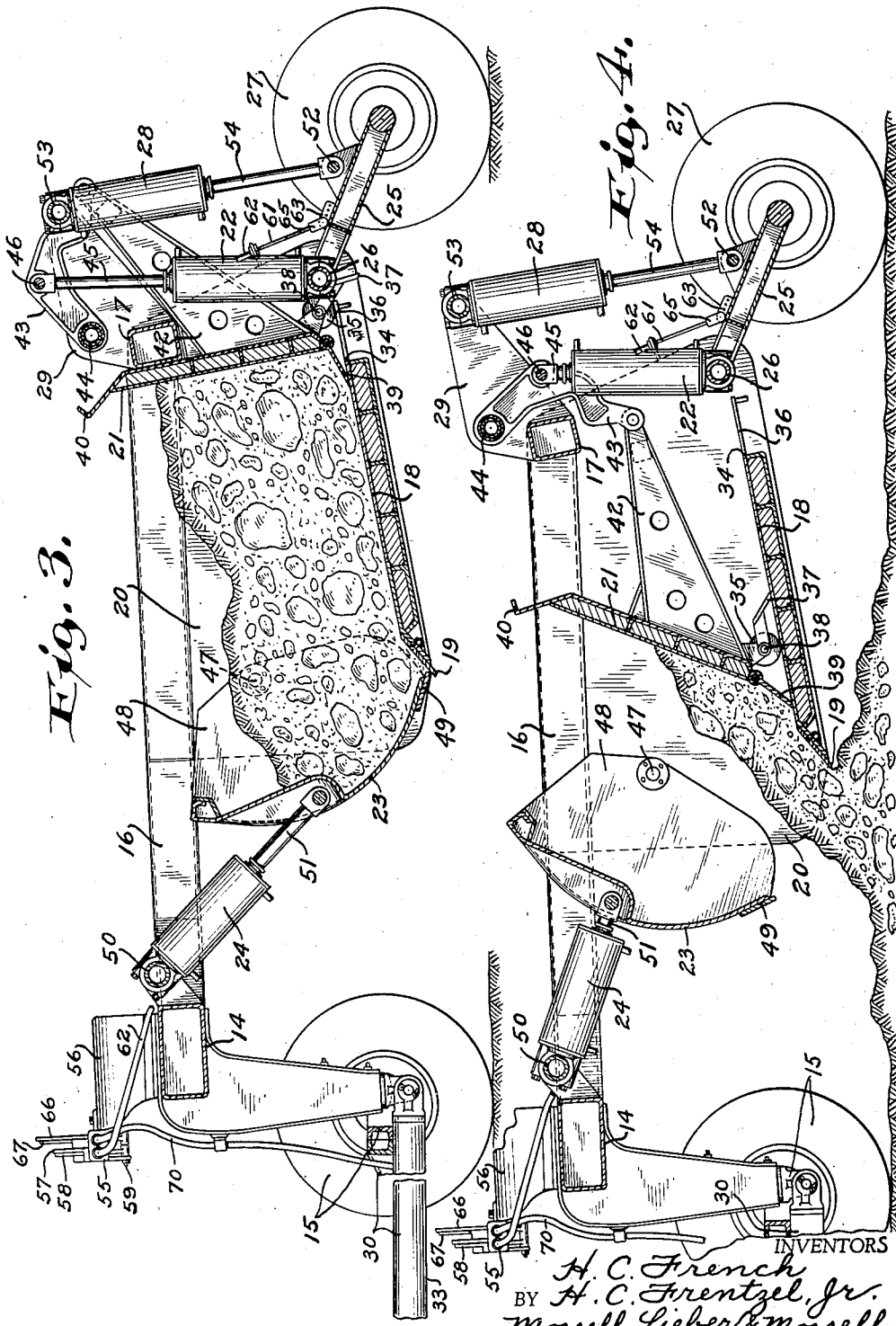
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3 Sheets—Sheet 2



