Oct. 31, 1950 C. R. VAN ALLEN 2,528,193

AUTOMATIC DISK BLADE GRINDER

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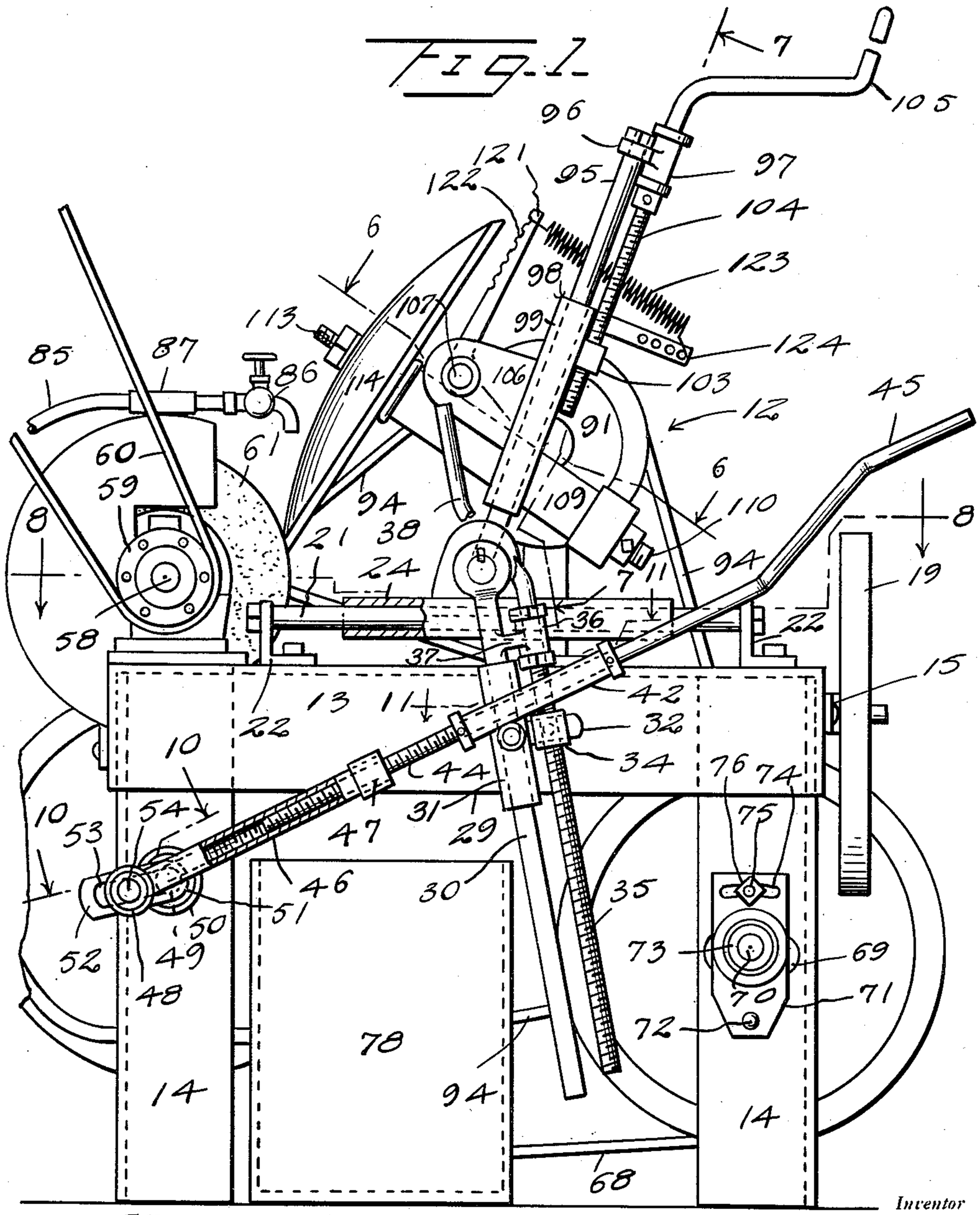
Fig. 1.



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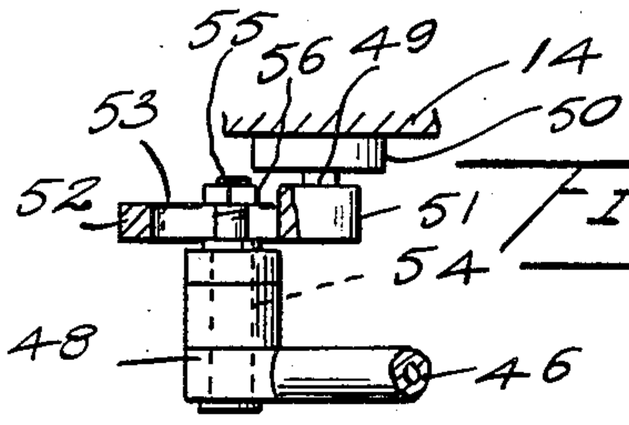

Fig. 10.

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Fig. 1.

Fig. 2.

