The invention relates to lapping machines, and more particularly to a lapping wheel truing apparatus for simultaneously truing the opposed faces of a pair of lapping elements.

One object of the invention is to provide a simple and thoroughly practical lapping machine. A further object of the invention is to provide an improved truing apparatus for truing the plane surface on a lapping wheel. Another object of the invention is to provide an improved lapping wheel truing apparatus whereby the opposed faces of a pair of lapping wheels may be simultaneously trued. A further object of the invention is to provide an improved hydraulically controlled lapping wheel truing apparatus. A further object of the invention is to provide an improved adjusting device for relatively adjusting the position of the truing tools. Other objects will be in part obvious or in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts, as will be exemplified in the structure to be hereinafter described, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings in which is shown one of various possible embodiments of the mechanical features of the invention,

Fig. 1 is a side elevation of the improved lapping machine, having parts broken away to more clearly show the construction;

Fig. 2 is a fragmentary cross sectional view taken approximately on the line 2—2 of Fig. 1, showing a plan view of the lapping wheel truing apparatus;

Fig. 3 is a fragmentary plan view of the truing tool supporting arm having parts broken away and shown in section to more clearly show the adjusting mechanism;

Fig. 4 is a fragmentary side elevation of the parts shown in Fig. 3;

Fig. 5 is a fragmentary vertical section through the hydraulic cylinder for actuating the truing tool;

Fig. 6 is a fragmentary sectional view taken approximately on the line 6—6 of Fig. 5, showing the cylinder and speed adjusting valves;

Fig. 7 is a fragmentary sectional view taken approximately on the line 7—7 of Fig. 5;

Fig. 8 is a fragmentary elevation, on an enlarged scale, of the adjustable bracket support for the truing apparatus;

Fig. 9 is a fragmentary sectional view, on an enlarged scale, taken approximately on the line 9—9 of Fig. 8, through one of the adjusting screws for the truing apparatus bracket, showing the threaded bushing and its actuator in elevation; and

Fig. 10 is a fragmentary section similar to Fig. 9, but showing the threaded bushing and its actuator in section.

Referring more particularly to the embodiment illustrated, the lapping machine may be constructed in its general aspects similar to the lapping machine illustrated in my prior U. S. Patent No. 2,103,984 dated December 28, 1937. This machine, as illustrated, may comprise a base 10 which rotatably supports a lower lapping wheel 11. The base 10 is provided with an upwardly extending column 12 having an outwardly extending horizontal portion 13 which rotatably supports a vertical spindle 14. The spindle 14 carries a rotatable lapping wheel 15 which is connected to its lower end by means of a supporting plate 16.

Power may be obtained from any suitable source, such as an overhead drive shaft or an electric motor mounted on the machine. A belt drive has been shown comprising a driving belt 20 which serves to rotate a pulley 21. The inner portion of the pulley 21 is formed as one part of a cone clutch. A slidable mounted cone clutch member 22 serves to mate with the clutch face within the pulley 21 to transmit a rotary motion to a rotatably mounted drive shaft 23 which is journaled in suitable bearings 24, 25, 26 and 27 in the base 10. The clutch member 22 is slidable keyed to the shaft 23. When the clutch member 22 is in the full line position (Fig. 1), no power is transmitted to the shaft 23. When it is desired to rotate the shaft 23, the cone clutch member 22 is moved in the direction of the pulley 21 so as to cause rotation of the shaft 23.

The clutch may be readily actuated from an operating position adjacent to the front of the machine, a pivotedly mounted control lever 28 is supported on a stud 29 on the base 10 of the machine. The lower end of the lever 28 is connected by a stud 30 with a link 31. The link 31 is in turn connected by a stud 32 with the forward end of a slidable mounted rod 33. The rod 33 is slidable journaled in bearings 34 and 35 which are fixedly mounted on the base 10. The rod 30 supports a vertically extending arm 36 which is yoke-shaped at its upper end and engages a groove 37 formed in a hub which is integral with the clutch member 22. By movement of the control lever 28 in a counterclock-
wise direction (Fig. 1), the clutch member 22 may be thrown into engagement with the clutch member formed within the pulley 21 to cause rotation of the shaft 22. An arrow point 26 projecting from the yoked portion of the arm 25 cooperates with a spring-pressed plunger 33 to maintain the clutch member 22 either into or out of engagement with the clutch member formed within the pulley 21. Similarly, when the lever 28 is moved in a clockwise direction into the position illustrated in Fig. 1, the clutch member 22 is disengaged, thus stopping the rotation of the shaft 23 so as to stop not only the rotation of the lower lapping wheel 14 and the upper lapping wheel 16 but also the work supporting cage.