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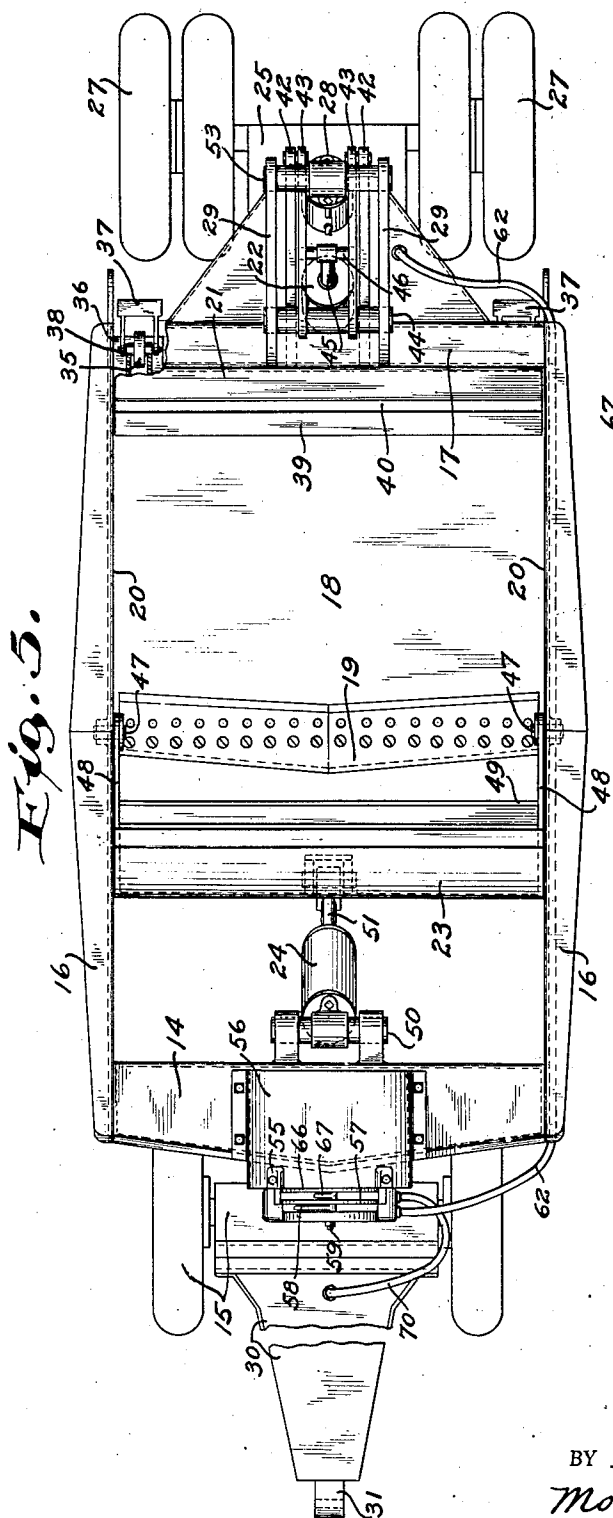
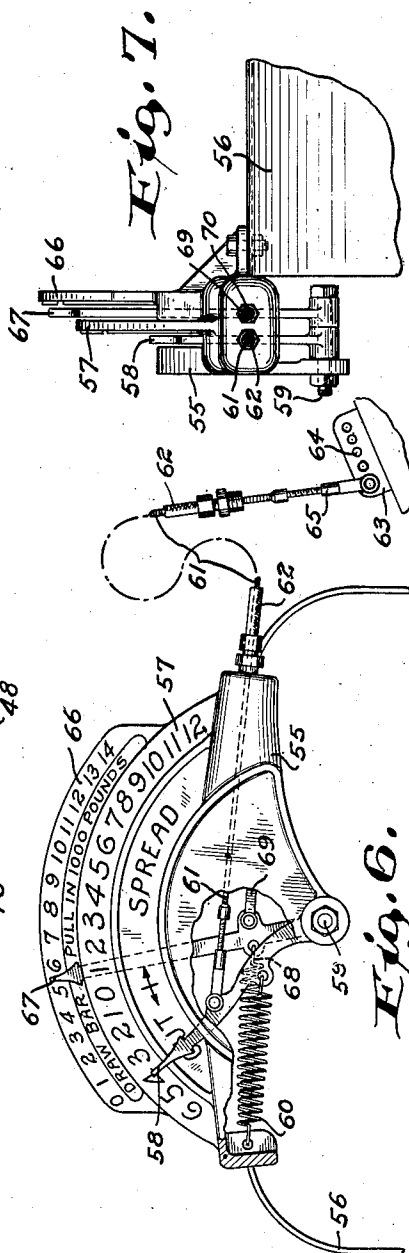
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SCRAPER

