May 16, 1944. W. H. MYERS 2,349,108

CRANKSHAFT GRINDER

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Fig. 1.

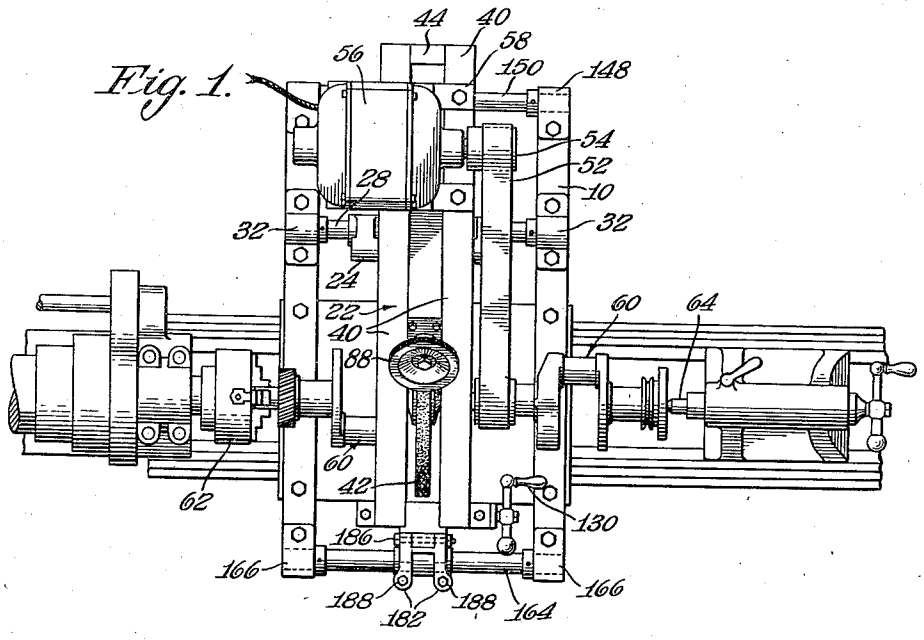
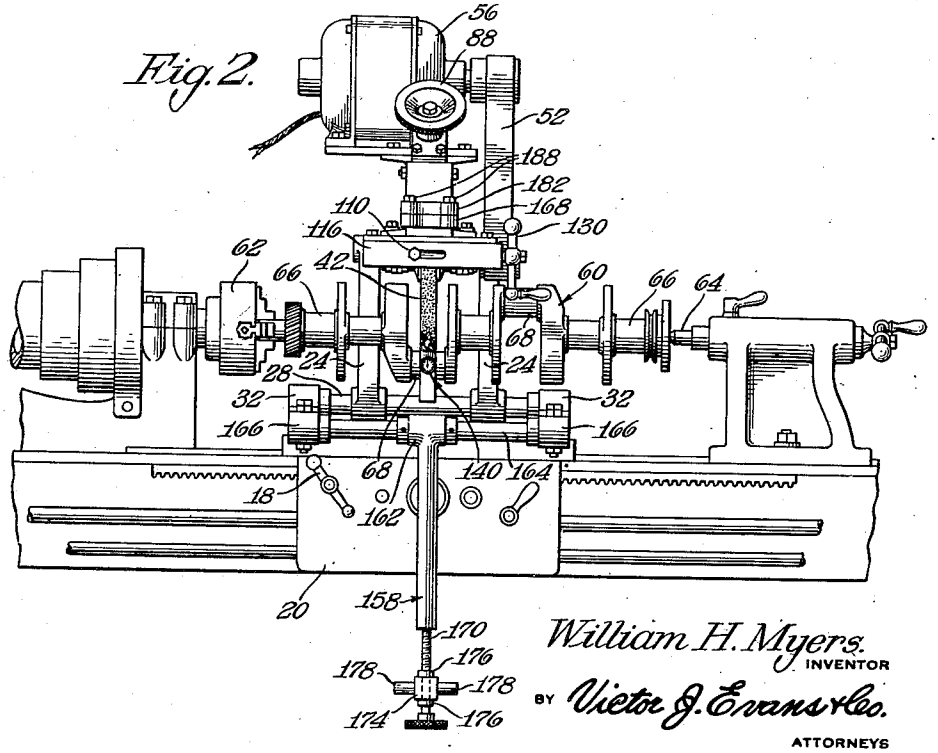


Fig. 2.



