H. P. ARNHOLD & A. P. WITTEMAN.

CRANK SHAFT LATHE.

APPLICATION FILED JULY 20, 1910.

1,015,117.

Patented Jan. 16, 1912.

4 SHEETS—SHEET 1.

Fig. 1.

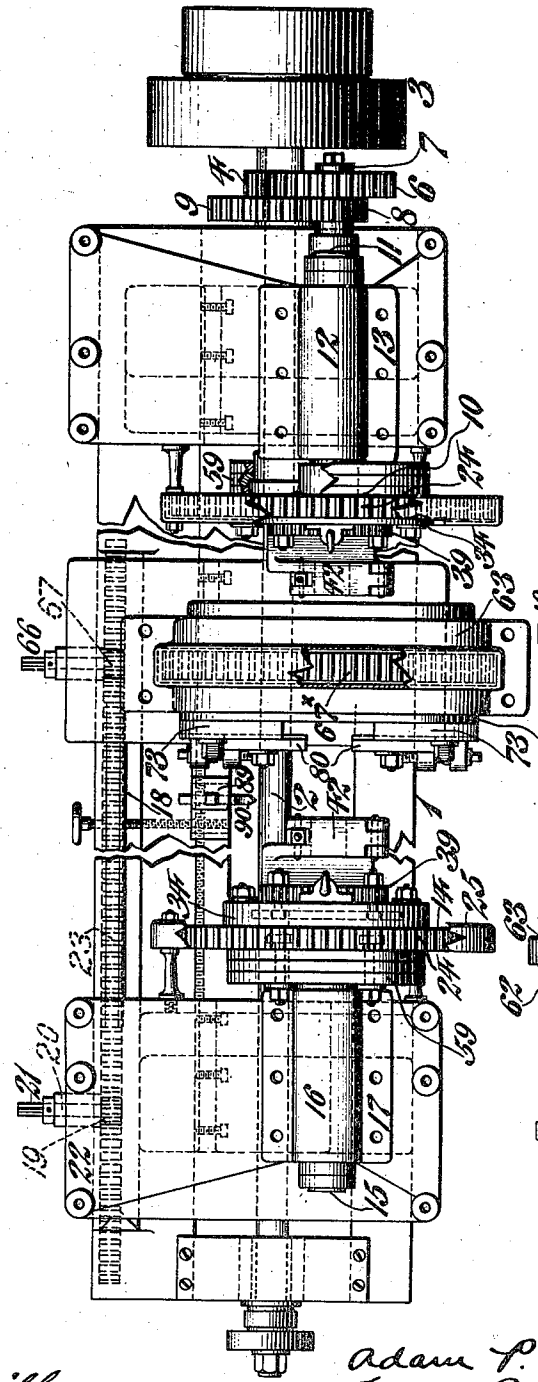
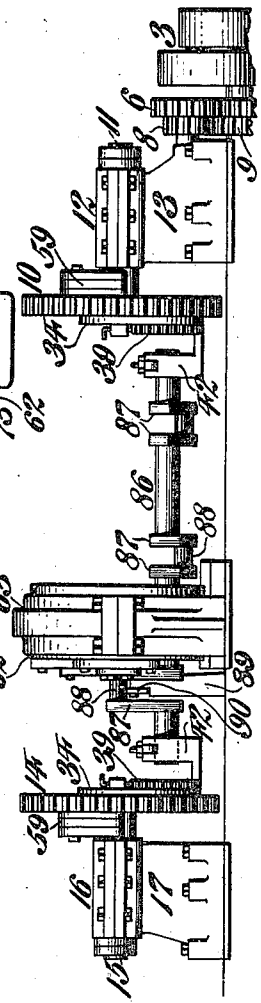


Fig. 1A.