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3 Sheets-Sheet 3



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2,154,503

SCRAPER

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Application October 27, 1937, Serial No. 171,255

8 Claims. (Cl. 37-126)

The present invention relates to improvements in the construction and operation of scrapers for excavating and grading, and the improved features are especially applicable to scrapers of the general type shown in our co-pending application Serial Number 150,232, filed June 25, 1937.

Generally defined, an object of our present invention is to provide various improvements in scrapers whereby the capacity and efficiency thereof is enhanced to a maximum.

When operating so-called dig and carry scrapers of the type forming the subject of our co-pending application above identified, it is extremely desirable for the operator of the tractor or draft vehicle of the scraper, to be able to constantly observe the scraper operation and action without obstruction. These scrapers are ordinarily controlled by a single operator who also controls the propelling tractor, and they are utilized in leveling both for the purpose of cutting down hills while accumulating loads within the scraper bowl, and for filling hollows or valleys while dumping and spreading the previously accumulated loads. It is therefore important for the operator to know both the depth of the cut and the rate of discharge of material due to inclination of the load carrying bowl or scoop, and it is also desirable that the operator be constantly advised of the draw-bar pull in order that he may prevent overloading of the tractor. In addition to being thus informed as to the operation of the scraper while stationed on the propelling tractor, the operator should also be able to quickly load the scraper bowl with uniformly distributed charges of material and without spilling any of the load, and the control mechanism should enable him to quickly confine and release the load without obstruction to his view of the interior of the material confining scoop.

Our present invention therefore contemplates the provision of various improvements in the details of construction and operation of scoop type scrapers, whereby the operator may readily observe and control the functioning of the scraper mechanism from a remote point such as the driver's seat of a draft or propelling vehicle.

Another specific object of our invention is to provide improved mechanism for enabling the operator to quickly and accurately determine the position of the scraper blade, both for cutting and spreading purposes.

A further specific object of the invention is to provide simple and effective means for constantly indicating the propelling power required for operation of a scraper, the indicating means pref-

erably being operable by variations in draw-bar pull.

Still another specific object of the present invention is the provision of an improved scraper blade which will most effectively shear the ground with minimum power consumption, and which will also insure uniform loading of the material receiving bowl.

An additional specific object of our invention is to provide improved instrumentalities for discharging the load from a scraper scoop or bowl, and for preventing spilling of material thereover and accumulation of rubbish thereon.

Our invention additionally contemplates provision of improved structure for confining the load within a scraper bowl, and for quickly releasing the material, without undesirably obstructing the operator's view.

These and other objects and advantages will be apparent from the following detailed description.

A clear conception of the various improved features, and of the mode of constructing and of operating a dig and carry scraper built in accordance with the present invention, may be had by referring to the drawings accompanying and forming a part of this specification wherein like reference characters designate the same or similar parts in the various views.

Fig. 1 is a somewhat diagrammatic longitudinal vertical section through one of our improved scraper assemblages, showing the scraper blade in cutting position and the load carrying bowl in the act of being loaded;

Fig. 2 is a similar sectional view of the scraper, showing the bowl partially loaded and the front apron lowered preparatory to elevating the bowl;

Fig. 3 is another similar sectional view showing the partially loaded bowl elevated for free transportation;

Fig. 4 is a further similar sectional view of the assemblage, showing the bowl elevated, the front apron raised, and the rear apron brought forward as during unloading or spreading;

Fig. 5 is a top view of the scraper assemblage with the front apron adjusted so as to afford a clear view of the scraper blade;

Fig. 6 is an enlarged fragmentary front view of the improved indicating mechanism for informing the operator as to the position of the cutting blade, and the draw-bar pull; and

Fig. 7 is a side view of the indicating rig.