The shaft 23 is provided with a worm 40 which meshes with a worm gear 41 mounted on the lower end of a vertical rotatably mounted shaft 42. The shaft 42 is connected by means of a universal joint 43 to the lower end of a shaft 44. The shaft 44 is preferably a telescopic shaft and is connected at its upper end by a universal joint 45 with the lower end of a rotatable shaft 46 which is rotatably supported in suitable bearings (not shown) in a bracket 48 which is firmly fastened to top of the column 12. The shaft 48 is provided with a multiple V-groove pulley 50 which is connected by a multiple V-belt 51 with a multiple V-groove pulley 52 which is fixedly mounted on a rotatable sleeve (not shown). The rotatable sleeve 53 is slidably keyed to an upwardly extending projection of the spindle 14 so that when the clutch 22 is engaged, the vertical spindle 14 supporting the upper lap will be rotated.

The sleeve above mentioned is provided with a rack 56 which meshes with a gear 55 mounted on a rotatable shaft 17 by means of which the upper lapping wheel 16 may be raised and lowered to the desired extent. In the preferred construction, a hydraulically operated mechanism is provided comprising a pair of diametrically opposed, hydraulically operated cylinders 58 (only one of which has been shown in Fig. 1). This mechanism is not considered to be a part of the present invention and since this part of the machine is identical with that shown in my prior U. S. Patent No. 2,103,984 and any reference may be had to the patent for details of disclosure not contained herein.

In order that the laps 11 and 15 may be maintained with their operative faces in a predeter-
mined lapping condition, a suitable truing apparatus is essential to permit a truing of the operative faces of the laps when desired and necessary. In the embodiment of the invention illustrated, a pivotedly mounted truing apparatus is provided in which a truing tool is mounted on a rock arm which is arranged to be swung through an arcuate path across the operative face or faces of the lap. As illustrated in the drawings, this mechanism comprises a vertically mounted rotatable shaft 58 which is supported in bearings 81 and 82 which are formed integrally with the column 12. The bracket 83 is adjustably fixed to the side face of the column 12 by means of three adjusting screw devices 64, 65 and 66, which are identical in construction, are provided for aligning the bracket 83 relative to the side face of the column 12.

The bracket 83 is also supported by a stud 87 which is fixed to the column 12 and which passes through an aperture in the bracket 83. The adjusting screw devices 64, 65 and 66 are provided with a slight amount of clearance to facilitate adjustment of the bracket 83 about the axis of the stud as a pivot. A pair of bosses 88 and 89 are fixedly mounted on the column of the machine. A pair of adjusting screws 70 and 71 extend through screw threaded apertures in the bosses 88 and 89, respectively, and bear against portions of the bracket 83. By means of the adjusting screw devices 64, 65 and 66, together with the adjusting screws 70 and 71, the bracket 83 may be accurately and precisely adjusted so that the axis of the shaft 60 may be adjusted in all directions relative to the axis of the lapping supporting spindles 14.

The adjusting devices 64, 65 and 66 are identical in construction, consequently only one of these devices has been shown in detail in Figs. 9 and 10. The screw 66 passes through a central aperture in a sleeve 72 and is screw threaded to the column 12. A clearance aperture is provided in the sleeve 72 to facilitate lateral adjustment of the bracket 83. The sleeve 72 is provided with a screw thread 73 on its outer periphery which meshes with or mates with a correspondingly shaped screw threaded aperture within a bushing 74. The bushing 74 slides on an aperture 75 formed in the bracket 83. The bushing 74 is provided with an integral flange 76 at its lower end which fits within a recess 77 formed in the under surface of the bracket 83. The upper end of the sleeve 74 is provided with clutch teeth 78 which are arranged to mate with clutch teeth 79 formed in the lower end of a rotatable sleeve 80. The sleeve 80 surrounds the bolt or screw 66 and is provided with an outwardly extending integral flange 81 which is provided with a plurality of radially extending holes 82 about its periphery.