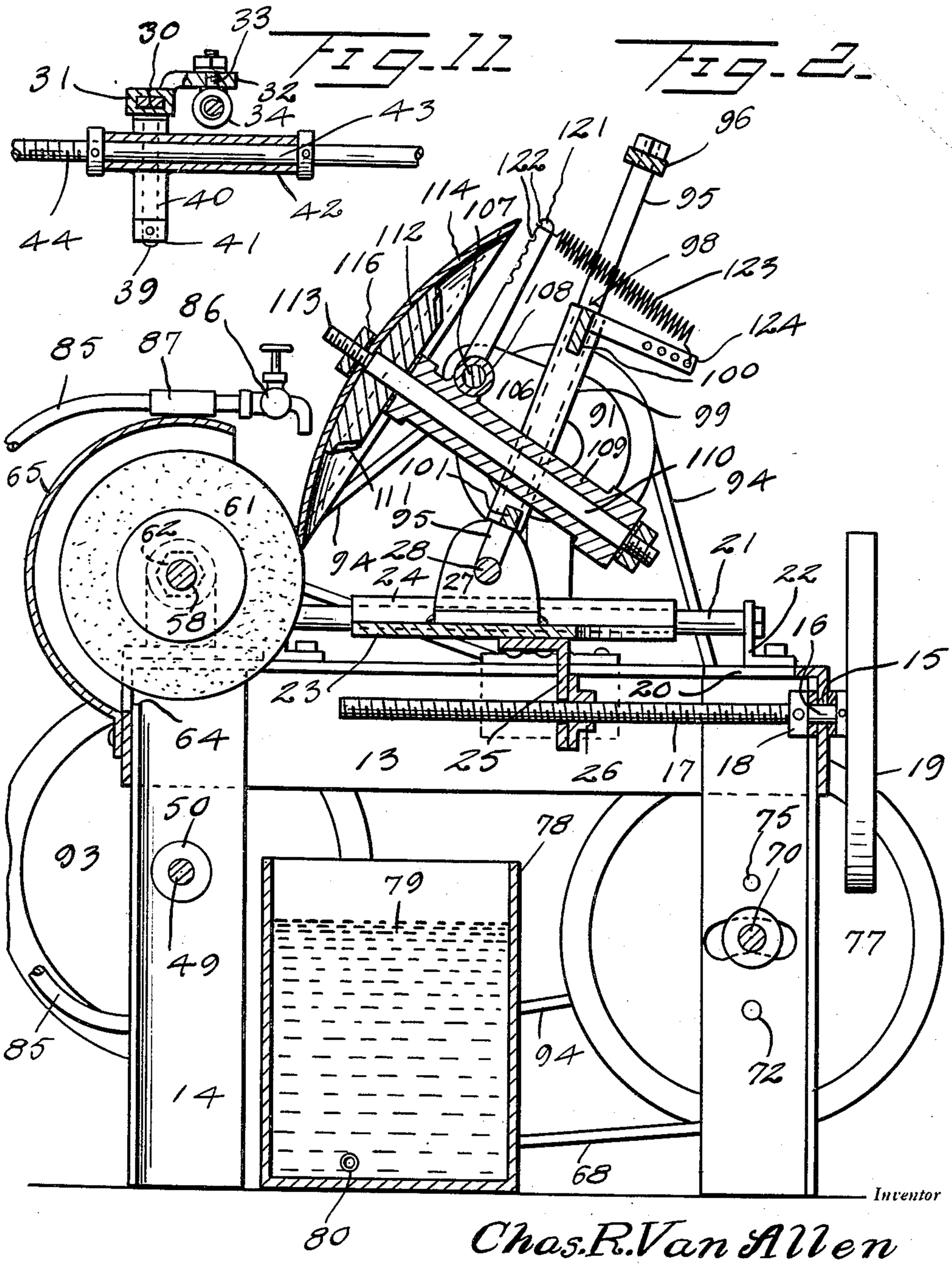

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FIG. 4

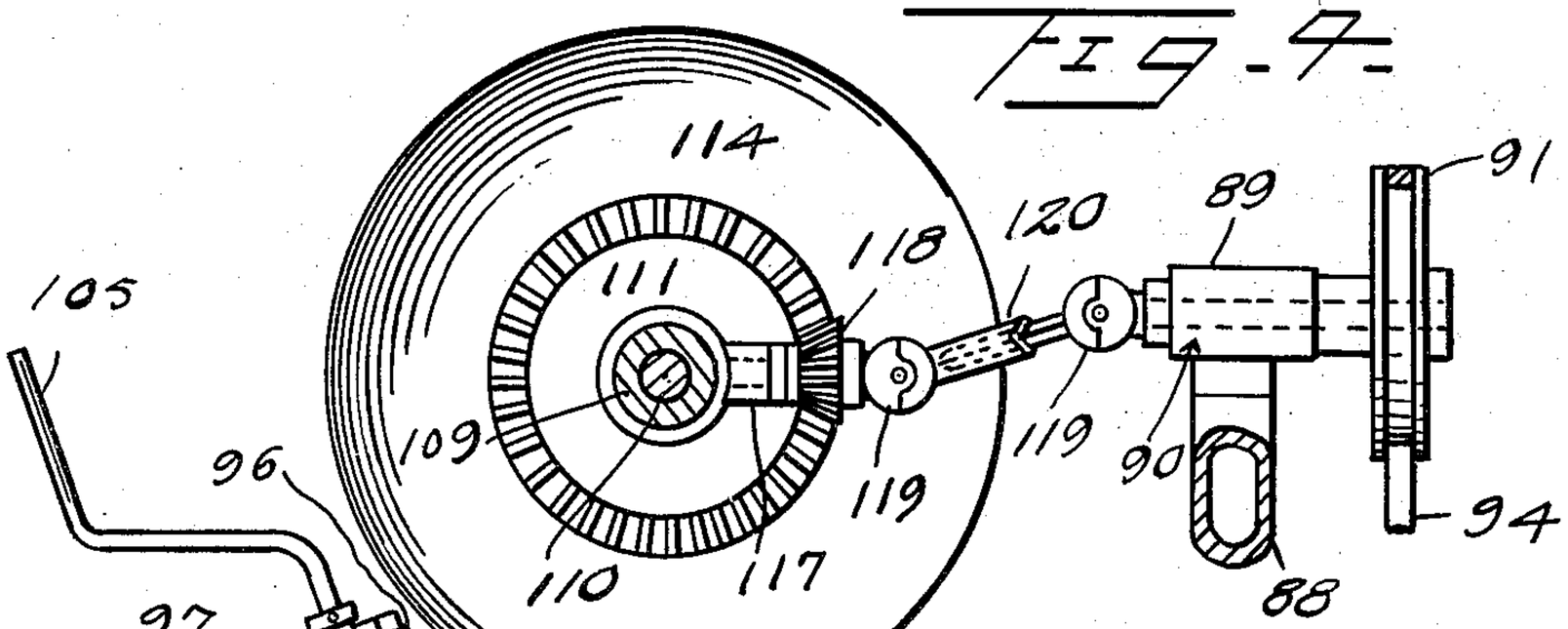

FIG. 3

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FIG. 7.