While our invention has been disclosed herein as being specifically embodied in and applied to a scoop type scraper of a particular design, it is not the intent to thereby unnecessarily restrict

the scope, since some of the improved features are obviously more generally applicable; and some of the novel features of scraper construction, shown but not specifically claimed herein, form the subject of our co-pending application, Serial Number 150,232, filed June 25, 1937.

Referring to the drawings, our improved load carrying scraper comprises in general, a main front frame 14 pivotally supported at its forward central portion upon a wheeled draft carriage 15 and having rearwardly extending parallel hollow side arms 16 which are rigidly interconnected at their rear ends by a hollow transverse beam 17; an open ended load carrying scoop or bowl having a flat bottom 18 provided with an inclined cutting blade 19 at its front portion and being rigidly attached by means of parallel side walls 20 to the side arms 16; a rear apron 21 normally closing between the side walls 20 and along the flat bottom 18 toward the blade 19 by means of a hydraulic jack 22; a front apron 23 pivotally suspended from the side walls 20 and being swingable toward and away from the blade 19 by means of a second hydraulic jack 24; an auxiliary frame 25 having its front end pivotally connected to the rear lower portion of the bowl by a heavy transverse pivot 26, and having its rear portion pivotally suspended from rear transporting wheels 27; and a third hydraulic jack 28 interposed between the medial portion of the auxiliary frame 25 and the rear ends of a pair of laterally spaced ears 29 which are rigidly associated with the cross-beam 17 of the main frame 14.

The main frame 14 together with its side arms 16, cross-beam 17, ears 29, and the bowl, are preferably formed of heavy metal plates welded together to provide a rigid integral structure, so that the entire bowl and main frame assembly may be swung as a unit about the pivotal support afforded by the draft carriage 15. The draft carriage 15 is capable of being detachably connected to a propelling tractor by means of a draw-bar 30, the front plunger section 31 of which coacts with a compression spring 32, confined within the rear draw-bar section 33 as shown in Fig. 1, and the operation of the three hydraulic jacks 22, 24, 28 may be effected through a fluid pressure system which is controllable by the tractor operator who is ordinarily stationed near the rear of the propelling vehicle so that he may readily observe the scraper, in a well known manner.

The bottom 18 of the bowl has a substantially flat load supporting upper surface, and the cutting blade 19 which is detachably secured to the front of the bowl bottom 18 is of improved formation, as clearly shown in Fig. 5. The inclination of the blade 19 relative to the plane of the bowl bottom 18, is such that the blade will assume the most effective cutting position when the bowl is in lowered position as shown in Fig. 1, and the cutting edge of the blade 19 is inclined rearwardly away from the central vertical plane of the bowl so that the mid-portion of the blade will enter the cut and subsequently proceed in advance of the side or end portions thereof. This formation of the blade has been found far superior to the old straight edged blade, since it permits the blade to more readily enter hard ground surfaces and also produces a draw cutting or slicing action on opposite sides of the blade center, thus not only minimizing the power required to drive the blade through the ground, but also improving the subsequent

distribution of the load within the scoop or bowl. The side plates or walls 20 very rigidly connect the bowl bottom 18 with the side beams or drums 16 and with the rear beam 17 of the main frame 14, and the heavy rear pivot 26 is mounted upon these side walls 20 a considerable distance rearwardly beyond the extreme rear end 34 of the bottom 18. It is noteworthy that the construction of the main frame and bowl is such that the entire top of the latter is open and free from obstruction at all times, thereby permitting unobstructed loading of the scraper from above.

