Oct. 13, 1953 A. R. ASKUE 2,654,966

CRUMBING MECHANISM FOR EXCAVATING MACHINES

Filed Jan. 27, 1950 3 Sheets-Sheet 1

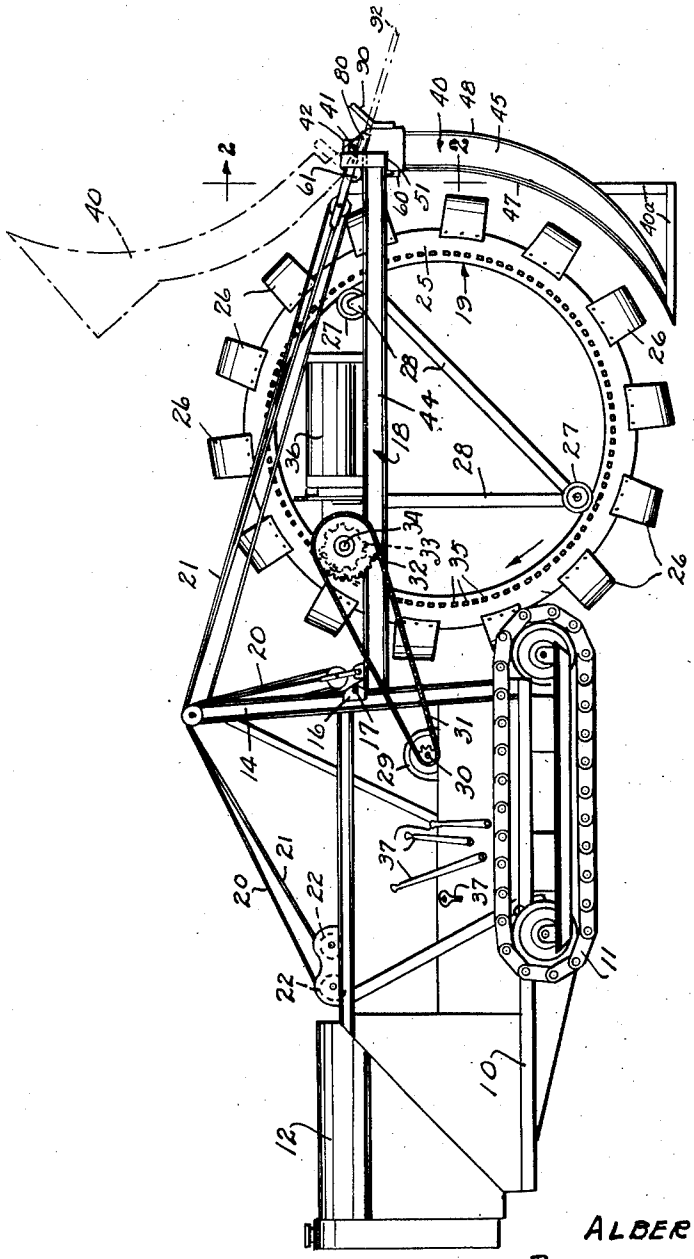


FIG. 1

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Filed Jan. 27, 1950 3 Sheets-Sheet 2