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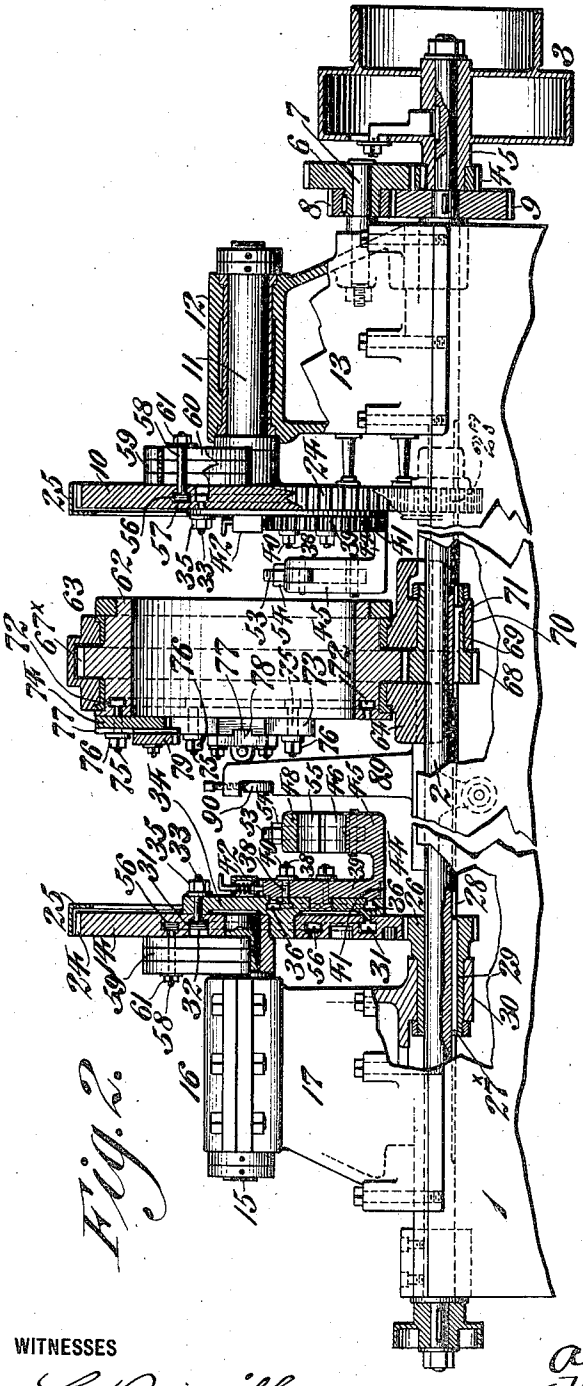

Fig. 2.

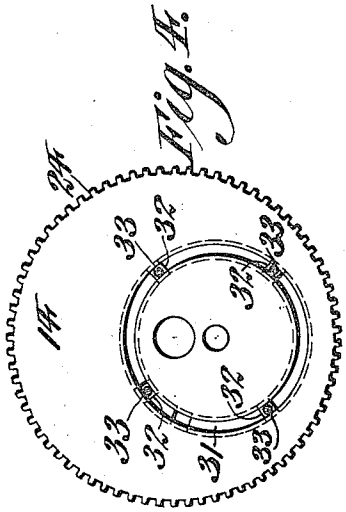

Fig. 4.

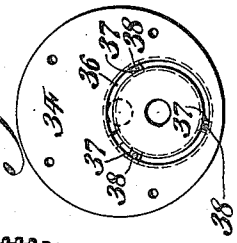

Fig. 5.

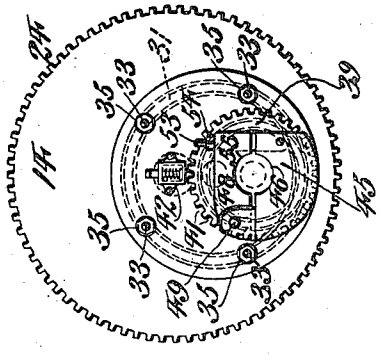

Fig. 3.

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4 SHEETS—SHEET 3.

Fig. 6.

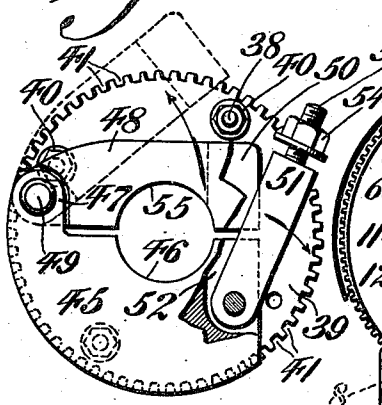


Fig. 7.

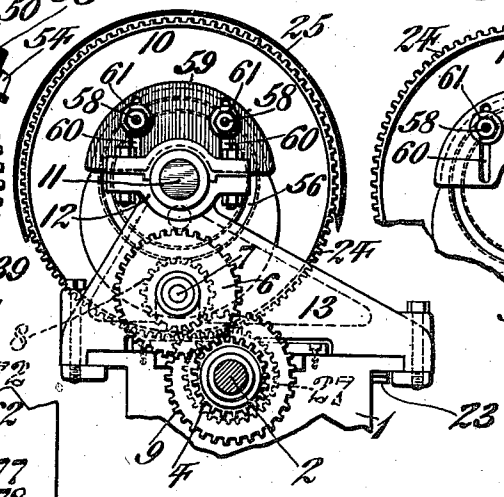


Fig. 8.