The rear apron 21 which is normally disposed at the rear and encloses that end of the bowl, is movably supported for transportation along the bowl bottom by means of a pair of rollers 35 coacting with the upper surface of the bowl bottom 18 and with side extensions 36 thereof near the side walls 20. The rollers 35 are carried by the lower portion of the apron 21, and each of these rollers 35 is provided with a scraper 37 freely swingable upon the roller axle 38 and having a blade cooperable by gravity with the upper surface of the bowl bottom 18 and with the extensions 36, to prevent accumulation of material on the roller tracks, see Figs. 4 and 5. The lower extremity of the rear apron 21 also carries a pivoted flap 39 which constantly engages the upper surface of the bowl bottom 18 as the apron 21 is moved therealong; and while the major portion of the apron 21 is flat, the upper portion thereof is provided with a forwardly inclined integral projection 40 which guides the material forced upwardly along the apron, forwardly into the bowl and prevents this material from being spilled in back of the apron 21. When the rear apron 21 is in fully retracted position as shown in Figs. 1, 2 and 3, it coacts with the transverse beam 17, and the apron is provided with laterally spaced rearwardly projecting parallel arms or brackets 42 which extend beneath the beam 17, see Figs. 1 to 4. The brackets 42 are rigid with the apron 21, being disposed on opposite sides of the hydraulic jacks 22, 28 and between the ears 29 of the main frame 14, and the rear portions of the brackets 42 are pivotally attached to the swinging extreme ends of laterally separated levers 43 which are swingably suspended from the ears 29 by means of a common pivot 44. The hydraulic jack 22 which is swingably suspended from the lower rear portion of the bowl and from the front end of the auxiliary frame by means of the pivot 26 connecting these parts, has a movable piston 45 which is pivotally attached to the medial portion of both levers 43, by a pin 46 so that operation of the jack 22 will result in swinging motion of the levers 43 thereby causing the rear apron 21 to move within the load confining bowl, see Fig. 4. This movement of the rear apron is obviously effected without interference with the hydraulic jack 22.

The front apron 23 is of improved construction, being swingably suspended from the side walls 20 by means of aligned pivots 47 coacting with side walls 48 formed integral with the apron, the common axis of the pivots 47 preferably being disposed above and slightly in advance of the front portion of the bowl bottom 18. The lower edge of the front apron 23 is provided with a transverse cut-off plate 49 which is cooperable with the blade 19 when this apron is lowered to confine the load as in Figs. 2 and 3, and the uppermost portion of the apron 23 is reinforced by an integral transverse beam, as shown in Figs.

1 to 5 inclusive. The front apron actuating jack 24 is swingably suspended from the front cross beam of the main frame 14 by means of a pivot 50, and has a movable piston 51 which is pivotally attached to the front medial portion of the apron 23 as shown in Figs. 1 to 4. The relatively short radius of swing of the front apron 23, resulting from the location of the pivots 47 directly above the blade 19, produces rapid opening and closing motion of this apron with limited travel of the piston 51, and the closing movement is assisted by gravity acting upon the apron 24.

The auxiliary rear frame 25 should be of rugged construction, and may also be constructed of heavy metal plates welded together. As previously indicated, the front swinging portion of the frame 25 is connected to the rear lower portion of the bowl by means of the pivot 26, while the rear of this frame is pivotally suspended from the rear transporting wheels 27. The wheels 27 are preferably disposed within the path of action of the scraper blade 19, and the hydraulic jack 28 for elevating the bowl and the rear portion of the main frame 14, is swingably suspended from the ears 29 by means of a pivot 53 and has a movable piston 54 which is pivotally attached to the medial portion of the frame 25 by a pin 52, see Figs. 1 to 4 inclusive. When the piston 54 is in retracted position as shown in Figs. 1 and 2, the bowl will be in extreme lowermost position; but when this piston 54 is moved out of the cylinder 28 as in Figs. 3 and 4, the bowl will be elevated to the maximum extent. It is noteworthy that all of the hydraulic jacks 22, 24, 28 may be of the same size and of interchangeable construction, thereby greatly facilitating the manufacture and installation thereof.