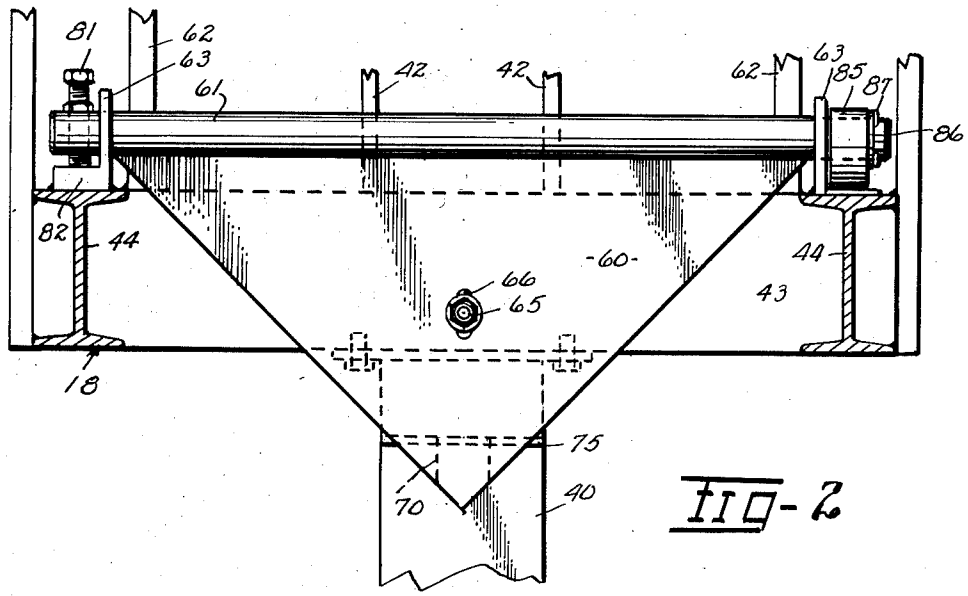


FIG. 2

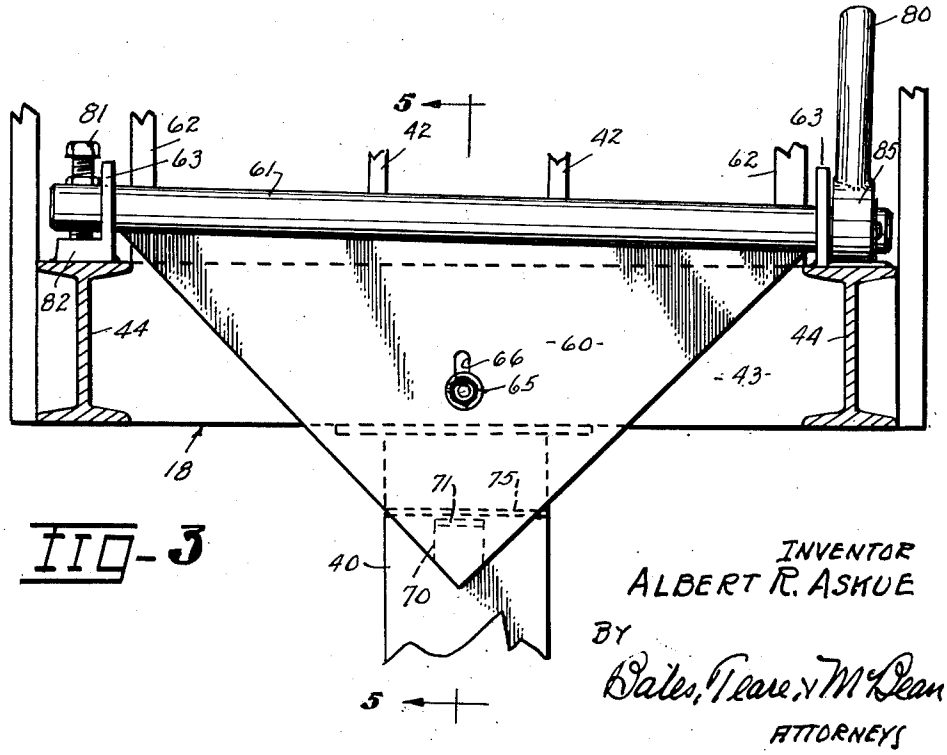


FIG. 3

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CRUMBING MECHANISM FOR EXCAVATING MACHINES

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FIG-4

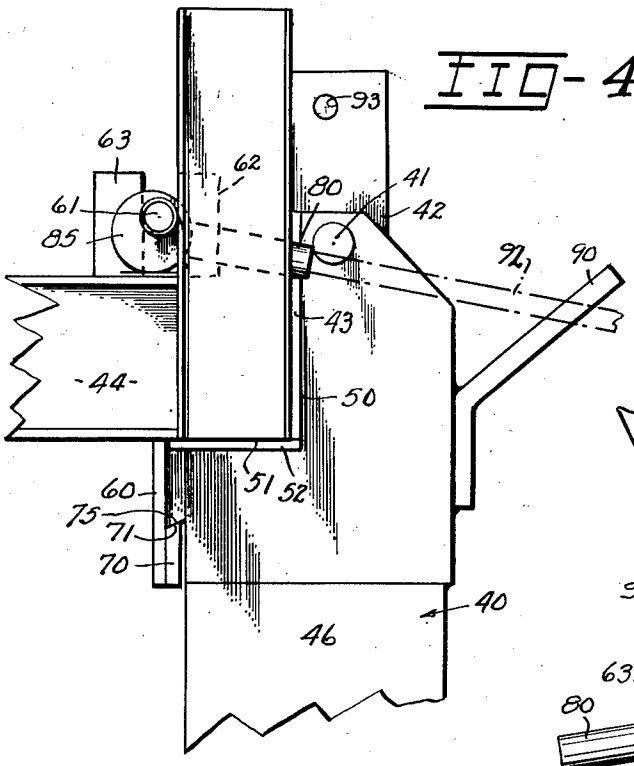


FIG-6

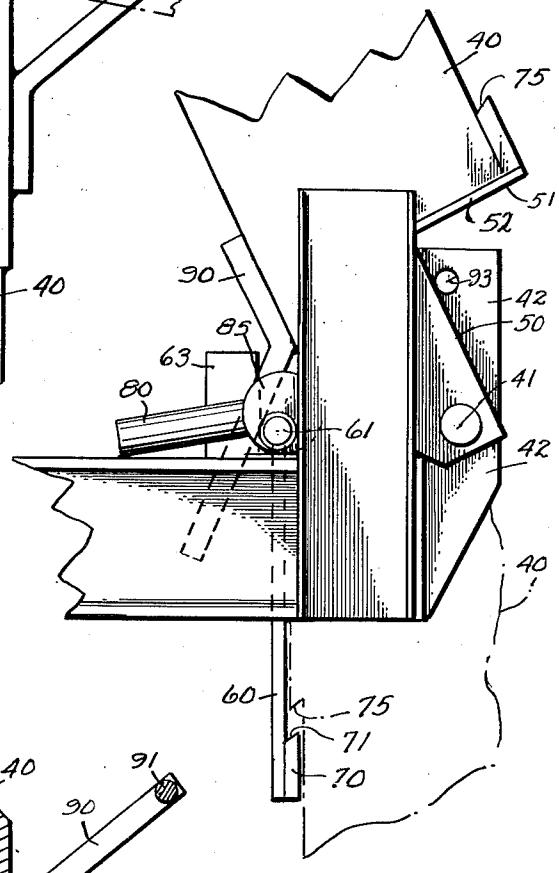
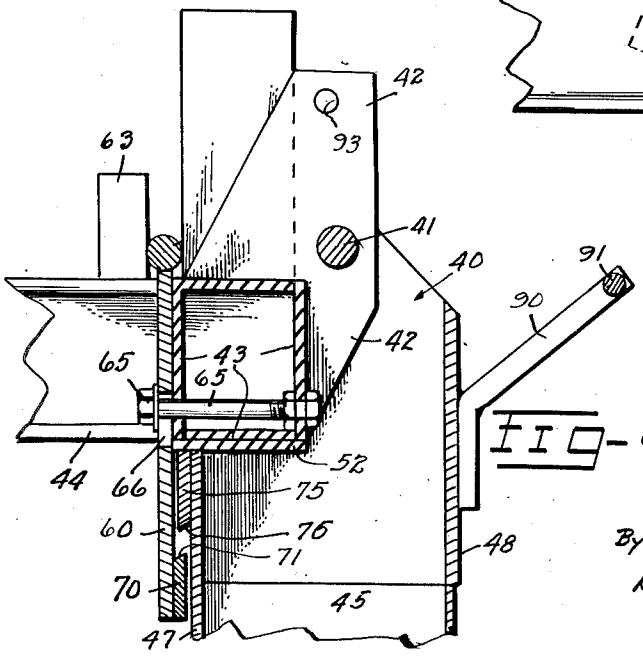


FIG-5



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CRUMBING MECHANISM FOR EXCAVATING MACHINES

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7 Claims. (Cl. 37—80)

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This invention relates to improvements in trench excavating or ditching machines, and more particularly, to a wheel type trench excavating machine having an improved crumbing mechanism which may be moved into and out of active position as desired. These therefore are the general objects of the present invention.

The present invention contemplates pivotally mounting a crumbing shoe on a trench excavating machine so that the shoe may be readily swung into and out of active position, and the provision of a simple mechanism for locking the shoe in its active position, which mechanism may be released quickly despite the great strain placed on the shoe during normal excavating operations, and which will effectively retain the shoe in its active position when so desired.