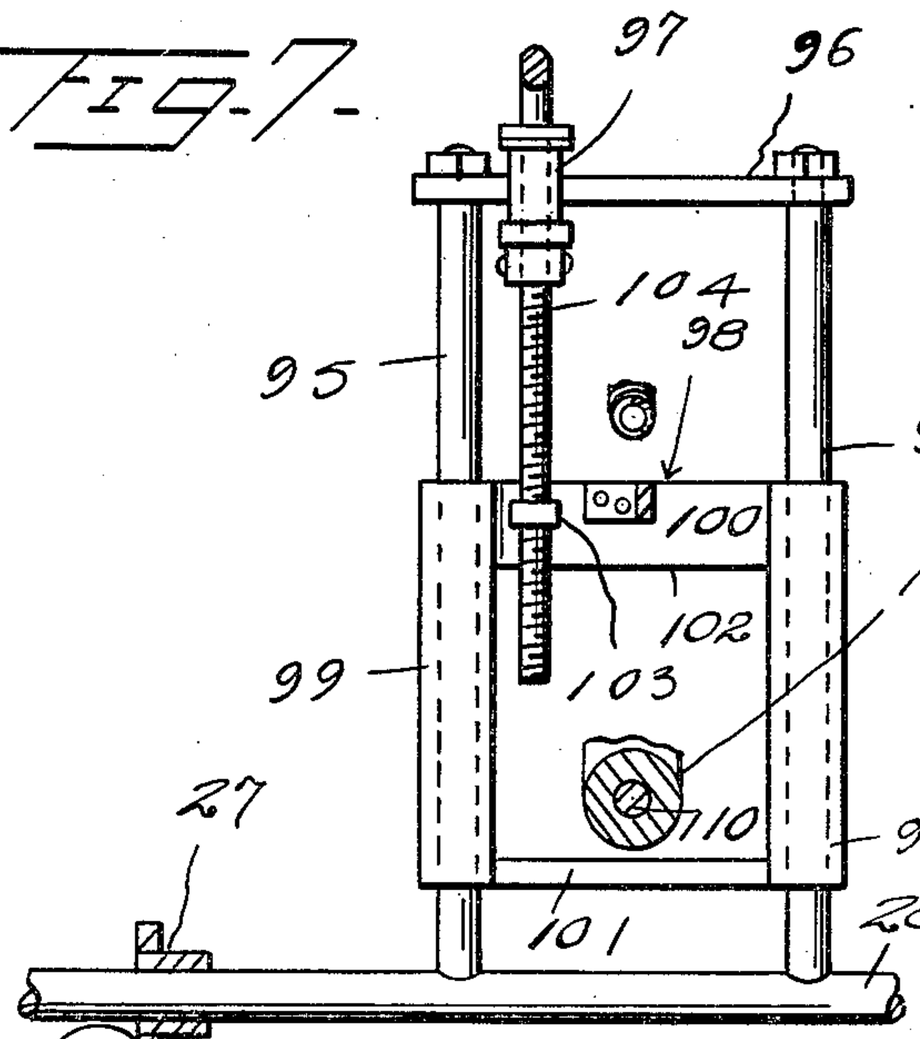

FIG. 9.

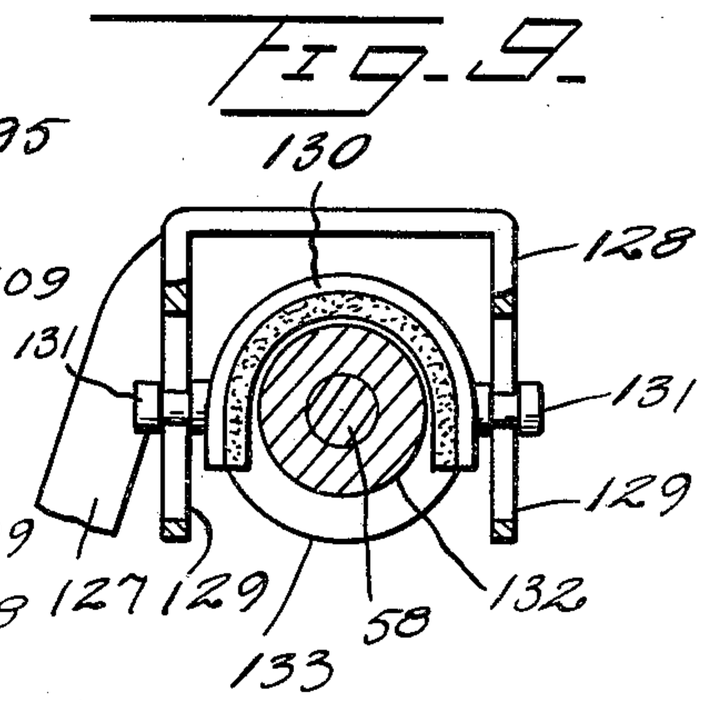

FIG. 8.

