May 1, 1923.

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MACHINE FOR GRINDING CRANK PINS

Filed Nov. 18, 1920

Inventor
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Attorney
To all whom it may concern:

Be it known that I, Paul Stoner, a citizen of the United States, residing at Waynesboro, in the county of Franklin and State of Pennsylvania, have invented certain new and useful Improvements in Machines for Grinding Crank Pins, of which the following is a specification.

My invention relates to a grinding machine intended primarily for grinding the crank pins of engine crankshafts. The device as shown is for grinding and facing the six crank-pins of a six throw crank shaft, although I wish it to be understood that by slightly modifying it the machine can be adapted to any shaft.

One object of the invention is to provide means whereby power may be applied at both ends of the crankshaft to revolve it.

Another object is to provide means whereby the work-holding devices on the two revolving chucks may be brought into alignment with respect to each other.

Another object is to provide means for counterbalancing the weight of the crankshaft or other device to be ground.

Still another object is the provision of means whereby unground crank-pins may be brought into exact position to be ground without removing the shaft from the machine.

Referring to the accompanying drawings which are made a part hereof and on which similar reference characters indicate similar parts,

Figures 1a and 1b represent a front elevation of the upper part of a crank-grinder constructed in accordance with my invention;

Figure 2, a detail sectional view of one of the head aligning devices taken on the line 2 x 3 of Fig. 1;

Figure 3, a detail section on the line 3 x 3 of Fig. 2;

Figure 4, a section on the line 4 x 4 of Fig. 5 showing the device for centering the unground crankpins;

Figure 5, a front elevation of the same;

Figure 6, a longitudinal section through a portion of a differential drive shaft;

Figure 7, a section on the line 7 x 7 of Fig. 6; and

Figure 8, a detail section on line 8 x 8 of Fig. 7.

In the drawings A B and C represent the three main bearings of the crank-shaft and 1 2 3 4 5 and 6 represent the six crank pins thereof. The bearings A B and C have already been ground and faced and are not concerned with the subject matter of this invention. The crank pins may, if desired, have been turned down nearly to size, but are ground to a finished surface in the machine now to be described.

The base 10 of the machine has, mounted upon its upper surface and at one end, a casing 11 containing the bearings for the reception of a spindle 12 which is in turn provided at one end with a pulley 13 and at the opposite end with a crank-shaft carrying chuck 14 adapted to receive and firmly hold the bearing C of the crank-shaft. A similar casing 15 is adjustable for crankshafts of varying lengths, being slidably mounted upon the upper surface of the base 10 at the end opposite the casing 11 and this casing contains bearings for a spindle 16 which is longer than the spindle 12 and which carries at one end a chuck 17 similar to the chuck 14. The spindle 16 extends beyond the casing 15 and is supported on an additional stationary bearing 18 which houses a pulley 19 splined to the spindle 16. The pulleys 13 and 19 are driven from a differential drive-shaft to be described later.

The chucks referred to differ in construction only with regard to length. They are each provided with a base or body portion 20 and a counterweight 21 for the crank-shaft or other work carried by the chucks, the counterweight being preferably integral with the base portion 20. Each counterweight in turn is constructed to form the stationary member 22 of one of the crank-shaft gripping devices. A movable member 23 is hinged to the stationary member 22 at 24 and is adapted to be clamped down against one of the bearings of the crank-shaft by means of the pivoted bolt 25 entering between the lugs 26 of the member 22 and held in place by a nut at its upper end.

One of the chucks has detachably mounted thereon, adjacent the shaft clamp, a crank-pin centering device. This device consists of a casting comprising a vertical base 27 and a T-shaped member 28 extending upwardly therefrom. Member 28 is provided on its upper surface with two
blocks 29 and 30 on which the crankpins may rest as explained hereinafter.

It is absolutely essential that the crankshaft be in perfect alignment in the machine and at right angles to the grinding wheel W and I have devised the following structure to secure this condition. Each chuck is provided with a pair of eccentrically mounted guiding disks 31 mounted on tapered spindles 32 rotatably adjustable in the rim of the base portion 20 and locked therein by means of a nut 33. To facilitate adjustment of the eccentrics, the spindles 32 are squared at their outer ends to receive a wrench. A square rod 34 is mounted to slide in a slot 35 in casing 11, between the eccentrics 31 which are adjusted to the rod. An anti-friction roller 36 is placed at the end of each rod and each rod is provided upon its upper surface with rack teeth 37 meshing with a pinion 38 keyed to a shaft 39 mounted to revolve in a bearing 40 formed integral with the casing 11. A similar mechanism is provided for chuck 17 as shown in Figure 1st also operated by a pinion on shaft 39. The shaft 39 is provided at one end with an operating handle 41 and at the other with a limiting collar 42. The spindles 16 and 19 should run at exactly uniform speed at all times and in order to insure this I make use of a differential counter drive-shaft of the form shown in elevation in Fig. 1st and 2nd and in detail section in Figs. 6, 7, and 8, and consisting of two separate lengths of shafting 43 and 44. The shaft 43 is provided at one end with a small belt pulley 45 connected by means of a belt 46 to the large pulley 13 on the spindle 12. The opposite end of said shaft has two reduced portions 47 and 48.