Other objects and advantages of the invention will become more apparent from the following description of a preferred form of the invention which is illustrated in the accompanying drawing. The essential and novel features of the invention will be summarized in the claims.

In the drawing Figure 1 is a side elevation of a trench excavating machine incorporating the present invention; Figure 2 is an enlarged fragmentary sectional view of the machine illustrating the upper portion of the crumbing shoe and its connection with the excavating machine, together with the mechanism for latching the shoe in an active position, the plane of the section being indicated by the line 2—2 on Figure 1; Figure 3 is a fragmentary sectional view similar to Figure 2, but illustrating the latch mechanism in a released position; Figure 4 is a side elevation of the portion of the excavating machine illustrated in Figure 2 as viewed from the right hand side of such figure; Figure 5 is a sectional view illustrating the crumbing shoe latch mechanism in a released position, the plane of the section being indicated by the line 5—5 on Figure 3; and Figure 6 is a fragmentary elevation, similar to Figure 4, but illustrating the crumbing shoe in a raised or inactive position.

The present invention is especially applicable to a wheel type trench excavating machine. Such an excavating machine is illustrated in general in Fig. 1. As shown, the machine comprises a main frame 10 supported by a pair of tractor belts, one of which is shown at 11. These belts are driven by a motor 12, which is supported on the forward end of the frame 10. At the rear of the frame 10, there is provided an upwardly extending forwardly inclined guideway 14, slidably mounted in which is a support 16 carrying a rearwardly extending boom or digging wheel frame 18. The boom 18 is pivotally mounted on the support 16, as at 17, and is arranged to be raised and lowered relative to the machine supporting surface by a pair of cables 20 and 21. The cable 20 serves to lower the forward or inner end of the boom 18, while the cable 21 controls the rear or outer end of the boom. The cables 20 and 21 are operated by respective winding drums, generally indicated at 22, and which are selectively driven by the motor 12.

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A digging wheel 19 is rotatably supported in the boom or frame 18. This wheel comprises a pair of spaced rings 25, which are secured together at their peripheries by a series of U-shaped digging buckets 26. The wheel is supported by a plurality of rollers, two of which are shown in Fig. 1 at 27. These rollers are rotatably mounted in bracket formations 28 carried by the boom 18.

The digging wheel is rotated by the motor 12 through the medium of a change speed transmission unit 29. This unit drives a sprocket wheel 30 which is connected by a drive chain 31 with a sprocket wheel 32 mounted on a shaft 34, which is supported by the boom 18. A suitable chain tensioning device (not shown) is provided to permit relative movement between the transmission 29 and the sprocket wheel 30 while maintaining the driving connection therebetween. A third sprocket wheel 33 is drivingly mounted on the shaft 34 and engages a series of tooth-like formations 35 carried by the digging wheel 19. The arrangement is such that the digging wheel 19 may be lowered into an excavating position in the usual manner and then rotated in the direction of the arrow shown in Figure 1 for excavating purposes.

The material excavated by the buckets 26 is carried upward to the top of the wheel where it drops by gravity onto a conveyor belt 36. This conveyor is supported by and extends transversely of the boom 18. The conveyor is driven from the shaft 34 by a suitable driving mechanism not shown and serves to carry the excavated material away from the digging wheel and discharge it at the side of the trench.

The winding drums 22, the tractor belts 11, the excavating wheel 19, and the conveyor 36, as heretofore mentioned, are all driven by the motor 12. Suitable manually operable controls, some of which are shown in Fig. 1 at 37, are provided to independently control the operation and direction of movement of the various elements actuated by the motor 12.

During the excavating operation, a certain

amount of excavated material remains in the excavating buckets 26 until the buckets begin their downward movement. This material, together with that which drops from the conveyor, falls to the bottom of the excavated trench. Likewise, a certain amount of material is carried to the bottom of the trench by the movement of the excavating wheel therethrough. This material remains on the floor of the trench beyond the reach of the excavating buckets. Crumbing shoes have been provided to propel such loose material forward so that it will be picked up by the buckets and removed from the trench.