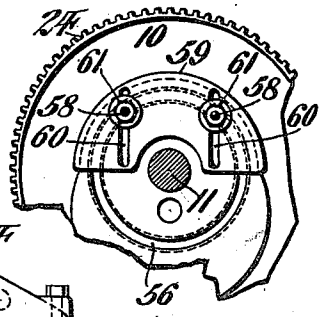


Fig. 11.

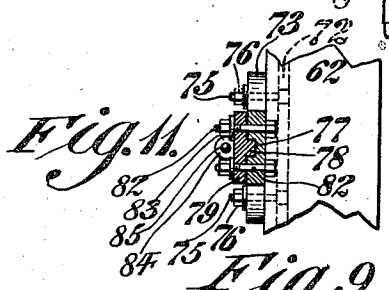


Fig. 9.

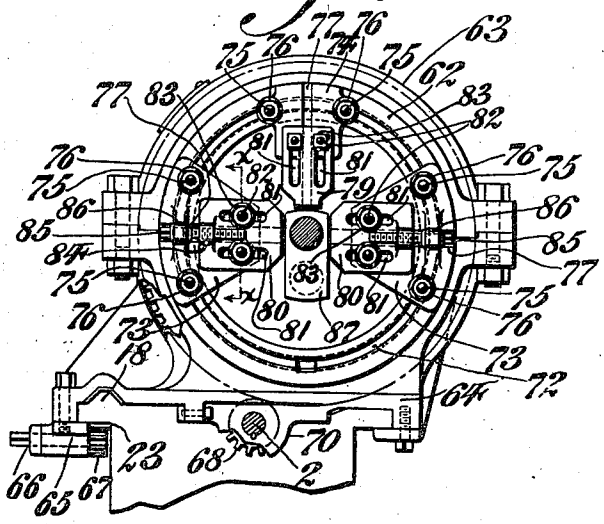
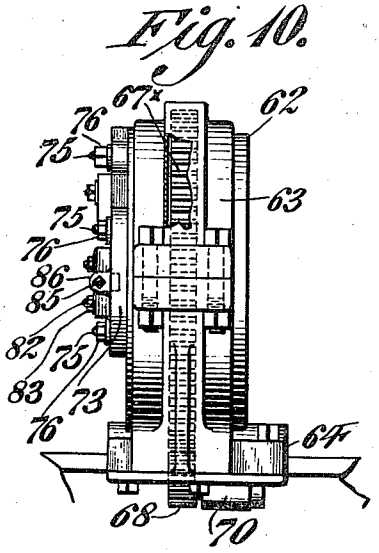


Fig. 10.



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4 SHEETS—SHEET 4.

Fig. 12.

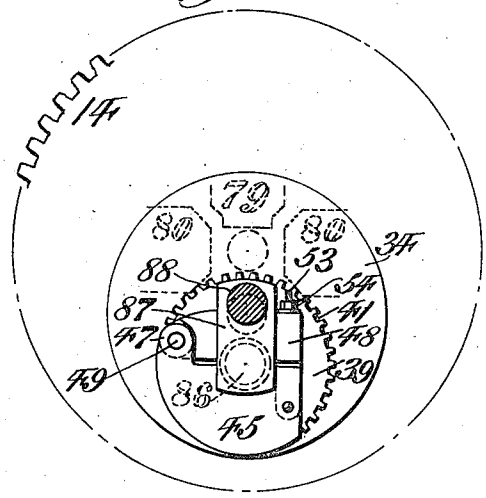
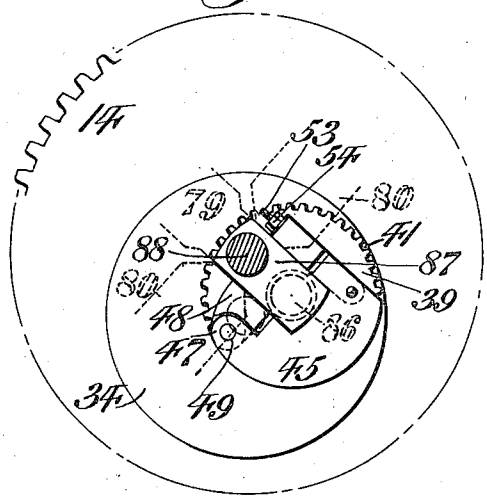


Fig. 13.



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UNITED STATES PATENT OFFICE.

HENRY P. ARNHOLD AND ADAM P. WITTEMAN, OF PHILADELPHIA, PENNSYLVANIA; SAID ARNHOLD ASSIGNOR TO SAID WITTEMAN.

CRANK-SHAFT LATHE.

1,015,117. Specification of Letters Patent. Patented Jan. 16, 1912.

Application filed July 20, 1910. Serial No. 572,921.