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Fig. 3.

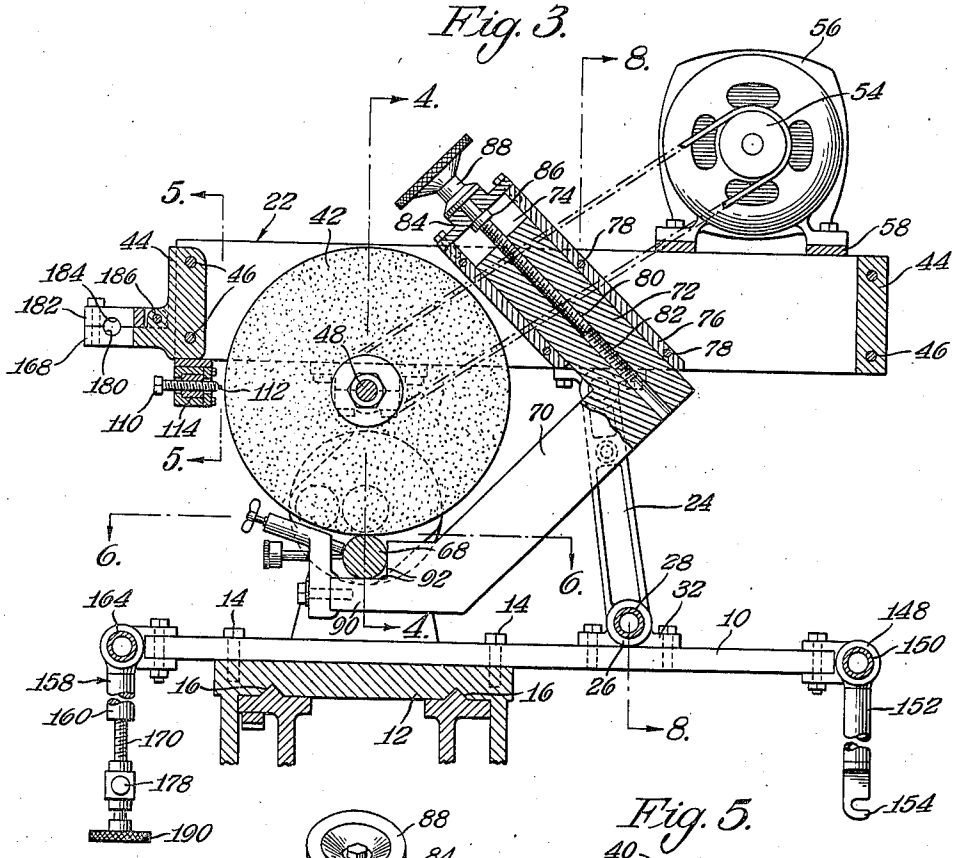


Fig. 4.

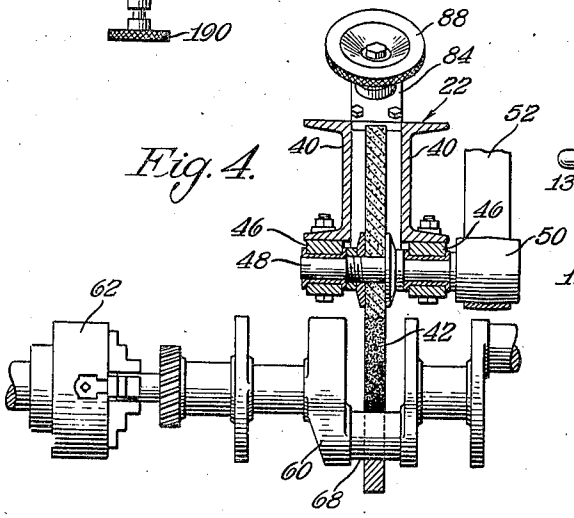


Fig. 5.

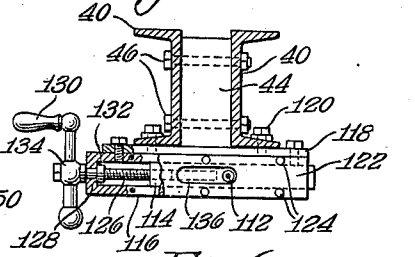
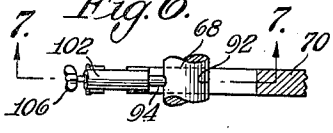


Fig. 6.