In the past it has been the general custom to rigidly secure the crumbing shoe to the outermost end of the boom. These shoes have extended downward from the boom to the floor of the trench and have been shaped to shove or propel the loose material on the floor of the trench forward so that it may be picked up by the downwardly moving buckets and removed from the trench, thereby maintaining the floor of the trench comparatively clean.

Crumbing shoes increase the overall length of the machine and limit the positioning of the machine toward fixed objects, such as sidewalks, curbs and the like, and hence have not been used on trenchers in the excavation of trenches for public utility service lines in relatively congested areas. The present invention contemplates overcoming the above mentioned disadvantage of crumbing shoes used in the past by pivotally mounting the crumbing shoe so that it may be raised clear of the trench as indicated by the dotted line in Fig. 1.

Pivotally mounting the crumbing shoe is made difficult as the boom 18 which provides the support for the shoe must remain above the ground at all times. Accordingly, the shoe must extend downward from its pivotal connection with the boom a distance equivalent to the maximum depth of trench for which the machine may be used. Further, the direction of movement of the shoe about its pivot from an active to an inactive position is the same as the resulting direction of the forces acting against the shoe during operation of the machine, such as the impulse of the material being gathered thereby and the frictional resistance between the moving shoe and the trench walls. This has presented a difficult problem both in the mounting of the crumbing shoe and in the provision of a suitable mechanism for retaining the shoe in its active position.

The mechanism for retaining the shoe in its active position must be capable of withstanding the severe strains placed thereupon during the digging operation and at the same time it should be capable of being released by the operator with a minimum amount of effort. The strains on this mechanism are increased by the desire to position it adjacent the boom, while the strains transmitted to such mechanism originate at a point remote from the boom. The present invention accordingly provides for an improved form of pivotal mounting for the crumbing shoe together with an improved mechanism to retain the shoe in its active position, which mechanism will be simple in operation, positive in its action, and capable of withstanding severe strains.

The crumbing shoe of the present invention is generally indicated at 40 as comprising an elongated box-like structure generally rectangular in cross section. The shoe is pivotally mounted on a pivot pin 41 carried by a pair of outwardly extending brackets 42 which are secured to a box-like frame member carried by and extending across the extreme outer end of a pair of spaced beams 44 which comprise the boom 18. The crumbing shoe 40 extends downward from its pivot and is curved forwardly conforming substantially to the arcuate path of travel of the excavating buckets 26. The lower end of the shoe is provided with a reinforcing structure 40*a*, the lower member of which is adapted to engage the floor of the trench.

The crumbing shoe 40 is formed by a pair of spaced side wall members 45 and 46 joined by a forward wall member 47 and a rear wall member 48. The various members forming the crumbing shoe may be secured together by welding and reinforced as desired. As indicated in the drawings, the upper end of the crumbing shoe 40 is formed of metal having a somewhat heavier gauge than the lower end, thereby reinforcing the area of the shoe through which the pivot pin 41 extends, as well as that portion of the shoe which coacts with the boom and the latch mechanism hereinafter to be described. The upper end of the shoe is provided with a vertical surface 50 and an intersecting horizontal surface 51 which intimately engage the end and lower surfaces respectively of the boom 18 when the shoe is in its active position. The horizontal surface 51 is provided with a horizontally extending reinforcing plate 52 which may be secured, as by welding to the side and front plates 45 and 47.

The mechanism which retains the crumbing shoe 40 in its active position includes a latch plate 60. This plate is secured at its upper end to the periphery of a transversely extending member, shown as a bar 61 which extends across boom members 44 between which the digging wheel extends. Each end of this bar is positioned between a pair of upstanding bars 62 and 63 carried by the boom members 44 and which act to prevent movement of the bar longitudinally relative to the boom. Rotary movement of the bar 61 is prevented by the plate 60 which is retained in sliding contact with the boom frame member 43 by a bolt 65 carried by such member, and which extends through an elongated vertically extending opening 66 in the plate. A hook-like member 70 is secured to the rear face of the plate 60 and is provided with an upper surface 71 which inclines forwardly and downwardly toward the plate 60. A complementary hook-like member 75 is secured to the upper end of the forward wall 47 of the crumbing shoe 40 and is provided with a complementary inclined surface 76, which like the surface 71 inclines downwardly and forwardly toward the plate 60. Accordingly, when the plate 60 is raised, the inclined surfaces 71 and 76 are brought into wedging engagement with each other and provide a lock or latch which not only restrains the swinging movement of the crumbing shoe about its pivot 41, but also clamps the plate 52 and vertical surface 50 of the crumbing shoe against the lower face and the vertical outer end of the boom respectively.