The first reduced portion 47 forms a shoulder 49 against which a four step belt pulley 50 bears. This pulley is driven by a belt connected to any suitable source of power and runs loose on the shaft 43. It has secured thereto a plate 51 having an enlargement 52 at each side thereof for the purpose of housing two enmeshed pinions 53 and 54 which mesh respectively with the internal gear teeth on two sleeves 57 and 58. The sleeve 57 is keyed to the shaft 43 while the sleeve 58, which is mounted to revolve on the reduced portion 48 of the shaft 43, is connected by means of a pin 59 with the second shaft 44. The shaft 43 is mounted to revolve in a bearing 60 attached to the base of the machine and a supplementary bearing 61 located inside the base. The shaft 44 is mounted to run in a bearing 62 adjacent the bearing 61 and another bearing 63 attached to the base of the machine. Beyond the bearing 63 is keyed a pulley 64 of the exact size of the pulley 45 on the shaft 43. A belt 65 connects pulley 64 with the pulley 19 on the spindle 16 before mentioned. In case, for example, that one of the bolts is tighter than the other, the above construction will enable the chuck-shafts to run in synchronism, whereas if a single shaft were used in place of shafts 43 and 44 and the differential gearing, one chuck-shaft would tend to run ahead of the other and skew the crankshaft, thus causing faulty grinding.

Having described the machine in detail, the operation thereof is as follows: As previously stated, in a six throw crank-shaft, such as is here illustrated, the three main bearings have been ground and faced in a machine other than the one just described. The two extreme main bearings are now securely clamped in the chucks 14 and 17 in such a position that the crank-pins 1 and 6 are in line with spindles 12 and 16 and consequently in position to be ground, the crank-pin centering device 27, 28 not being in the machine at this time. Now in order to center the remaining pins, use is made of the crank-pin centering device in the following manner. If the finished crank pin 1 is rested on the block 29 of the centering device the pins 2 and 5 will be at the exact center of rotation of the spindles, or at 120° from pin 1, which places them in position to be ground by the wheel W. After grinding these pins the chucks will be released and the crank shaft will be rotated relatively thereto so as to put the pin 1 in contact with the block 30, when pins 3 and 4 will be in a position to be ground by the wheel W.

After the crank shaft has been placed in proper position relative to chuck 17 the chucks are aligned by simply pulling downwards on the handle 41 which through the medium of the pinions and racks, will cause the square rods 34 to enter between the eccentrics 31 and, if they are out of alignment slightly turn either or both chucks so as to bring the crank shaft exactly parallel with the spindles 12 and 16, the rollers 36 enabling the rods to turn the chucks easily. The clamps are closed and the handle 41 being now moved up as far as it will go will withdraw the rods 34 and leave the chucks free to be rotated as by the differential device and belt gearing shown in the drawings.

My machine or parts thereof will be found useful in other arts and for various purposes, and various modifications will occur to those skilled in the useful arts and I do not therefore limit myself in these respects except as set forth in the appended claims.

Having thus fully described my said invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a grinding machine, opposed chucks to hold the work, and means for driving said chucks comprising aligned shafts, dif-
ferential gearing connecting said shafts and connections from the shafts to the chucks. 2. In a grinding machine for the crank-pins of crank-shafts, a grinding wheel, two opposed eccentric chucks to hold said crank-shafts, means for aligning said chucks, means for centering successive crank-pins relative to the grinding wheel by rotation of the crankshaft, and common driving means for both chucks.

3. In a grinding machine for the crank-pins of crank-shafts, a grinding wheel, two opposed chucks to hold said crank-shafts, means for aligning said chucks, means for centering successive crank-pins relative to the grinding wheel and means for driving the machine including differential gearing between the chucks.

4. In a grinding machine for the crank-pins of crank-shafts, a grinding wheel, two opposed chucks to hold said crank-shafts, shafts carrying the chucks, aligned shafts in parallelism to the chucks, belts gear ing between the latter shafts and the chuck shafts, and differential gearing between said aligned shafts.