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Fig. 8.

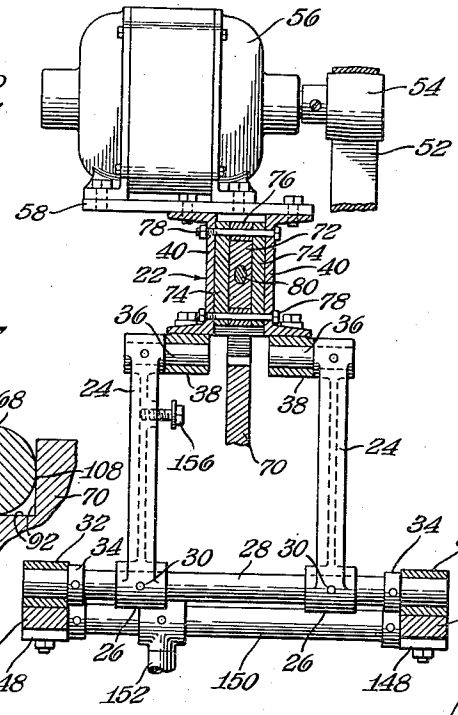


Fig. 7.

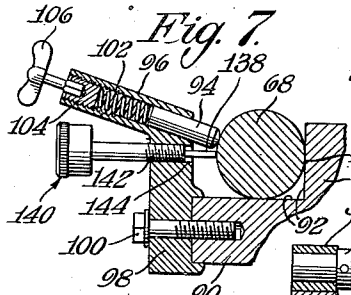
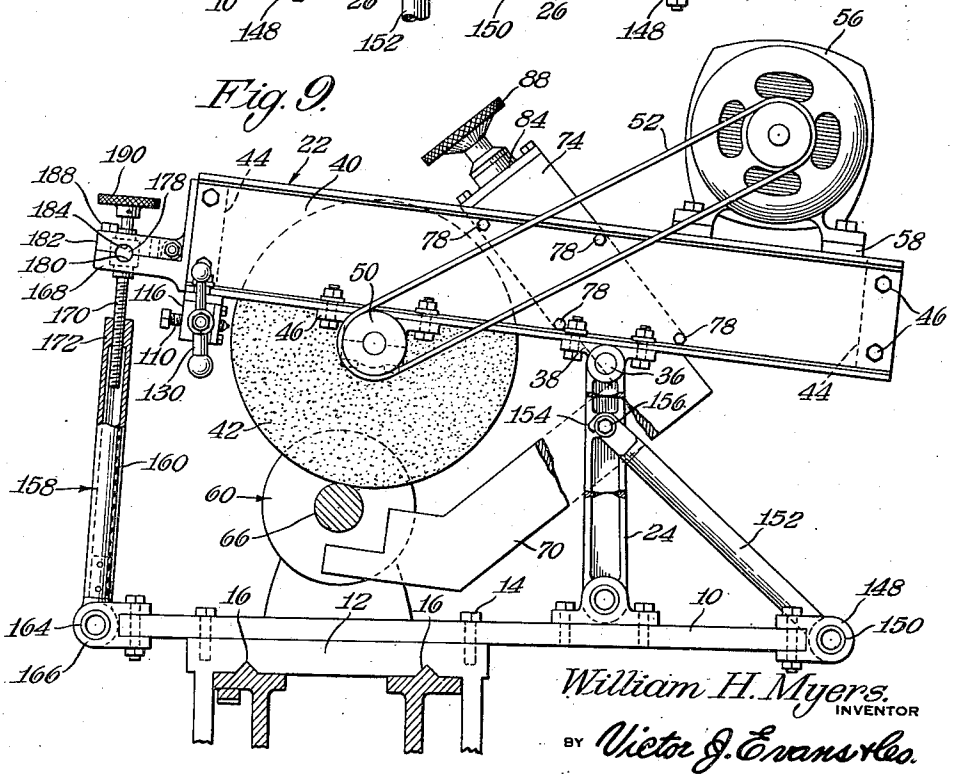


Fig. 9.



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UNITED STATES PATENT OFFICE

2,349,108

CRANKSHAFT GRINDER

William Howard Myers, Glasgow, Mont.

Application February 25, 1941, Serial No. 380,535

9 Claims. (Cl. 51—72)

This invention relates to the art of grinding and truing cylindrical surfaces, and has among its objects and advantages the provision of an improved crankshaft grinding apparatus.