When it is desired to adjust the position of the bracket 83 to align the axis of the shaft 60 relative to the axes of the lapping wheels 11 and 15, the screws 64, 65 and 66 are loosened and a spanner wrench is inserted in one of the holes 82 in the flange 81. The bushing 80 is then rotated to transmit a rotary motion through the clutch teeth 78—79 to rotate the threaded sleeve 72 and thereby adjust the position of the bushing 74 so as to adjust the position of the bracket 83 as desired. When the desired adjustment has been accomplished, the screw 66 is then tightened to lock the bracket 83 in a fixed position relative to the column 12 and the base 10.

Each of the screw adjusting devices 64, 65 and 66 is provided with corresponding adjustments and each is provided with flanged bushings 81, 83 and 84, respectively, which are arranged to be engaged by spanner wrenches in the manner above described to adjust the position of the bracket 83 at three symmetrically arranged points. It will be readily apparent from the foregoing disclosure that by loosening any one of the screws 64, 65 and 66 and adjusting the flanges 81, 83 and 84 of the bushings 80, the position of the bracket 83 may be readily adjusted relative to the column 12 so as to position the axis of the shaft 60 in the desired relationship with the axis of the rotatable lapping wheels 11 and 15.

A swinging arm 65 is provided with an enlarged end portion 86 having an aperture which trips the shaft 60. One side of the enlarged end 86 of the arm 65 is provided with a slot 87 which allows the end portion 86 to expand and con-
tract so that it may be readily clamped in position on the shaft 60 by means of clamping screws 88 and 89. It will be readily apparent from the foregoing disclosure that by means of the clamping screws 88 and 89, the arm 85 may be adjusted angularly relative to the shaft 60 and may also be adjusted in a vertical direction to position the arm in the desired and predetermined position. The end of the arm 85 is provided with a pair of opposed aligned diamonds or truing tools 89 and 91, respectively, which are arranged simultaneously to true the opposed operative faces of the lapping wheels 11 and 15, respectively. It is desirable to provide means for readily adjusting the position of the diamonds relative to the swinging arm. The outer end of the swinging arm 85 is provided with a pair of pivotally mounted arms 92 and 93, respectively, which are rotatably supported by a sleeve 94 (Fig. 3). A binder screw 95 passes through a central aperture within the sleeve 94 and carries at one end a plate 96 which is held against rotation by means of a pin 97 which is fixedly supported by the arm 92. A collar 98 is mounted at the other end of the screw 95. This collar is secured to a barboreed portion of the arm 93 and a manually operable binder or nut 99 is provided whereby the stud 95 may clump the collars 96 and 98 and the arms 92 and 93 in rigidly adjusted position on the swinging supporting arm 85.

To facilitate adjustment of the arms 92 and 93 to position the truing tools 90 and 91, respectively, as desired, the arm 85 is provided with an outwardly extending member 100 which serves as a support for a pivotally mounted stud 101. The arm 85 also supports a stud 102 which is arranged parallel to the stud 101. An adjusting screw 103 is provided with a right and hand screw threaded portion projecting in opposite directions from the right and left-hand threaded portions of the screw 103 are threaded into correspondingly threaded apertures in the studs 101 and 102, respectively, so that by rotation of the screw 103 when the nut 99 is released the arm 85 may be adjusted relative to the swinging arm 85 to facilitate adjustment of the position of the diamond or truing tool 91.

Similarly, a stud 104 is also supported by the extending portion 100 of the arm 85. A stud 105 is carried by the arm 92 and an adjusting screw 106 having oppositely extending right and left-hand screw threaded portions is screwed through into the studs 104 and 105, respectively. Adjustment of the screw 106 when the nut 99 is loosened facilitates an adjustment of the arm 92 to position the diamond or truing tool 90 as desired. After the truing tools or diamonds 90 and 91 have been adjusted to the desired extent, the binder nut 99 is tightened to lock the truing tools in adjusted position.

The diamonds or truing tools 90 and 91 are supported, respectively, by nips 110 and 111 which fit within apertures formed within the arms 92 and 93, respectively. Seats screws 112 and 113 are provided on the arms 92 and 93, respectively, to lock the nips 110 and 111, respectively, in fixed positions relative to the arms 92 and 93. As illustrated in the drawings, the diamond or truing tools 90 and 91 are arranged in substantial alignment with each other and project vertically above and below the truing tool arm assembly so that they will simultaneously engage and true the opposed faces of the lapping wheels 11 and 15, respectively.