While the operator of the tractor, who also controls the operation of the scraper, normally has a relatively clear view of the aprons 21, 23 and of the interior of the bowl, he cannot normally observe the cutting blade 19 especially when in the cut, nor can he ascertain the pull which is being exerted by the tractor. In order to enable the operator to more clearly observe the functioning of the blade, and the draw-bar pull, we have provided improved indicating mechanism such as shown in detail in Figs. 1, 6 and 7, which at a glance will inform him as to these factors. This scraper blade position indicating rig comprises in general, a bracket 55 which may be attached either to the valve guard 56 at the front of the scraper, or to the control lever support on the tractor; a calibrated gage plate 57 for indicating the position of the cutting blade 19, associated with the bracket 55; a swinging pointer 58 cooperating with the calibrations on the gage plate 57 and being swingably supported by a pivot pin 59 carried by the bracket 55; a tension spring 60 for constantly urging the pointer 58 in one direction; a flexible cable 61 attached to the pointer 58 and extending through a protecting tube 62 to the rear of the scraper to a point directly above the swinging end of the auxiliary frame 25; another bracket 63 secured to the frame 25 and having a series of holes 64 therein; and an adjustable connector 65 for attaching the rear cable end to the bracket 63. The draw-bar pull indicator comprises a second calibrated gage plate 66 for indicating the pull in thousand pounds, also associated with the bracket 55; a second swinging pointer 67 cooperating with the calibrations on the gage plate 66 and being swingably supported by the pivot pin 59; another

tension spring 68 functioning independently of the spring 60 to constantly urge the pointer 67 toward the zero position; a flexible cable 69 attached to the pointer 67 and extending through a protecting tube 70 to a point in proximity to the draw-bar 30; a plunger 71 slidably mounted within the draw-bar section 33 and coacting with the end of the movable draw-bar section 31; and a compression spring 72 for constantly urging the plunger 71 against the end of the draw-bar section 31, the plunger 71 being adjustably connected to the cable 69. The gage plates 57, 66 may be formed integral with, or attached to the bracket 55, and either of the indicators may be used to the exclusion of the other if so desired. The connections between the cables 61, 69 and their respective pointers 58, 67 are preferably adjustable so as to permit accurate initial setting of these pointers, and the adjustable attachments at the other ends of these cables also facilitate such setting. The cables 61, 69 are formed of flexible metallic wire and are freely slidable within their protecting and guiding tubes 62, 70 so that motion of the ends of these cables remote from the indicator, will be immediately and positively transmitted to the pointers 58, 67.

During normal operation of the improved scraper, the front carriage 15 is ordinarily connected to a tractor, and the fluid distribution system is in condition for use and is ordinarily controllable directly by the operator stationed on the tractor. The hydraulic jacks 22, 24, 28 may then be actuated independently of each other to effect their several operations, and the indicating rig should be accurately set so as to give correct indications of the position of the scraper blade, and of the draw-bar pull.

When the elements are positioned as shown in Fig. 1, and the scraper is being advanced along the ground, the cutter blade 19 is being driven through the soil and is delivering a uniformly distributed load of material into the bowl and against the rear apron 21 which should then be located in extreme rearmost position against the cross beam 17. The bottom 18 of the scoop or bowl is substantially horizontally disposed, and the mid portion of the cutter blade 19 is being forced through the ground in advance of the side inclined portions thereof, thus not only reducing the power to a minimum, but also causing the major portion of the load to enter the medial portion of the bowl and to uniformly distribute itself towards the sides thereof. The rear supporting wheels 27 are progressing along the path cut by the scraper blade 19, well within the opposite sides thereof, and the front apron 23 is elevated sufficiently to avoid undesirable obstruction to entry of the dirt to the interior of the scoop.

When the bowl of the scraper has been sufficiently loaded, the front apron 23 may be lowered by operation of the hydraulic jack 24, to the position shown in Fig. 2. As the lower cutting blade 49 of the front apron 23 approaches the scraper blade 19, the blade 49 due to its formation and its short radius of swing, will quickly remove the transverse mound of dirt in front of the cutting blade 19, and will confine the load within the bowl in the manner clearly indicated in Fig. 2. The loaded bowl may thereafter be quickly elevated to the position shown in Fig. 3, by operation of the hydraulic jack 28. Such operation of the jack 28 causes the piston rod 54 thereof to move downwardly and to swing the rear end of the main frame 14 upwardly, and because the bowl

is rigidly attached to the arms 16 and cross beam 17, the load will naturally be withdrawn from the ground and elevated. The loaded scraper assembly may then be freely transported along the ground to any desired place. It is to be noted that when the scraper is in the condition shown in Fig. 3, it may also be loaded from above with the aid of a steam shovel, if so desired.