In the accompanying drawings:

Figure 1 is a top plan view of the invention illustrating a crankshaft mounted in the lathe for coaction with the device;

Figure 2 is a front elevational view of the structure illustrated in Figure 1;

Figure 3 is a side elevational view with certain parts broken away for the sake of clearness;

Figure 4 is a sectional view along the line 4—4 of Figure 3;

Figure 5 is a sectional view along the line 5—5 of Figure 3;

Figure 6 is a sectional view along the line 6—6 of Figure 3;

Figure 7 is an enlarged sectional view along the line 7—7 of Figure 6;

Figure 8 is a view taken substantially along the line 8—8 of Figure 3; and

Figure 9 is a view illustrating the device in a position for grinding the main bearings of the crankshaft in contradistinction to its position in Figures 1 through 4 wherein one of the crank pins is being ground.

In the embodiment selected to illustrate the invention, two parallel members 10 are arranged transversely of the lathe carriage 12 and fixedly related thereto by bolts 14. The carriage 12 is movable on the ways 16 in the usual manner, which movement may be imparted thereto through the medium of the conventional carriage handle 18 associated with the lathe apron 20.

A beam 22 is mounted above the members 10 through the medium of links 24. In Fig. 8, the lower ends of the links 24 are provided with bored heads 26 for the reception of a shaft 28 fixedly secured thereto by set screws 30. Bearings 32 are bolted to the members 10 and rotatably support the ends of the shaft 28, the latter being provided with collars 34 engaging the respective bearings 32 to restrain the shaft from relative endwise movement. To the upper ends of the links 24 are fixedly connected pins 36 which are axially aligned in the direction of each other and mounted in bearings 38 bolted to the channels 40 of the beam 22. Thus the beam 22 is pivotally mounted to the upper ends of the links 24, and the latter may pivot at their lower ends about the axis of the shaft 28. The grinding stone or disc 42 is mounted on the beam 22.

The channels 40 are spaced apart back to back and held in such spaced relation by spacers 44 made secure by bolts 46 extending through the respective spacers and channels. To the bottom flange of each channel 40 is bolted a bearing 46, see Fig. 4, for supporting a shaft 48 to one end of which is fixedly connected a pulley 50. This pulley is driven by a belt 52 which in turn is driven by the pulley 54 operated by the motor 56 bolted to the cross members 58 bolted to the upper flanges of the channels 40.

Figs. 1 and 2 illustrate the crankshaft 60 in position in the lathe, with one end of the crankshaft supported by the driving chuck 62 and the other end supported by the dead center 64. Obviously the axis of the main bearings 66 coincides with the common axis of the chuck 62 and the dead center 64. Thus the crank pins 68 rotate about the common axis of the lathe and the crankshaft when the latter is turned by the lathe. In grinding the crank pins 68, the beam 22 is oscillated to move the grinding stone 42 in a path conforming to the movement of the crank pin being ground. In Fig. 3, an arm 70 includes a right-angular projection 72 slidably guided between walls 74 and spacers 76, with the spacers and the walls secured into a unitary structure by bolts 78. Fig. 8 illustrates the bolts 78 as passing through the channels 40, with the plates 74 fitting against the backs of the channels so that the plates, the spacers and the channels are connected as a unitary structure, with the projection 72 adapted for longitudinal adjustment. Adjustment of the projection 72 is accomplished through the medium of a screw 80 threaded into the bore 82. To the upper ends of the plates 74 is bolted a plate 84 bored to rotatably receive the unthreaded upper end of the screw 80. Relative longitudinal movement of the screw 80 is restrained by reason of a collar 86 secured to the screw and abutting one side of the plate 84 and a hand wheel 88 also fixed to the screw and abutting the opposite side of the plate. Thus rotation of the screw 80 imparts motion to the projection 72 which in turn moves the arm 70 toward and away from the beam 22.