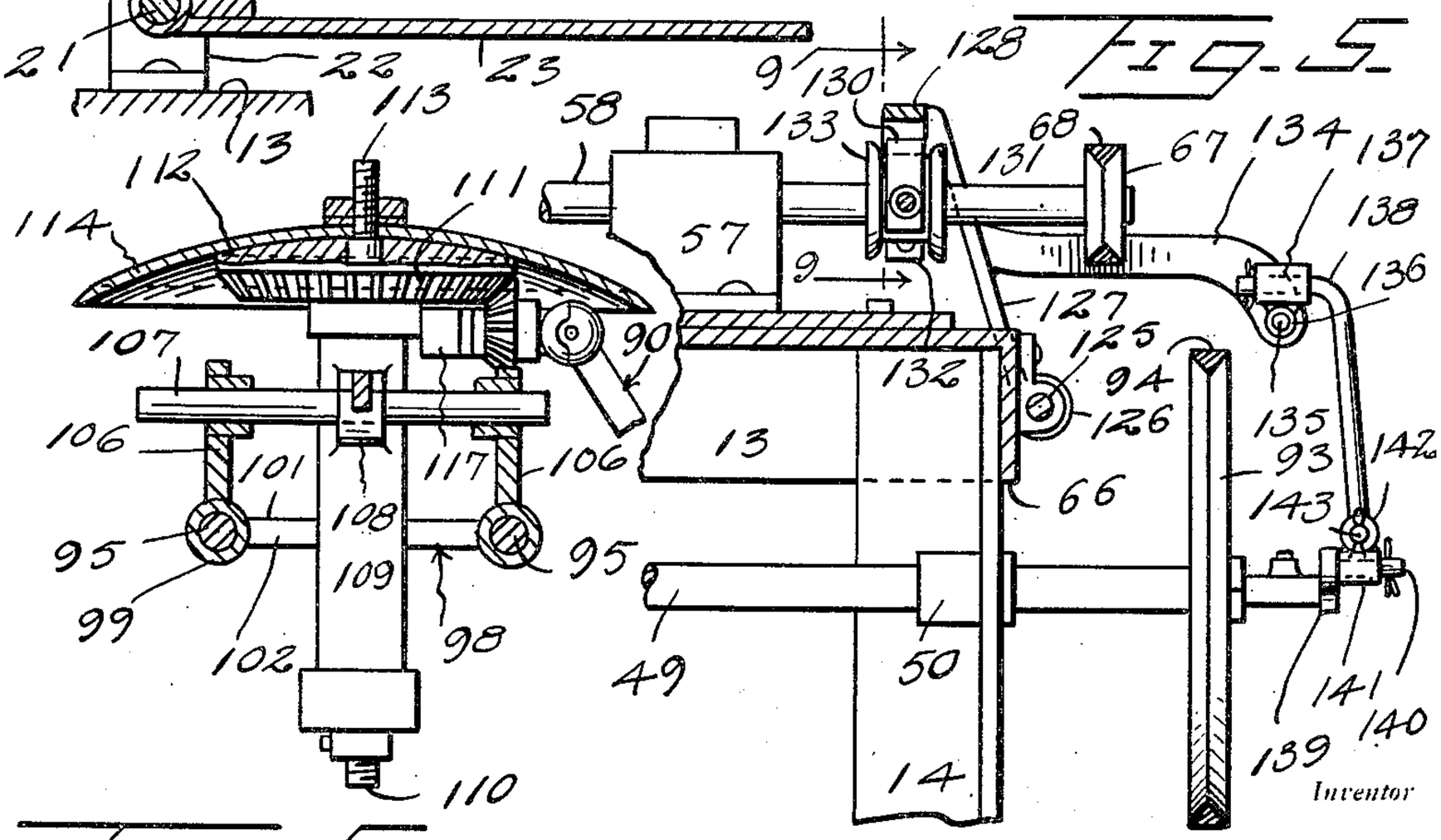

FIG. 6.

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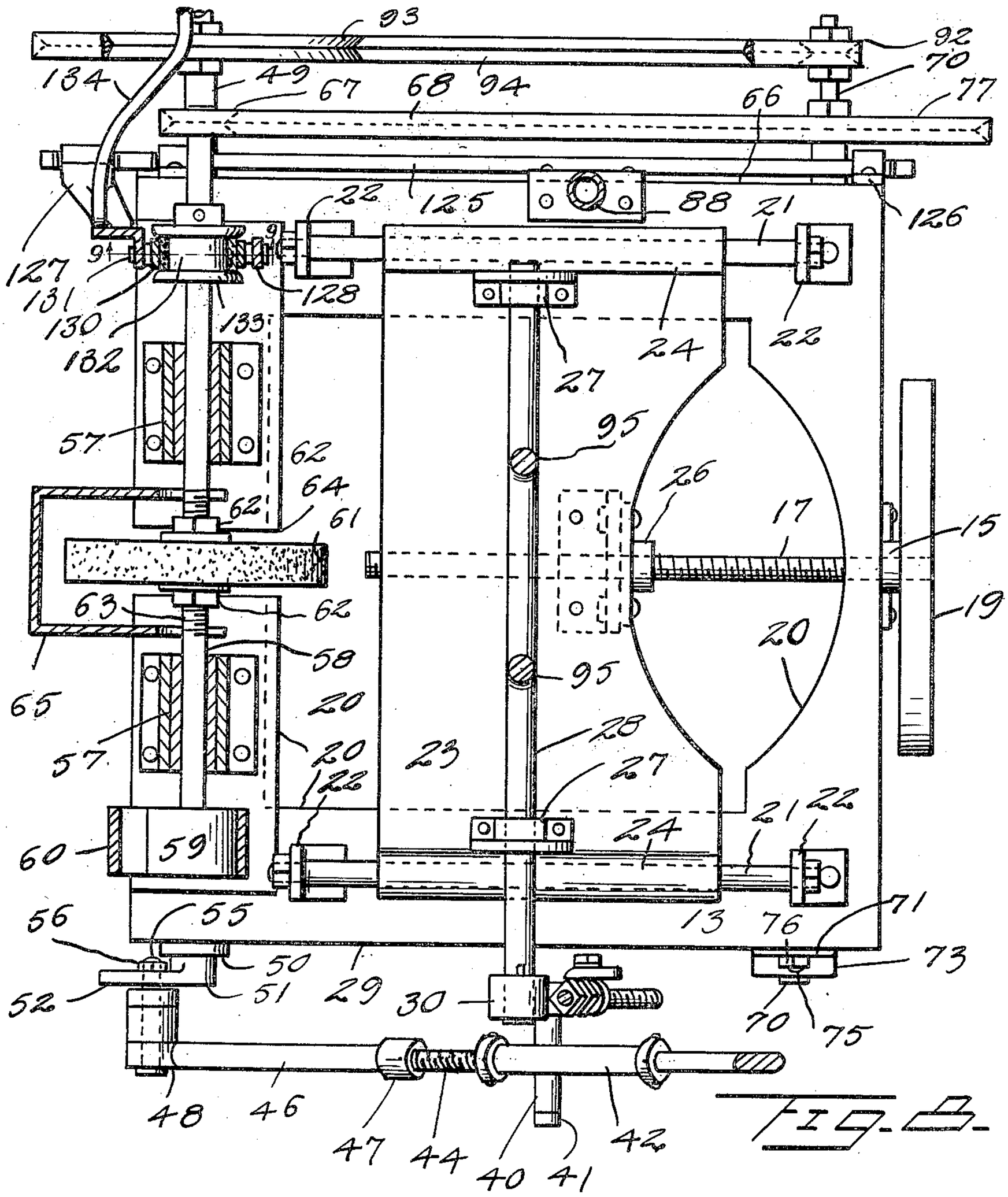

FIG. 8.

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UNITED STATES PATENT OFFICE

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AUTOMATIC DISK BLADE GRINDER

Charles R. Van Allen, Williston, N. Dak.