The plate 60, together with its hook-like member 70, is moved up and down to move it into and out of locking engagement with the coacting hook-like member 75 of the crumbing shoe 40 by the manual operation of a hand lever 80. As shown in the drawing, and particularly in Figures 2 and 3, it will be noted that one end of the bar 61 is provided with a set screw 81 which is adjustably mounted in the bar 61 and extends some distance below the bottom thereof into contact with a block 82 carried by the left

hand frame 44 of the boom 18, and facilitates the raising and lowering of the bar by rocking the other end of the bar up or down. The hand lever 80 is secured to the periphery of a disc 85, which is rotatably and eccentrically mounted on the right hand end of the bar 61 (Fig. 3) and is retained in position thereon by any suitable means, such as a washer 86 and a cotter pin 87.

When the hand lever 80 is moved to the full line position shown in Figure 4, the eccentrically mounted disc 85 rocks the right hand end of the rod (Fig. 2) upward, drawing the hook surface 71 of member 70 on the plate 60 into wedging engagement with the coacting hook surface 76 of member 75 on the shoe. The eccentricity of the disc 85 and the axis of the bar 61 are so related that, when they are in the positions shown in Figure 4, the bar 61 is slightly past dead center so that any tendency for the shoe to swing in a counterclockwise direction toward an idle position tends to rotate the disc 85 in a clockwise direction, which rotation is prevented by engagement of the handle 80 with the upper surface of the boom. When the shoe is in its raised position as indicated in Figure 6, the engagement of the handle 80 with the bar 61 may prevent further movement of the shoe. The bar 61 extends a substantial distance to either side of the clamping members 70 and 75. As herebefore described, the clamping member 70 is raised by rocking one end of the bar upward. The set screw 81 which is provided with a pivotal seat on the boom for this rocking movement is located at the other end of the bar, and, being vertically adjustable relative to the bar 61, permits such end of the bar to be raised or lowered a sufficient distance to insure the desired clamping action and to compensate for wear.

The crumbing shoe 40 may be swung into place by the power applied through the medium of the excavating wheel. To this end the shoe 40 is provided with a pair of spaced brackets 90 which are interconnected at their outer ends by a cross bar 91. When it is desired to utilize power to raise the shoe, the lever 80 may be moved from the position shown in Figure 4 to that shown in Figure 6, and a chain or cable placed around the bar 91 and extended to one of the excavating buckets 26 which is adjacent the top of the wheel 19, whereupon counterclockwise rotation of the wheel will result in swinging of the shoe about its pivot 41 from the full line position in Figure 1 to the dotted line position therein shown. The engagement of the brackets 90 with the bar 61 provides a stop to limit the movement of the shoe in the counterclockwise direction. Power may also be used to lower the crumbing shoe to its active position. Likewise, cross bar 91 may be used as a handle for manual operation of the shoe. The operating handle 80 may be so arranged as to provide a socket to receive a bar indicated by the dotted line 92 to extend the arm and facilitate manual operation. When the shoe is in its raised position the bar 92 may be inserted in suitable openings 93 formed in the boom brackets 42 and thereby prevent inadvertent return of the shoe to its active position.

I claim:

1. A retaining mechanism for a pivotally mounted crumbing shoe of an excavating machine having a support on which one end of the shoe is pivotally mounted to swing from a position with its other end in engagement with

the floor of a trench to be excavated to a position with such other end out of the excavated trench, said mechanism including a member pivotally seated at one end on said support, a movable cam coacting with the other end of said member to raise and lower said member, and means carried by said member intermediate its ends to engage said shoe and clamp it against said support to thereby prevent movement of said shoe.

2. In a trench excavating machine, a support, a crumbing shoe pivotally mounted at one end on said support for swinging movement from a position with its other end in engagement with the floor of a trench to be excavated and a surface thereof in engagement with the under side of said support to a position with such other end out of the excavated trench, said mechanism including a member pivotally seated at one end on said support, a disc rotatably and eccentrically mounted on the other end of said member and coacting with said support to raise and lower said member, means carried by said member intermediate its ends to engage said shoe and clamp it against the under surface of said support to thereby prevent swinging movement of said shoe, and means associated with said support to adjust the vertical position of said member.