A suitable power operated mechanism is provided for oscillating the arm 85 to traverse the truing tools 90 and 91 simultaneously across the opposed faces of the lapping wheels 11 and 15 at a slow uniform rate to true the operative faces thereof to maintain the desired lapping surfaces. In the preferred construction, a hydraulically actuated mechanism is provided to swing the arm 85 through an arcuate path. A fluid pressure cylinder 120 is pivotally mounted on stud 121 which is supported by a bracket 122 which is in turn fixedly mounted on the column 12. A piston 123 is slidably mounted within the cylinder 120 and is connected by means of a piston rod 124 with a stud 125. The stud 125 is supported at one end of a rock arm 126, the other end of which is fixedly supported on the upper end of the rotatable shaft 60. It will be readily apparent from the foregoing disclosure that when fluid is admitted to the cylinder 120, causing the piston 123 to move therein, the motion will be transmitted through the connecting rod 124 and stud 125 and the rock arm 126, which serves to rock the vertical shaft 60 and thereby to swing the arm 85 and the truing tools 90 and 91 across the operative faces of the rotatable lapping wheels 11 and 15, respectively.

A fluid pressure system is provided to supply fluid pressure to operate the piston 123. This system comprises a reservoir 130 formed within the base 10 of the machine. A motor driven pump 131 drives fluid from the reservoir 130 through a pipe 132 and forces fluid under pressure through a pipe 133 to a control valve 134 which will be hereinafter described. A fluid pressure relief valve 135 is connected in the pipe line 133 to return excess fluid under pressure through an exhaust pipe 136 to the reservoir 130.

The control valve 134 is preferably a rotary type valve which is formed integral with the cylinder 120. The cylinder 120 is provided with an upwardly extending hollow boss 140 having a cap 141 fixedly mounted thereto. The valve 134 comprises a valve chamber 142 formed in the boss 140. A valve rotor 143 is rotatably mounted within the chamber 142 and is held in its uppermost position by means of a ball 144 and a spring 145 (Fig. 5) to maintain the valve rotor 143 in operative contact with the under surface of the cap 141. A manually operable lever 146 is provided to operate the valve rotor 143 to reverse the direction of flow of fluid to the cylinder 120 so as to control the oscillatory movement of the truing tools. The control lever 146 is fixedly mounted on the upper end of a bushing 147, the lower reduced end portion of which is rotatably supported within a central aperture in the cap 141. A strip of flat stock 148 is located at its upper end in a slot formed in a cover plate 149. The lower end of the strip 147 engages a slot formed in the upper surface of the valve rotor 143. When the valve 134 is moved, the flat strip 148 will transmit a rotary motion to the valve rotor 143.