Application November 15, 1946, Serial No. 710,050

7 Claims. (Cl. 51—51)

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This invention relates to a machine for grinding disk-type blades of plows or similar implements and has particular reference to a machine which is capable of being adjusted and thereafter power-operated for grinding the edge of a disk-type blade to a predetermined bevel and throughout the entire circumference of the blade.

More particularly, it is an object of the invention to provide a machine having a driven grinding element and a driven detachable mounting means for a disk-type blade whereby a blade may be supported on the mounting means and revolve as the edge thereof is ground.

Still a further object of the invention is to provide yieldable means for urging the edge portion of the blade into engagement with the grinding element and stop means for limiting the extent to which the edges of blades can be ground, and for insuring a uniform grinding of all portions of the circular edge of the blade.

Still a further object of the invention is to provide manually actuated adjustable means for adjustably disposing the blade supporting structure with respect to the grinding element for varying the depth and angle of the grinding operation.

Still another object of the invention is to provide means, actuated by the driving means of the grinding element for laterally displacing said grinding element, during the operation thereof, for insuring uniform wear on the grinding element and a resulting uniform engagement with the work.

Still another object of the invention is to provide means actuated by the driving means of the grinding element for supplying a liquid under pressure to be discharged onto the surface of the work and at the point thereof engaged by the grinding element.

Various other objects and advantages of the invention will hereinafter become more fully apparent from the following description of the drawings, illustrating a preferred embodiment thereof, and wherein:

Figure 1 is a side elevational view of the disk-blade grinding machine;

Figure 2 is a longitudinal substantially central sectional view thereof;

Fig. 3 is a side elevational view on a reduced scale from the opposite side thereof to the side as illustrated in Figure 1;

Figure 4 is an enlarged transverse sectional view through a portion of the blade supporting structure and showing the power take-off means for revolving a portion of said structure;

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Figure 5 is a transverse vertical sectional view taken substantialy along a plane as indicated by the line 5—5 of Figure 3;

Figure 6 is a sectional view taken substantially along a plane as indicated by the line 6—6 of Figure 1;

Figure 7 is a transverse vertical sectional view taken substantially along a plane as indicated by the line 7—7 of Figure 1;

Figure 8 is a horizontal sectional view taken substantially along a plane as indicated by the line 8—8 of Figure 1;

Figure 9 is an enlarged cross sectional view taken substantially along the plane as indicated by the line 9—9 of Figure 8, and

Figures 10 and 11 are sectional views taken substantially along planes as indicated by the lines 10—10 and 11—11, respectively, of Figure 1.

Referring more specifically to the drawings, the improved grinding machine in its entirety is designated generally 12 and includes a substantially horizontally disposed supporting frame or table 13 which is supported in an elevated position with respect to any suitable supporting surface by means of depending supporting legs 14 which are secured to and depend from the four corners of the table or frame 13.

The table or frame 13 is provided with depending sides or flanges in one of which is formed a bearing or journal 15, as seen in Figures 2 and 8, for receiving and journaling an unthreaded portion 16 of a feed screw 17 which is disposed beneath the table top and which extends longitudinally thereof. The unthreaded portion 16 is retained in the bearing or journal 15 by means of collars 18 which are fixed to the feed screw 17 and on opposite sides of the bearing 15. The feed screw 17 has one end projecting outwardly from the bearing 15 and to which a hand wheel 19 is keyed. As best illustrated in Figure 8, the top portion of the table or frame 13 is provided with a relatively large central opening 20, beneath which the feed screw 17 is disposed.

A pair of longitudinally disposed guide rods 21 are supported above the top surface of the table 13 and adjacent its side edges and longitudinally thereof by upstanding supporting brackets 22 which are fixed to the table 13 and in which the ends of the rods 21 are secured. The rods 21 are disposed substantially parallel to one another and to the feed screw 17, as seen in Figure 8.

As best seen in Figures 7 and 8, a platform 23 is supported above the table 13 and transversely thereof by means of the rods 21; said platform being provided with sleeves 24 at the ends thereof

which slidably engage the rods 21 for supporting the platform transversely of and across the opening 20 and for movement in a direction longitudinally of said opening and of the table 13. As best seen in Figure 2, the platform 23 is provided with a depending bracket 25 for supporting an internally threaded sleeve 26 through which the feed screw 17 extends and in which said feed screw is threadedly engaged whereby the platform 23 will be moved lengthwise of the table 13 when the hand wheel 19 is revolved.

The platform 23 is provided with a pair of longitudinally spaced and aligned upstanding bearings 27 in which a shaft 28 is journaled. One end of the shaft 28 extends beyond the side edge 29 of the table 13 and has a lever 30 keyed to the terminal thereof and depending from the shaft 28 beyond said side edge 29, as best seen in Figure 1. As best seen in Figures 1 and 11, a sleeve 31 is slidably keyed to the lever 30 and is provided with a laterally projecting arm 32 for journaling a pin 33 which extends therethrough and which projects laterally from an internally threaded sleeve 34 which is thus supported through the arm 32 and pin 33 for swiveling movement with respect to the sleeve 31. The internally threaded sleeve 34 is adapted to threadedly engage a feed screw 35 which is disposed substantially parallel to the lever 30 and which has an unthreaded upper portion which is journaled in a bearing 36. The bearing 36 is formed integral with an arm 37 which is in turn formed integral with the upper part of the lever 30. The feed screw 35 has a portion which extends to above the bearing 36 and which terminates in an off-set terminal forming a crank 38. As best seen in Figure 11, a pin 39 projects laterally and in a direction outwardly from the sleeve 31 to provide a journal for a sleeve 40 which is detachably retained on the pin 39 by a collar 41. A sleeve 42 is secured to or formed integral with the sleeve 40 and disposed at substantially a right angle thereto and provides a journal for an unthreaded portion 43 of a screw 44, the threaded end of which projects from the sleeve or bearing 42 in a direction away from the hand wheel 19. The screw 44 is provided with an opposite, unthreaded end which projects toward the hand wheel 19 and from the opposite end of the bearing 42 and which terminates in a laterally off-set terminal forming a crank 45. The threaded end of the screw 44 engages an internally threaded sleeve 46 which extends therefrom and which is adjustable with respect thereto through the turning of the crank 45. A locknut 47 is preferably carried by the screw 44 for bearing against an end of the sleeve 46 to retain the sleeve and screw in adjusted positions. The opposite, free end of the sleeve 46 terminates in a bearing 48 which is disposed substantially at a right angle to the axis of the sleeve 46, as best seen in Figure 1.