If it becomes desirable to dump the load, this can readily be done by merely manipulating the hydraulic jacks 24, 22 to first elevate the front apron 23, and to thereafter move the rear apron 21 forwardly. As the levers 43 are swung downwardly, the swinging ends thereof, being pivotally attached to the rear ends of the brackets 42, will cause the rear apron 21 to travel forwardly along the bowl bottom 18 and between the side walls 20. The levers 43 are so formed and mounted, that maximum power is delivered to the rear apron 21 at the beginning of the dumping stroke, and the apron speed will increase as the required push decreases. At the beginning of this stroke, the apron 21 is substantially perpendicular to the bowl bottom 18, and at the end of the stroke, the apron is inclined rearwardly and upwardly so as to insure most effective discharge of the load; and a relatively short stroke jack 22 may be utilized. The flap 41 at the lower extremity of the apron 21 will travel along the bowl bottom 18, and the entire load will be pushed forwardly and delivered from the bowl over the scraper blade 19. As the apron 21 moves forwardly and rearwardly, the supporting rollers 35 ride along the upper surface of the bowl bottom 18 and along the extensions 36, and the auxiliary scrapers 37 will effectively remove any accumulated dirt during the rearward movement of the apron. During loading of the bowl, the upper extension 40 of the rear apron 21 will throw the material which advances along the forward surface of the apron, into the scoop or bowl and will thus not only enhance the uniform distribution of the load, but will also prevent material from spilling over the rear apron. Return of the apron 21 to loading position may be quickly effected by operation of the jack 22, and the several jacks may obviously be actuated independently so as to produce the desired operations.

When the bowl is lowered into the ground to the position shown in Fig. 1, the auxiliary frame 25 will swing downwardly and will cause the pointer 58 of the blade positioning indicator to move along the calibrations on the plate 57 and indicate the depth of cut. When the bowl is elevated out of the ground, to load carrying position, the frame 25 will swing upwardly to cause the pointer 58 to swing over the spread indicating portion of the gage. By accurate adjustment of the initial position of the pointer 58, the indicating mechanism can be made to effectively indicate the precise position of the blade with reference to the ground line, and the operator on the tractor is thus advised as to the precise location of the blade 19, at all times. When the draw-bar pull varies, the spring 32 will be compressed more or less and the movable section 31 of the draw-bar will slide within the tubular section 33. The plunger 71 will then be moved in accordance with variations in the compression of the spring 32, and this movement of the plunger 71 will be transmitted to the pointer 57 which cooperates with the draw-bar pull indicating gage plate 56. By accurately originally setting the pointer 57, the operator may be quickly advised as to variations in the draw-bar pull, at

the same time that he is observing the indicated position of the cutter blade 19. He may then control the operation of his tractor so as to insure most efficient pulling of the scraper assemblage, and stalling of the tractor and scraper can be readily avoided.

From the foregoing specific description it will be apparent that the present invention provides an improved scraper assemblage which can be readily manipulated, effectively loaded and unloaded, and the precise operation of which is at all times conveniently ascertainable. The improved construction of the scraper blade 19, of the rear apron 21, and of the front apron 23, obviously enhances the efficiency of operation and permits most efficient distribution of the load within the bowl without spilling material. The improved indicating mechanism facilitates most efficient operation of the scraper without inconvenience to the operator. This improved scraper moreover utilizes only three hydraulic jacks, all of which may be of like construction, in order to effect operation of all of the scraper parts, and these jacks are so located that they will most effectively cooperate with the elements which they are intended to actuate.