According to Fig. 3, the arm 70 is arranged at an angle of about 45° to the beam 22, which is also true of the projection 72. Thus the arm and its projection are so fashioned as to permit the grinding wheel to take a position partly inside the angle defined by the arm and its projection, with the three parts lying in a common plane. Such an arrangement permits the parts to be closely nested and conveniently arranged on a beam of relatively short dimension. The lower end of the arm 70 is fashioned with a short ex-

tent 90 which parallels the beam 22 and is notched to provide crank pin supporting surfaces 92 which are preferably arranged at right angles. This structure is best illustrated in Fig. 7, wherein the crank pin 68 is held against the faces 92 by a pin 94 slidable in a tubular member 96 located at the upper end of a bracket 98 bolted at 100 to the extension 90 of the arm 70. One end of a compression spring 102 engages the inner end of the pin 94 and its opposite end engages a plug 104 threaded into the tubular member. Adjustment of the plug 104 varies the tension of the spring 102 so that the pressure of the pin 94 against the crank pin 68 may be adjusted to suit different conditions.

One end of the plug is provided with a square opening for the reception of a key 106 which may be used for adjusting the plug. Contact between the end of the pin 94 and the crank 68 is located above the point of contact 108 between the crank pin and the vertical surface 92 so that the crank pin is firmly held in position. In other words, the arm 70 is really tied to the crank pin 68, and the spring 102 permits the pin 94 to adjust itself to irregularities in the contour of the crank pin so that the two surfaces 92 are always held firmly against the peripheral face of the crank pin.

Since the crank pin 68 rotates about the axis of the crankshaft, the arm 70 is carried by the crank pin so that oscillatory motion is imparted to the beam 22 as well as to the links 24. Oscillatory motion of the beam 22 imparted thereto through the medium of the arm 70 which follows the crank pin 68, causes the stone 42 to follow the crank pin. Thus rotation of the crankshaft in the lathe presents all surfaces of the crank pin 68 to the stone. Precise adjustment of the stone to the crank pin is accomplished through shifting of the arm 70 through rotation of the screw 80. The arm 70 may be adjusted to lower the extension 90 sufficiently far to permit the crank pin 68 to be placed between the grinding stone and the horizontal surface 92. The screw 80 is then adjusted to bring the crank pin 68 into engagement with the two surfaces 92 and the pin 94 is properly tensioned against the crank pin. While the beam 22 is pivotally mounted, the arm 70 is adjustably mounted thereto in such a manner as to permit the arm to be precisely positioned to the crank pin and the latter to the grinding stone. The beam 22 may be lowered to bring the grinding stone 42 into proper grinding relation with the crank pin 68 and the arm 70 then adjusted to precisely relate the faces 92 to the crankshaft, as illustrated in Fig. 3.

Figs. 1, 3 and 9 illustrate the motor 56 as being located near the end of the beam 22 opposite the grinding wheel 42, and the bearings 38 are located intermediate the ends of the beam to bring the weight of the motor to one side of the common axis of the bearings. Thus the motor counterbalances the beam in such manner as to tend to rotate the beam in a clockwise direction, as when viewing Figs. 3 and 9. Accordingly, the beam and grinding stone weight is held from the crank pin 68, and engagement between the crank pin and the grinding stone is accomplished by pivoting the beam downwardly to locate the grinding stone 42 in proper relation with the crank pin 68 and adjusting the arm 70 to lessen the distance between the axis of the pin 68 and the axis of the shaft 48. Under such conditions, the extension 90 is urged against the bottom side of the crank pin 68 in all positions of the crank, and the spring pressed pin 94 maintains the vertical surface 92 in firm engagement with the crank pin so that the beam 22, which carries the grinding stone 42, will oscillate strictly in accordance with the rotary motion of the crank pin 68.

Although the grinding stone 42 is illustrated as being considerably narrower than the length of the crank pin 68, the stone is moved back and forth on the crank pin through manipulation of the carriage handle 18 through the medium of which the carriage, which carries the grinding mechanism, is moved back and forth on the ways 16.

For grinding purposes, it is essential that the grinding stone 42 be maintained in good condition and its peripheral surface concentric with the axis of the stone. To this end, Figs. 3, 5 and 9 illustrate a screw 110 provided with a diamond point 112 arranged to be moved into cutting engagement with the peripheral face of the stone through adjustment of the screw. The screw 110 is threaded through a body 114 slidable in a housing 116 bolted to a plate 118 secured to the bottom flanges of the channels 40 by bolts 120.