A shaft 49 is journaled in bearings 50 formed in the laterally aligned legs 14 which are disposed remote to the hand wheel 19. The shaft 49 is disposed beneath the table 13 and the ends thereof protrude outwardly from said legs 14 and the bearings 50 thereof. As best seen in Figures 1 and 10, the end of the shaft 49 which projects from the side 29 of the frame or table 13 has a crank 51 keyed thereto and which is provided with a laterally projecting arm 52 having a longitudinally disposed slot 53. A stub shaft 54 is journaled in the bearing 48 and is provided with an inwardly extending, restricted

and threaded extension 55 which extends loosely through the slot 53 and which is longitudinally adjustable therein. The protruding end of the threaded shank 55 carries a nut 56 which is adapted to be tightened for clamping the shaft 54 in a plurality of longitudinally adjusted positions relatively to the arm 52 for varying the throw or stroke of the sleeve 46 and screw 44 when the crank 51 is revolved with the shaft 49.

The table or frame 13, at the end thereof remote to the hand wheel 19, is provided with a pair of transversely aligned upstanding bearings 57 in which a shaft 58 is journaled. The shaft 58 is disposed substantially directly above and parallel to the shaft 49 and has a belt pulley 59 keyed to one end thereof and disposed above the table 13 and adjacent its side edge 29. A belt 60 is trained over the pulley 59 for driving the shaft 58 from any suitable source of power, not shown. A grinding wheel 61, such as an emery wheel, is detachably and adjustably keyed to the intermediate portion of the shaft 58 by lock nuts 62 which engage a threaded intermediate portion 63 of the shaft 58. A horizontal and vertical flange of a portion of the frame or table 13 are recessed at 64 to accommodate the grinding wheel 61 and an arcuate hood or shield 65 is secured to the frame 13 and disposed over the outer portion of the emery wheel 61. The emery wheel 61 is disposed on the shaft 58 and between its bearings or journals 57 and substantially intermediate of the side edges of the table 13 and substantially in alignment with the longitudinal axis of the feed screw 17, as clearly illustrated in Figure 8.

As best seen in Figures 3, 5 and 8, the opposite end of the shaft 58 projects beyond the opposite side edge 66 of the table 13 and has a belt pulley 67 keyed to said protruding end and provided with a V-shaped groove over which is trained a V-shaped belt 68.

As best seen in Figures 1 and 2, the legs 14, located adjacent the hand wheel 19, are provided with laterally aligned arcuate slots 69 through which a shaft 70 loosely extends. A plate 71 is pivotally connected at its lower end at 72 to each of the legs 14 beneath said slots 69 and said plates 71 each carry a bearing 73 which registers with the associated slot 69 and in which bearings said shaft 70 is journaled. The upper portion of each plate 71 is provided with transversely disposed arcuate slot 74 for loosely receiving a bolt 75 which projects from the leg 14 thereof. A nut 76 engages each bolt 75 and is adapted to be tightened for clamping the plate 71 against the leg 14 to provide means for adjustably positioning the shaft 70 relatively to said legs 14 and whereby said shaft may be moved toward and away from the shaft 58.

A relatively large tensioning and idler belt pulley 77 is keyed to the shaft 70 and outwardly of the side 66 of the frame 13. A vat or container for water or other liquid is disposed on the supporting surface of the grinder 12 and beneath the frame 13. Said vat or container 78 contains a liquid 79, as seen in Figure 2, and is provided adjacent its bottom with an outlet 80 to which a pump 81 is connected. The pump 81 is disposed on the outer side of the vat 78 and adjacent the side 66 of the frame 13 and includes a pump shaft 82 which projects outwardly therefrom and to which a belt pulley 83 is keyed. The inlet of the pump 81 is connected to the outlet 80 of the container 78 and said pump has an upwardly extending and upwardly opening outlet 84 which is

connected to one end of a conduit 85. The opposite end of the conduit 85 terminates in a valved outlet 86 which may assume the form of a conventional water faucet and the bib of which is disposed to open downwardly and over the inner portion of the emery wheel 61, for a purpose hereinafter to be described. The conduit 85 extends over the upper part of the shield 65 and is secured thereto and supported thereby through a sleeve 87 which engages around a portion of the conduit 85 and which is fixed to the shield 65.

The belt 68 is trained over the idler pulley 77 and the pump pulley 83 for driving said pulleys from the shaft 58 through the belt pulley 67, so that when the emery wheel 61 is revolved by the shaft 58 the liquid 79 from the container 73 will be supplied under pressure by the pump 81 to be discharged, as controlled by the faucet 86 onto the inner portion of the emery wheel 61.

A standard 88 is secured to and extends upwardly from the frame 13 at its side 66 and is provided with a transversely disposed bearing 89 at its upper end, as best seen in Figures 3 and 4. A shaft, designated generally 90 has a portion journaled in the bearing 89 and a belt pulley 91 is keyed to the outer end of the shaft 90, outwardly of the bearing 89 and the frame side 66. A small belt pulley 92 is keyed to the shaft 70, outwardly of the pulley 77 and a relatively large belt pulley 93 is keyed to the opposite end of the shaft 49 and outwardly of the frame side 66. A belt 94 is trained over the pulleys 91, 92 and 93, whereby said pulleys 91 and 93 will be driven by the pulley 92 from the belt 68, through pulley 77 and shaft 70, so that pulleys 92, 93 and 91 and the shafts 49 and 90 are driven from the shaft 58.

It will be readily obvious that the plates 71 may be adjusted relatively to their supporting legs 14 for moving the shaft 70 and the belt pulleys 77 and 92 toward or away from the other pulleys, previously described and located beyond the frame side 66, for decreasing or increasing the tension on the belts 68 and 94.

The shaft 28, intermediate of the bearings 27, is provided with a pair of longitudinally spaced upstanding rods or shafts 95 which are disposed substantially at right angles to the shaft 28 and which are connected at their upper ends by a crosshead 96 which is provided with a transversely disposed bearing 97, disposed substantially parallel to the rod 95. An open frame, designated generally 98 is provided with parallel sleeve portions 99 at the sides thereof and which slidably engage the rods 95; said sleeves 99 being connected adjacent their upper ends by a crossbar 100 and adjacent their lower ends by a crossbar 101.