3. A mounting for a crumbing shoe of a trench excavating machine having a boom to which one end of a crumbing shoe is pivoted to swing from a position depending into an excavated trench to a position out of the trench, said mounting including a bar mounted on and extending transverse of said boom and movable in a substantially vertical plane, means intermediate the ends of said bar to engage said shoe and clamp it against said boom, cam means associated with said boom to raise said bar into a clamping position, and manually operable means associated with said cam to operate said cam and thereby clamp said shoe in position.

4. A retaining mechanism for a pivotally mounted crumbing shoe of a trench excavating machine having a boom to which the upper end of a crumbing shoe is pivotally mounted for swinging movement from a position below the boom to a position above the boom, said mechanism including a bar fulcrumed on and extending transverse of the boom, and movable in a substantially vertical plane, means intermediate the ends of said bar to engage the shoe and clamp it against the boom when the bar is in its uppermost position and to release said shoe when the bar is in its lower position, said bar having a pivotal connection at one end with the boom, a cam disc rotatably and eccentrically mounted on the other end of said bar and coacting with said boom, and manually operable means coacting with said disc to rotate said disc and thereby clamp said shoe in position.

5. A retaining mechanism for a crumbing shoe of a trench excavating machine having a substantially horizontally extending boom comprising a pair of horizontally spaced elongated parallel frame members connected at their outer ends by a cross frame member to which one end of an elongated crumbing shoe is pivotally mounted to swing in a plane parallel with the frame members from a position with its other end below the boom and extending into the excavated trench to a position with its other end out of the trench and above the boom, said mechanism including a pair of surfaces carried by the shoe

and which coact respectively with the outer and under surface of the cross frame member of the boom when the shoe is in its depending position, a vertically extending guideway on the boom frame members, a bar mounted in said guideway, manually operable means coacting with said boom to raise and lower said bar, a plate secured to and depending from said bar, a latch member carried by said plate and having an upwardly facing surface inclining downwardly and inwardly toward said plate, and a coacting latch member carried by the shoe and having a downwardly facing surface complementary to said upwardly facing surface.

6. A mounting for a crumbing shoe of a trench excavating machine having a substantially horizontally extending boom comprising a pair of horizontally spaced elongated parallel frame members connected at their outer ends by a cross frame member to which one end of an elongated crumbing shoe is pivotally mounted to swing in a plane parallel with said frame members from a position with its other end extending into the excavated trench to a position outwardly and upwardly above said boom, said shoe having a pair of surfaces which abut respectively the outer and under surface of said cross frame member when the shoe extends into the excavated trench, a vertically extending guideway on boom frame members, a bar mounted in said guideway, said bar being pivotally seated at one end on one of the frame members and extending across the boom to the other frame member, a disc rotatably and eccentrically mounted on said bar and coacting with said other frame member to control the position of said bar, a plate secured to and depending from said bar intermediate its ends parallel with and adjacent to the inner surface of said cross frame member, a latch carried by said plate below said frame member and projecting toward said shoe, said latch having an upwardly facing surface inclining downwardly and inwardly toward said plate, a coacting latch member carried by said shoe and projecting toward said plate intermediate said boom and said first named latch and having a downwardly facing surface complementary to the upwardly facing surface of said first named latch, and means carried by said cross frame member and coacting with said plate to restrain the movement of said plate to movement in a vertical plane.

7. A retaining mechanism for a crumbing shoe of a trench excavating machine having a boom to which one end of the shoe is pivotally mounted to swing from a position with its other end in engagement with the floor of a trench being excavated to a position with such other end out of the excavated trench, said mechanism comprising a member mounted for vertical movement on the boom, manually operable means coacting with said boom to raise and lower said member, means carried by said member to engage said shoe and clamp it against the boom to thereby prevent movement of the shoe, said last named means having a clamping surface positioned below the pivoted connection between the shoe and the boom, said surface inclining upwardly toward such pivoted connection, and a complementary inclined surface fixed relative to the shoe to coact with the first named inclined surface.

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