5. In a machine for grinding crank pins, a pair of opposed chucks for supporting a crankshaft and means for engaging a crankpin in different positions of rotation relative to the chucks to center the various crankpins relatively to the chucks, substantially as set forth.

6. In a machine for grinding crankpins, a pair of opposed chucks for supporting a crankshaft and means carried by one of the chucks for engaging a crankpin in different positions of rotation relative to the chucks to center the various crankpins relatively to the chucks, substantially as set forth.

7. In a machine for grinding the crank pins of a crankshaft, a pair of opposed chucks in alignment with each other, and a T-shaped member secured to one of the chucks and adapted to engage a crankpin in two different positions of rotation to center successive crank-pins relative to the chucks, substantially as set forth.

8. In a chuck, a base, eccentric work gripping means thereon comprising a jaw integral with the base, a jaw pivoted on the first and a counterweight for the work integral with said first jaw, substantially as set forth.

9. A chuck comprising a body portion, eccentric work gripping means thereon, comprising a jaw integral with the body and a jaw pivoted on the first for movement radially thereof, the center of mass of the body being eccentric to the axis of the chuck to act as a counterweight for the work, substantially as set forth.

10. In a machine for grinding the crank pins of a crank-shaft, a pair of opposed chucks, each comprising a body portion, a radially swingable jaw pivoted thereon, the body and the jaw forming between them an opening eccentric to the axis of the chuck and adapted to hold a crankshaft with any of its pins in alignment with said axis and a bolt pivoted on the body and adapted to engage a slotted portion of the jaw, the body of the crankshaft being adapted to act as a counterweight to the chucks.

11. In a machine for grinding crank-pins and the like, a pair of opposed co-axial chucks, work-gripping means eccentric thereof, work counterbalancing means diametrically opposite thereto, and means on one of the chucks for centering a crank-pin relative to the axis of the chucks.

12. In a machine for grinding crank-pins and the like, a pair of opposed co-axial chucks, work-gripping means eccentric thereof, work counterbalancing means diametrically opposite the work-gripping means, and means on one of the chucks for centering successive crank-pins relative to the axis of the chucks.

13. In a machine for grinding crank-pins and the like, a pair of opposed co-axial chucks, work-gripping means eccentric thereof, work counterbalancing means diametrically opposite the work-gripping means and differential driving means interposed between the chucks.

14. In a machine for grinding crank-pins and the like, a pair of opposed co-axial chucks, work-gripping means eccentric thereof, work counterbalancing means diametrically opposite the work-gripping means, means on one of the chucks for centering a crank-pin relative to the axis of the chucks, and a train of gearing for driving said machine comprising differential driving means interposed between said chucks.

15. In combination, a pair of opposed co-axial chucks, eccentric work-gripping means on each chuck, and means to align said opposed work-gripping means.

16. In combination, a pair of opposed co-axial chucks, adjustable eccentric abutments on each chuck, rods adapted to engage such abutments and common means to move the rods.

17. In combination, a pair of opposed co-axial chucks, eccentric work-holding means on each chuck, a pair of abutments on each chuck and means on the fixed frame of the machine adapted to enter between said abutments to align the work-holding means.

18. In combination, a pair of opposed co-axial chucks, a pair of adjustable eccentric abutments on each chuck, a rod adapted to engage between each pair, and a shaft having means to engage racks on the rods.

19. In combination, a pair of opposed co-axial chucks, eccentric work-gripping means on each chuck, means to align said opposed
work-gripping means, and means diametrically opposite the work-holding means to counterbalance the work.

20. In combination, a pair of opposed co-axial chucks, eccentric work-gripping means on each chuck, means to align said opposed work-gripping means, and common driving means for the chucks including differential gearing interposed therebetween.

21. In a machine for grinding crank-pins of multiple crank shafts, a pair of opposed co-axial chucks, eccentric work-gripping means on each chuck, means to align said opposed work-gripping means and means on one of the chucks to center the crank-pins successively.

22. In a grinding machine a pair of opposed work-holding devices and means for driving them comprising aligned shafts, a pulley on one shaft, a web fast thereto and compensating gearing connecting the web to each of said aligned shafts.

23. In a grinding machine a pair of aligned spindles, opposed work-gripping devices on said spindles, a shaft geared to each spindle, said shafts being in alignment, a pulley loose on one of said shafts, a web fast to the pulley, intermeshing planetary gears on said web, and a pair of opposed sleeves fast to said shafts, each sleeve having internal teeth meshing with one of said planetary gears.

In witness whereof, I have hereunto set my hand and seal at Washington, D. C. this thirteenth day of November, A. D nineteen hundred and twenty.

PAUL STONER. [L. S.]

Witnesses:
E. W. BRADFORD,
F. W. DAHN.