The sleeves 99 and bars 100 and 101 combine to form the open frame 98 and to define the opening 102 thereof. An internally threaded sleeve 103 is carried by the upper bar 100 for threadedly engaging a feed screw 104 which has an upper unthreaded portion journaled in the bearing 97 and a laterally offset portion disposed thereabove and forming a crank 105, as seen in Figure 1. The frame 98 is provided with bearing members 106 which project outwardly from the sleeves 99, on the opposite side of the frame 98 to the sleeve 103 and in a direction toward the emery wheel 61 and away from the hand wheel 19. A shaft 107 is journaled in the aligned bearings 106 and substantially parallel to the plane of the frame 98 and is keyed or rotatably connected to a collar 108 which extends upwardly from an elongated sleeve bearing 109. The sleeve bearing 109 is thus

pivotally mounted relatively to the frame 98 and extends through the opening 102 thereof and is provided with a shaft 110 which is journaled in the bearing 109. A bevel gear 111 is keyed to the shaft 110 and disposed at the end of the bearing 109 which is adjacent to the emery wheel 61. The bevel gear 111 is provided with an outer convex surface 112 from which projects a threaded extension 113 of the shaft 110. The surface 112 is adapted to form a clamping surface for receiving the concave side of a conventional disk-type plow blade 114, a portion of which is adapted to fit flush against the surface 112 and to be clamped thereto. The threaded extension 113 extends through the conventional central opening 115 of the blade 114 and the exposed end thereof is adapted to receive one or a plurality of lock nuts 116 for clamping and keying the blade 114 to the bevel gear 111.

The sleeve bearing 109 is provided with a bearing 117 which projects laterally therefrom, adjacent the gear 111 and which forms a journal for the opposite end of the shaft 90. The shaft 90, adjacent the bearing 117, is provided with a small bevel gear 118 which meshes with and drives with the bevel gear 111 for revolving the disk-blade 114 from the shaft 58 through the drive connection, previously described. The shaft 90, between the bevel gear 118 and the bearing 89 is provided with spaced universal joints 119 and includes an extensible section 120, formed of telescoping sections, which is interposed between the universal joints 119.

An arm 121 is rigidly fixed to and extends upwardly from the collar 108 and is adapted to be selectively connected by means of notches 122 therein to one end of a contractile coil spring 123, the opposite end of which is selectively anchored in longitudinally spaced openings of an arm 124 which extends from the upper crossbar 100 in a direction away from the arm 121. It will be readily obvious that the spring 123 will tend to rock the bearing 109 and the disk-blade 114, carried thereby, in a clockwise direction, as seen in Figures 1 and 2 and relatively to the frame 98 for swinging the lower portion of the blade 114 toward a portion of the periphery of the grinding wheel 61. The lower bar 101 functions as a stop to be engaged by the bearing sleeve 109 for limiting its clockwise swinging movement. The universal joints 119 and the extensible shaft section 120 accommodate the swinging movement of the end of the shaft 90 which is journaled in the bearing 117 relatively to the opposite end of said shaft, which is journaled in the bearing 89.

As best seen in Figures 3, 5, 8 and 9, a shaft 125 is journaled in bearings 126 longitudinally of the frame 13 and outwardly of its side 66 and an arm 127 is keyed to one end of the shaft 125 beyond an end of the frame 13 and adjacent to the shaft 58. The arm 127 extends upwardly and is provided at its upper free end with a downwardly opening inverted U-shaped portion 128 having corresponding depending legs provided with longitudinal slots 129. A yoke 130 is disposed within the member 128 and is provided with outwardly projecting trunnions 131 which slidably engage the slots 129 for loosely supporting the yoke 130 in the bifurcated member 128. A collar 132 is keyed to the shaft 58 and is provided with spaced flanges 133 between which the yoke 130 is disposed.

An arm 134 projects laterally from the arm 127, adjacent the free end of the latter, said arm 134 extending outwardly to beyond the belt pul-

ley 93 and having a laterally projecting pin 135 which projects laterally from its free end and on which a sleeve 136 is journaled, as seen in Figure 5. A bearing 137 is fixedly mounted on the sleeve 136 transversely thereof and journals one end of a shaft 138, the opposite end of which shaft depends downwardly on the outer side of the belt pulley 93. As seen in Figure 3, a crank 139 is keyed to the outer end of the shaft 49 and outwardly of the pulley 93 and is provided with a crank pin 140 on which a sleeve or bearing 141 is journaled. A sleeve or bearing 142 is secured to the bearing 141 transversely thereof and provides a journal for the laterally turned depending end 143 of the shaft 138. It will thus be readily apparent that as the shaft 49 is revolved through its connection with the shaft 58, as previously described, the crank 139 will reciprocate the shaft 138 to oscillate the arms 134 and 127 to thereby oscillate the yoke 130 in a direction substantially longitudinally of the shaft 58 so that said yoke through engagement with the flanges 133 of the collar 132 will cause a slight reciprocating motion of the shaft 58 in the bearings 57 for reciprocating the emery wheel 61 slightly relatively to the disk-blade 114 and while said emery wheel is being revolved. The slidable connection of the trunnions 131 with the slots 129 permits the yoke 130 to remain in proper engagement with the collar 132 during the oscillating movement of the arm 127 relatively to the reciprocating movement of the shaft 58.

From the foregoing, it will be readily apparent how the disk-blade 114 can be mounted on and keyed to the bevel gear surface 112. As the diameters of such plow blades 114 vary in size, after the blade 114 is mounted, as previously described, the hand wheel 19 is revolved so that the feed screw 17 will move the platform 23, supported by the rods 21, either toward or away from the emery wheel 61. The crank 105 is revolved for rotating the feed screw 104 to raise or lower the frame 98 so that the combined movements of the platform 23 and frame 98 will substantially correctly adjust the blade 114 relatively to the emery wheel 61.