While the V-shape of the cutting blade 19 does in fact improve the distribution of material within the bowl, this formation of the blade also permits the blade to more effectively enter hard surfaced ground, since the forwardly disposed midportion will initially enter the surface and greater portions of the sloping cutting edges on opposite sides of the center will gradually become effective as the bowl is lowered into the cut and the scraper advances. By varying the depth of the cut with the aid of the depth indicator, and by observing the power indicator, this improved blade 19 may be caused to most effectively shear the ground with minimum power variation and consumption. The formation and mounting of the rear apron actuating levers 43 is also important in securing most effective and rapid actuation of the rear apron 21 with minimum power consumption, and the same is true of the construction and mounting of the front apron 23.

The improved scraper assembly including the indicator mechanism has proven highly successful in actual commercial use, and can be manufactured, sold and operated at extremely moderate cost.

It should be understood that it is not desired to limit this invention to the exact details of construction herein shown and described, for various modifications within the scope of the claims may occur to persons skilled in the art.

We claim:

1. In a scraper, a transportable main frame carrying a ground engaging blade and being swingable about a front pivot to raise and lower said blade, an auxiliary frame swingable about a rear pivot and cooperating with said main frame to raise and lower said blade, and visible means carried by said main frame and being operable by said auxiliary frame to indicate the position of said blade relative to and beneath the ground, said visible means including a pointer and a longitudinally movable flexible member for actuating said pointer.

2. In a scraper, independently supported simultaneously transportable frames, a blade carried by one of said frames and being movable toward and away from the ground and to various depths beneath the ground surface by relative

movement of said frames, and visible means operable by relative movement of said frames to indicate the position of said blade relative to and beneath the ground, said visible means including a pointer and a longitudinally movable member operable by the movement of one of said frames for actuating said pointer.

3. In a scraper, independently supported simultaneously transportable and pivotally connected trailer frames, a scraper blade carried by one of said frames and being movable toward and away from the ground and to various depths beneath the ground surface by the relative pivotal movement of said frames, a pointer visibly supported remote from said blade, and an elongated motion transmitting member for actuating said pointer and being operable by the relative pivotal movement of said frames.

4. In a scraper, independently supported simultaneously transportable and interconnected front and rear trailer frames, a scraper blade carried by said front frame and being movable to various depths beneath the ground surface by relative movement of said frames, a depth indicating pointer cooperable with an indicating dial mounted upon the forward portion of said front frame, and an elongated flexible motion transmitting member for actuating said pointer and being operable by movement of said rear frame relative to said front frame.

5. In a scraper, independently supported simultaneously transportable and pivotally interconnected front and rear trailer frames, said front frame having a tubular beam extending rearwardly therefrom, a scraper blade suspended from said beam and being movable to various depths beneath the ground surface by relative swinging of said frames, a depth indicating pointer cooperable with an indicating dial mounted upon the forward portion of said front frame, and an elongated flexible motion transmitting member for actuating said pointer from said rear

frame, said member being housed within said tubular beam.

6. In a scraper, relatively movable front and rear frames, a scraper blade suspended from one of said frames and being movable to various depths beneath the ground surface by relative movement of said frames, an indicating dial disposed upon the forward portion of said front frame, an indicating pointer cooperating with said dial to indicate the depth of cutting by said blade, a longitudinally movable cable operable by movement of said rear frame to move said pointer in one direction, and resilient means for moving said pointer in the opposite direction.

7. In a scraper, relatively movable front and rear frames, a scraper blade suspended from one of said frames and being movable to various depths beneath the ground surface by relative movement of said frames, an indicating dial disposed upon the forward portion of said front frame, an indicating pointer cooperating with said dial to indicate the depth of cutting by said blade, a longitudinally movable cable operable by movement of said rear frame to move said pointer in one direction, resilient means for moving said pointer in the opposite direction, and means for varying the connection between said cable and said rear frame to vary the range of movement of said pointer.

8. In a scraper, relatively movable trailer frames, a scraper blade suspended from one of said frames and being movable to various depths beneath the ground by relative movement of said frames, a dial carried by the blade carrying frame, a pointer cooperable with said dial to indicate the depth of cutting, a longitudinally movable cable operable by movement of the other of said frames to move said pointer, and means for varying the point of connection of said cable to said other frame to vary the range of movement of said pointer.

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