In the position of the valve shown in the drawings, fluid under pressure from the pump 131 passes through the pipe 132 into the valve chamber 142 and passes upwardly through a passage or hole 150 formed in the valve rotor 143 (Fig. 5) and through a U-shaped passage 151 in the cap 141 and through a passage 152 into a cylinder chamber 153 formed at the left-hand end of the
cylinder 120 (Fig. 5). Admission of fluid under pressure to the cylinder chamber 183 causes the piston 123 to move toward the right (Fig. 5), which movement serves to oscillate the arm 85 in a counterclockwise direction (Fig. 2). During the movement of the piston 123 toward the right (Fig. 5), fluid within a cylinder chamber 164 exhausts through a passage 155 through a U-shaped passage 156 in the cap 141 and passes along an arcuate groove 157 formed in the upper surface of the valve rotor 143. Fluid passing through the arcuate groove 157 may pass through a U-shaped passage 158 formed in the cap 141 and through a passage 159 through a needle type valve 160 which in the present case is formed as a cylindrical end portion having an angular slabbled-off end face to provide a precise adjustment of the exhaust aperture. Fluid passing through the valve 160 enters a chamber 161 and from there passes out through a pipe 162 which exhausts into the reservoir 130. The valve 160 comprises a valve stem 163, a portion of which is screw threaded into the side portion of the housing. A knurled knob 164 is adjustably mounted on the outer end of the stem 163 and is normally held in a locked position by means of a second knurled nut 165. The needle valve 160 serves to control the rate of exhaust of fluid from the cylinder chamber 164, thus controlling the relative rate of oscillation or traverse of the truning tools supporting 65 arm 85 as it moves the diamond or truning tools 80 and 81 across the faces of the lapping wheels. When the valve rotor 143 is rotated in a clockwise direction (Fig. 7) to reverse the direction of flow of fluid within the system, a vertically extending aperture or hole 170 in the valve rotor 143 swings in a counterclockwise direction into alignment with the U-shaped passage 156 so that fluid under pressure in the valve chamber 142 passes upwardly through the passage 156, through the U-shaped passage 156, through the passage 155, into the cylinder chamber 154, to move the piston 123 toward the left (Fig. 5). During this shifting movement of the valve rotor 143, the needle valve 160 moves out of contact with the U-shaped passage 156, thus cutting off the flow of fluid to the exhaust from that side of the system. At the same time the valve rotor 143 is moved in a counterclockwise direction, the vertical passage or hole 156 in the valve rotor 143 moves out of alignment with the U-shaped passage 156 and an arcuate groove 171 formed in the upper surface of the valve rotor 143 moves into position so that one end connects with the U-shaped passage 156 and the other end connects with a U-shaped passage 151 so that as the piston 123 moves toward the left (Fig. 5), fluid within the cylinder chamber 153 exhausts through the passage 152, through the U-shaped passage 151, through the arcuate groove 171, and through the U-shaped passage 172 and through a passage 173 which connects with an adjustable needle valve 174. This needle valve 174 is substantially the same in construction as the valve 160 and comprises a valve stem 175 which is screw threaded into a part fixed to the valve casing. The outer end of the stem 175 supports a knurled actuating knob 176 which is arranged to be locked in an adjusted position on the stem 175 by means of a knurled locking nut 177. By adjusting the position of the slabbled-off end of the valve 174, the rate of exhaust of fluid from the chamber 153 into the valve chamber 161 may be varied as desired to control the rate of movement of the piston 123 toward the right (Fig. 5).

It will be readily apparent from the foregoing disclosure that the needle valves 160 and 174 serve independently to adjust the rate of movement of the piston 123 as it moves toward the right and left, respectively, to oscillate the truning tools 80 and 81 across the operative faces of the lapping wheels 11 and 15. By providing an independent adjustment of the movement of the truning tools in the opposite direction, compensation may be made for the differential in piston area on opposite sides of the piston 123 so that the rate of movement in either direction may be equal or uniform or, if desired, the rate of movement may be adjusted so that the truning tools travel at one rate when the arm 85 is oscillated in one direction and at a different rate when the arm is oscillated in the opposite direction. It will be readily apparent from the foregoing disclosure that each operative stroke of the truning tools may be independently adjusted so as to produce any desired and predetermined result.

In order to facilitate adjustment of the needle valves 160 and 174, adjustable stop devices are provided for accurately positioning the valves when desired. As illustrated in Fig. 6, the knurled adjustable stop device 180 is provided with a stop pin 182 which is arranged in the path of a stop lug 181. The stop lug 181 is supported on a pivotedly mounted member 182 which is supported by a stud 183 carried by a bracket 184 which is fixedly connected to the valve casing or boss 185. It will be readily apparent from the foregoing disclosure that the valve stem 175 may be rotated by the knurled knob 176 until the stop pin 180 engages the stop lug 181, thus providing a rapid adjustment of the valve 176 to a predetermined operative position to produce the desired traversing speed of the diamond or truning tool in one direction. Due to the fact that the knurled knob 176 is adjustably supported on the valve stem 175, the position of the stop pin 180 may be readily varied by loosening the locking nut 177 and then repositioning the knurled knob 176 to obtain the desired precise adjustment of the valve.

The valve 180 is provided with a similar stop adjusting device comprising a stop pin 188 which is carried by an adjustable stop member 187 which is pivotally supported by a stud 188. This stud 188 is in turn supported by a bracket 189 which is fixedly supported relative to the valve casing or boss 184 and the cylinder 120. The mounting for the knurled knob 184 and its locking nut 185 is identical with the corresponding parts of the valve 174, consequently sectional details of this valve have not been shown (Fig. 6). By adjusting the position of the knurled knob 184, the location of the stop pin 185 may be adjusted relative to the stop lug 186. If it is desired to adjust the position of the valves 174 and 180 by an amount greater than one turn of the valve stem, the members 182 and 187, respectively, may be swung in a counterclockwise and clockwise direction, respectively, to move the stop lugs 181 and 186, respectively, out of the operative path of the stop pins 180 and 185 respectively, so that the knobs 176 and 184, respectively may be rotated more than one turn as desired. It will thus be seen that by manipulation of the valves 180 and 174, the speed of oscillation of the diamonds 80 and 81 may be independently and pre-
closely adjusted to the same or to a different speed as the arm 85 moves in opposite directions.