The crank 45 is revolved to vary the length of the screw 44 and sleeve 46 for rocking the shaft 28 in the bearings 27 for varying the angle of the frame 98 and bearing 109 relatively to the periphery of the emery wheel 61 to thereby angularly adjust the edge of the blade 114 relatively to the periphery of the emery wheel 61 so that the outer, convex side of the edge of the blade will be sharpened to any desired angle or bevel by engagement with the revolving emery wheel 61. The shaft 28 will also be rocked by the rotation of the crank 52 through the reciprocation of the connecting rod 44, 46 by which the lever 30 will be oscillated for rocking the blade 114 into and out of engagement with the emery wheel 61. The length of the stroke of the connecting rod 44, 46 can be varied by adjusting the pin 55 in the slot 53 and the length of the throw of the lever 30 can likewise be varied by turning the feed screw 35 through the crank 33 for moving the sleeve 31 upwardly on the lever 30 to reduce the throw of said lever, or downwardly thereon to increase the throw of said lever. Further, the blade 114 is pivotally mounted relatively to the frame 98 through the pivotal support of the bearing 109 on the bearing ears 106 and is spring urged by the contractile spring 123 to yieldably retain the edge thereof in engagement with the periphery of the emery wheel

and so that the blade 114 will engage the emery wheel with the proper amount of pressure applied thereto.

It will thus be seen that as the emery wheel 61 is revolved, as previously described, that the outer side of the edge of the blade 114 will be rocked into and out of engagement with the emery wheel to be sharpened to the correct bevel thereby and at the same time, the blade 114 will be slowly revolved in the manner as previously described so that all portions of the circular edge of the blade 114 will be sharpened uniformly and to the same bevel. The operation of the parts as previously described, will also cause operation of the pump 81 to furnish a water pressure in the conduit 85 so that the water can be discharged therefrom through the faucet 86 and controlled by the valve thereof, and said water will be discharged onto the emery wheel and blade at the point of engagement of said parts and substantially directly over the open top of the container 78. When the edge of the blade has been sharpened to the required bevel, the bearing 109 will abut against the lower frame bar 101 and said bar will form a stop to limit further rocking movement of the blade 114 in response to the biasing action of the spring 123 to prevent the blade from being sharpened excessively and to insure sharpening to the proper, predetermined bevel.

Likewise, during the sharpening operation the shaft 58 will be reciprocated slightly in its bearings 57 through the yoke 130 and collar 132, as previously described, to insure a uniform wearing off of the periphery of the emery wheel 61 and consequently a uniform sharpening operation of the blade 114.

As seen in Figure 3, the pulley 92 will be revolved at the same speed as the pulley 77 and consequently and because of the small diameter of the pulley 92 relatively to the pulley 77, the belt 94 will be driven at a much slower rate than the belt 68 and will turn the larger pulleys 91 and 93 at a very slow rate of speed so that the rocking movement of the blade 114, produced by the crank 52 and the rotation of said blade, through the rotation of the shaft 90, will be at a very slow rate of speed as compared with the speed at which the emery wheel shaft 58 will be revolved, and likewise, the reciprocation of the shaft 58 through the actuation of the crank 139 will also be at a greatly reduced rate of speed.

Various modifications and changes are contemplated and may obviously be resorted to, without departing from the spirit and scope of the invention as hereinafter defined by the appended claims.

I claim:

1. A sharpening machine comprising a machine support, a driven shaft journaled thereon, a sharpening wheel keyed to said shaft, a work holder adapted to support an article to be sharpened by the sharpening wheel, said work holder including a primary and a secondary section, a platform slidably supported on the machine support for movement toward and away from the sharpening wheel, said primary section being pivotally mounted on the platform, said secondary section being pivotally mounted on the primary section and having means for supporting said article, means for moving the platform toward and away from the sharpening wheel, means for angularly adjusting the work holder as a unit relatively to the sharpening wheel for swinging said article toward and away from the sharpen-

ing wheel, means for angularly adjusting the secondary work holder section relatively to said primary section for angularly adjusting the article relatively to the sharpening wheel, means driven by said shaft for rocking the work holder for moving said article into and out of engagement with the sharpening wheel as the latter is revolved, and means driven in unison with said driven shaft for revolving a portion of the work holder including said article as the sharpening wheel is revolved.

2. A sharpening machine for disk-type blades comprising, a support, a driven shaft journaled on the support, a sharpening wheel keyed to the shaft, a platform, guides for slidably supporting the platform on the support for movement toward and away from the sharpening wheel, a pair of arms pivotally mounted on and rising from the platform, a frame supported on the arms for swinging movement therewith toward and away from the sharpening wheel, a sleeve supported in the frame and having one end extending therefrom toward the sharpening wheel, a disk-blade supporting member journaled in the sleeve and adapted to support a disk-blade thereon for engagement with the sharpening wheel, driving means connecting the supporting member and driven shaft for revolving the blade, and a crank and linkage means connecting the driven shaft to said arms for rocking the disk blade toward and away from the sharpening wheel as the wheel is revolved.

3. A sharpening machine as in claim 2, the linkage of said crank and linkage means being formed of longitudinally adjustable sections for swinging the blade toward or away from the sharpening wheel and to angularly adjust it relatively thereto.

4. A sharpening machine as in claim 2, said sleeve being pivotally mounted intermediate of its ends on the frame, and spring means connected to the sleeve and frame for yieldably urging the sleeve to rock relatively to the frame in a direction to move a portion of the disk blade into engagement with the sharpening wheel.

5. A sharpening machine as in claim 2, the linkage of said crank and linkage means being formed of longitudinally adjustable sections for

swinging the blade toward or away from the sharpening wheel and to angularly adjust it relatively thereto, said sleeve being pivotally mounted intermediate of its ends on the frame, and spring means connected to the sleeve and frame for yieldably urging the sleeve to rock relatively to the frame in a direction to move a portion of the disk blade into engagement with the sharpening wheel.

6. A sharpening machine as in claim 2, a first feed screw means for moving the platform toward and away from the sharpening wheel, and a second feed screw means for moving the frame toward and away from the platform.

7. A sharpening machine as in claim 2, the linkage of said crank and linkage means being formed of longitudinally adjustable sections for swinging the blade toward or away from the sharpening wheel and to angularly adjust it relatively thereto, a first feed screw means for moving the platform toward and away from the sharpening wheel, and a second feed screw means for moving the frame toward and away from the platform.

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