One side of the housing 116 is open and made closed by a plate 122 detachably secured to the housing by bolts 124. An adjusting screw 126 is threaded into the body 114 and extends loosely through an opening in the end wall 128 of the housing for connection with a crank 130. Relative longitudinal movement of the screw 126 is restrained by reason of a flange 132 fixed to the screw and engaging one side of the end wall 128 and engagement of the crank hub 134 with the other side of the end wall. Since the body 114 is rectangular in cross section and fits snugly against the inner wall faces of the housing 116, rotation of the screw 126 through the medium of the crank 130 will shift the body 114 longitudinally of the housing for adjusting the screw 110 laterally of the grinding stone 42. Thus the screw 110 may be adjusted longitudinally for precisely positioning the cutting point 112 against the peripheral face of the grinding stone and lateral trim is accomplished through manipulation of the crank 130. Fig. 5 illustrates the plate 122 as being provided with a slot 136 of sufficient length to accommodate the necessary shift of the screw 110.

The grinding device is fashioned to facilitate mounting thereof upon the carriage 12 of a lathe, and the lathe is employed for imparting rotary motion to the crankshaft. Thus an ordinary lathe may be employed as a mount for the crankshaft as well as a source of power therefor. The oscillating action of the beam 22 permits the arm 70 to be effectively connected with the crank pin 68 to accurately follow the crank pin in its rotary travel. The cutting action of the grinding stone 42 is controlled through adjustment of the screw 80, and the screw is so angled as to conveniently position the hand wheel 88 directly before the operator at the lathe.

In Fig. 7, the gauge pin 138 of a surface dial gauge 140 is illustrated in engagement with the crank pin 68. The shank 142 of the dial gauge is threaded into the opening 144 in the bracket 98. Accordingly, the condition of the pin may be easily observed during the grinding stage as well as in the stationary condition of the work.

Grinding the main bearings of the crankshaft presents a problem somewhat different from grinding of the crank pins. The lathe carriage may be moved longitudinally of the crankshaft sufficiently far to bring the grinding stone 42 into

alignment with the different main bearings or crank pin bearings. However, the crankshaft axis coincides with the common axis of the main bearings so that the beam 22 action will be somewhat different in that it is devoid of any oscillatory action while operating on the main bearings.

Fig. 9 illustrates the device adjusted to work on the main bearing 66. To the rear ends of the members 10 are bolted bearings 148 which rotatably support a shaft 150 to which a brace arm 152 is fixedly secured. A hook 154 is fashioned at the free end of the brace arm for the reception of a bolt 156 threaded into one of the links 24. Normally the brace arm 152 hangs from the shaft 150, as in Fig. 3, but in grinding the main bearings, the links 24 are latched against oscillatory movement by swinging the brace arm into the position of Fig. 9. In addition, the bracket 98 is removed from the arm 70. Further, the beam 22 is also secured from any oscillatory motion through the medium of a rigid link 158. This link comprises a tubular member 160 having a sleeve 162 at one end, see Fig. 2, loosely mounted on a shaft 164 supported in mounts 166 bolted to the forward ends of the members 10.

One of the spacers 44 is provided with two spaced projections 168 between which a screw 170 may pass as it is pivoted upwardly about the axis of the shaft 164. The screw is threaded into the end 172 of the tube 160 and is provided with a head 174 which is loosely supported on an unthreaded extent of the screw. Collars 176 are secured to the screw 170 on opposite sides of the head 174 to restrain the screw from relative longitudinal movement, but the screw may be rotated easily.

Two pins 178 project from the head 174 at right angles to the axis of the screw 170, and the projections 168 are each recessed at 180 to partly embrace one of the pins 178. The pins are rotatably clamped to the projections 168 by fingers 182 each recessed at 184 to partly embrace one of the pins 178, with the two fingers 182 connected together at their rear ends and pivotally connected at 186 with the adjacent spacer 44. Bolts 188 are passed through openings in the fingers 182 and are threaded into the projections 168 to clamp the parts together in the manner of Fig. 9, at which time the fingers and the projections coact as bearings for the pins 178. To the outer end of the screw 170 is fixedly connected a hand wheel 190. Since the screw 170 is restrained from relative longitudinal movement, rotation of the screw imparts pivotal motion to the beam 22 for adjusting the grinding stone 42 to the main bearings 66. Thus the main bearings may be accurately trued, as illustrated in Fig. 9. Ordinary calipers may be employed to take measurements of the main bearings. The screw 170 firmly supports the beam against relative movement in addition to constituting an adjustment for the beam to control the position of the grinding stone with respect to the main bearings.