The operation of the improved lapping machine truing device will be readily apparent from the foregoing disclosure. The position of the shaft 60 is first adjusted by manipulation of the screw adjusting devices 64, 65, 66, 70 and 71 so that its axis is parallel to the axes of the lapping wheels 11 and 15. In this position of the shaft 60, the oscillatable truing arm 80 and 81 may be swung in a path normal to the axis of the lapping wheels 11 and 15. The upper lapping wheel 15 will then be moved downwardly into a truing position with an adjustable stop screw 190 which moves with the spindle 14 in engagement with a stop abutment 191 which is fixedly mounted with respect to the column 12. The diamonds or truing tools 90 and 91 are then adjusted in the manner above described to position them in relation with the operative faces of the lapping wheels. The arm 85 may then be adjusted to the desired vertical position and swung about the axis of the shaft 60 to position the truing tools adjacent to the peripheral surface of the lapping wheels, after which the clamping screws 88 and 89 may be clamped to lock the arm 85 rigidly with respect to the shaft 60. After these adjustments have been made, the truing operation may be accomplished by actuation of the valve control lever 146 which serves to control the admission to and exhaust of fluid from the cylinder chambers 153 and 154 to oscillate the arm 85 and the truing tools 90 and 91 simultaneously to true the opposed operative faces of the lapping wheels 11 and 15. By manipulation of the needle valves 150 and 174, respectively, the rate of oscillation of the truing tools and their supporting arms may be independently adjusted so that the arm travels at the same rate of speed in opposite directions or at different rates of speed as desired for the particular truing operation.

It will thus be seen that there has been provided by this invention apparatus in which the various objects hereinabove set forth together with many thoroughly practical advantages are successfully achieved. As many possible embodiments may be made of the above invention and as many changes might be made in the embodiment above set forth, it is to be understood that all matter heretofore set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. In a lapping machine having a base, a rotatable lapping wheel and a truing apparatus comprising a bracket on said base, a rocking shaft supported thereby, an oscillatable arm adjustably supported on said shaft, a truing tool adjustably supported on said arm, means to oscillate said arm to pass the truing tool across the operative face of said lapping wheel, and a plurality of screw adjusting devices forming a three-point support between the bracket and base whereby the position of said shaft may be adjusted into parallelism with the axis of said lapping wheel.

2. In a lapping machine truing apparatus having a movable member, a pair of independent, pivotally mounted truing tool supporting arms supported on said member, aligned opposed truing tools on said arms, independent screw and nut adjustments independently to adjust the position of said arms and truing tools relative to said member, and a manually operable clamping device simultaneously to clamp said arms and truing tools in adjusted position.

3. In a lapping machine truing apparatus having an oscillatable member, a pair of independent, pivotally mounted truing tool supporting arms supported on said member, aligned opposed truing tools on said arms, independent screw and nut adjustments between the ends of said arms and said member independently to adjust the position of said arms and truing tools relative to said member, and a manually operable clamping device whereby said arms and truing tools may be simultaneously clamped in adjusted position.

4. In a lapping machine truing apparatus having a movable member, a pair of independent, pivotally mounted arms, a pivot stud connecting one end of each of said arms with said member, independent adjusting devices between the other ends of said arms and said member, aligned opposed truing tools on said arms, and a manually operable clamping device associated with said pivot stud for clamping said arms and truing tools in adjusted positions.

5. In a lapping machine truing apparatus having a movable member, a pair of independent, pivotally mounted arms, a pivot stud connecting one end of each of said arms with said member, independent adjusting devices between the other ends of said arms and said member, aligned opposed truing tools on said arms, said truing tools being located on said arms between the pivot stud and said adjusting devices, and a manually operable clamping device associated with said pivot stud for clamping said arms and truing tools in adjusted positions.

HERBERT S. INDEE.