Having thus described certain embodiments of my invention in detail, it is, of course, understood that I do not desire to limit the scope thereof to the exact details set forth except insofar as those details may be defined in the appended claims.

I claim:

1. In combination with a lathe having a carriage and means for supporting and rotating a crankshaft, oscillating links mounted on said carriage, a beam pivotally connected with said oscillating links intermediate its ends, a rotary grinding stone carried by said beam, an arm adjustably connected with said beam and having contacting faces engageable with a crank pin of the crankshaft, resilient means acting on said crank pin for holding said contacting surfaces in engagement with the crank pin to oscillate said links and said beam and move said grinding stone in conformity with the travel of the crank pin, a motor mounted on said beam in a position thereon to pivot the beam and the grinding element away from the crank pin and operatively connected with said grinding stone, and means acting on said arm and said beam for adjusting the arm relatively to the beam to position the grinding element in grinding proximity to the crank pin.

2. The invention described in claim 1 wherein means are provided for bracing said links against oscillation, and means for supporting said beam against pivotal movement and adjusting the same to position the grinding stone in grinding proximity to a main bearing of the crankshaft.

3. In combination with a lathe having a carriage and means for supporting and rotating a crankshaft, a support mounted on said carriage, a beam pivotally mounted on said support, a power driven grinding stone rotatably mounted on said beam, and means acting on said beam to secure the latter against pivotal movement and to adjust the same toward and away from a main bearing on the crankshaft to position the grinding stone in grinding proximity with the main bearing.

4. An attachment for a lathe having means for supporting and rotating a crankshaft, an oscillating support mounted on the lathe rearwardly of the crankshaft, a beam pivoted between its ends to the support with the front portion thereof overlying the crankshaft, a grinding disc mounted on the beam forwardly of the pivot of the beam and having its lower edge contacting with a crank pin of the crankshaft directly over the center of the crank pin, means for rotating the grinding disc mounted upon the beam rearwardly of the pivot of the beam, an arm connected to the beam rearwardly of the grinding disc and extending therefrom in the direction of the crank pin at an angle of 45°, the lower end of the arm being provided with a recess open at its upper side and receiving the crank pin with its lower and rear walls in contact with the crank pin, and means carried by the lower end of the arm and contacting with the crank pin to maintain said walls in contact with the crank pin.

5. A lathe attachment as set forth in claim 4, wherein the arm is secured to the beam by means adapting the arm to be adjusted bodily with relation to the grinding disc, and wherein the arm is adjusted and held in adjusted position by means carried by said first means.

6. An attachment for a lathe as recited in claim 4, wherein the arm is provided at its upper end with an extension extending upwardly and forwardly therefrom at right angle thereto, wherein a guide carried by the beam slidably receives the extension of the arm, and wherein an adjusting screw is swivelly mounted on the guide and engaged with the extension of the arm.

7. A lathe attachment as set forth in claim 4, wherein the arm is adjustably secured to the beam for bodily adjustment with relation to the grinding disc, and wherein the means carried by the lower end of the arm and contacting with the crank pin comprises a spring pressed pin.

8. In combination with a lathe having a carriage and means for supporting and rotating a crankshaft, an oscillating support mounted on said carriage, a beam pivotally mounted on said support, a power driven grinding element rotatably mounted on said beam, an arm adjustably connected with said beam and having two relatively fixed surfaces contacting with a crank pin of the crankshaft, a spring pressed pin carried by the arm and contacting with said crank pin to hold said surfaces thereagainst to effect the oscillation of said support and said beam and move said grinding element in conformity with the travel of the crank pin, and means acting on said arm and said beam for adjusting the arm relatively to the beam to position the grinding element in grinding proximity to the crank pin.

9. In combination with a lathe having a carriage and means for supporting and rotating a crankshaft, an oscillating support mounted on said carriage, a beam pivotally mounted on said support, a power driven grinding element rotatably mounted on said beam, an arm adjustably connected with said beam and having means for rotatable connection with a crank pin of the crankshaft to oscillate said support and said beam and move said grinding element in conformity with the travel of the crank pin, means acting on said arm and said beam for adjusting the arm relatively to the beam to position the grinding element in grinding proximity to the crank pin, means to hold said support against oscillation, and means for securing the beam against pivotal movement on said support and adjust said grinding element into grinding proximity to a main bearing on the crankshaft.

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