To all whom it may concern:

Be it known that we, HENRY P. ARNHOLD and ADAM P. WITTEMAN, both citizens of the United States, residents of the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Crank-Shaft Lathe, of which the following is a specification.

Our invention consists of an improved lathe for turning crank-shafts or similar eccentric machine elements.

It further consists of an improved head for such a machine in which crank-pins may be centered to be turned regardless of the angles at which the cranks project in relation to each other.

It further consists of an improved face-plate in which a crank-shaft may be supported to center crank-pins of different throws and at different relative angles.

It further consists of improved means for counterbalancing a crank-shaft in a face-plate so as to balance such plate in its rotation.

It further consists of other novel features of construction, all as will be hereinafter fully set forth.

For the purpose of illustrating our invention we have shown in the accompanying drawings one form thereof which is at present preferred by us, since the same has been found in practice to give satisfactory and reliable results, although it is to be understood that the various instrumentalities of which our invention consists can be variously arranged and organized and that our invention is not limited to the precise arrangement and organization of these instrumentalities as herein shown and described.

Figure 1 represents a top plan view of our improved crank-shaft lathe. Fig. 2 represents an axial vertical section of the lathe. Fig. 3 represents a face view of one of the face-plates and its chuck and means for adjusting it. Fig. 4 represents the stripped face-plate. Fig. 5 represents a view of a disk upon the face-plate. Fig. 6 represents an enlarged view of the chuck upon the face-plate and its adjusting disk. Fig. 7 represents a view of the outer face of the face-plate and its gearing. Fig. 8 represents a partly broken view of said face-plate. Fig. 9 represents a face-view of the rotating head for supporting the cranks. Fig. 10 represents an edge-view of said head. Fig. 11 represents a sectional detail view taken on the line x—x in Fig. 9. Fig. 12 represents a diagrammatic view of one of the face-plates, illustrating the position of a crank before centering. Fig. 13 represents a similar view illustrating the position of the centered crank. Fig. 14 represents a somewhat diagrammatic side view of the two face-plates and the head, showing the crank-shaft in position.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings, the lathe has a suitably supported bed, 1, and a shaft, 2, is journaled longitudinally in said bed. A cone-pulley, 3, to which the driving power is applied, is journaled loose upon the end of this shaft, and has a pinion, 4, secured upon its hub-sleeve, 5, which pinion meshes with a cog-wheel, 6, upon a stub-shaft, 7, to which cog-wheel a pinion, 8, is secured, which pinion meshes with a cog-wheel, 9, secured upon the shaft 2 to revolve the same. A stationary face-plate, 10, has a short shaft, 11, journaled in a bearing, 12, upon a standard, 13, upon the bed, and a similar movable face-plate, 14, has its shaft, 15, journaled in a bearing, 16, upon a standard, 17, mounted to slide longitudinally upon ways or shears, 18, on the bed. A pinion, 19, having a shaft, 20, formed with a polygonal end, 21, for a crank or handle to turn it, has said shaft journaled in an overhang, 22, of the foot of the standard for the movable face-plate, and meshes with a rack, 23, upon the bed, so that the face-plate may be longitudinally moved upon the bed-plate. The two face-plates have cogged rims, 24, and have guards, 25, secured to their standards and covering the cogged rims. Said cogged rims mesh with pinions, 26 and 27, upon the main shaft 2 to be rotated in unison from the same, and the pinion 26 which meshes with the cogs of the movable face-plate has a spline, 27^x, which slides in a longitudinal groove, 28, in the shaft, so that the pinion may slide upon and revolve with the shaft. The pinion has a hub-sleeve, 29, which is journaled in a depending bearing, 30, upon the base of the standard, so that the pinion will move longitudinally with the standard and the face-plate.

Each face-plate has a circular T-groove or otherwise undercut groove, 31, upon its

inner face, and having its center eccentric to the center of the plate, and the heads, 32, of screw-bolts, 33, fit and slide in said groove. A circular disk, 34, is secured over said groove and to the face of the face-plate by having the screw-bolts passed through holes in the disk and having nuts, 35, upon the bolts and bearing against the face of the disk, so that the disk may be rotated and adjusted upon the face-plate. A circular T-groove or otherwise undercut groove, 36, is formed in the face of the disk and has its center eccentric to that of the disk, and the heads, 37, of screw-bolts, 38, fit and slide in said groove. A circular disk or foot-flange, 39, is secured to the face of the disk 34 by the bolts passing through holes in such foot-flange and having nuts, 40, for clamping the same, so that said flange may be rotated and adjusted. The periphery of the foot-flange has a number of notches, 41, dividing said periphery in such sub-divisions of the circle as will correspond to the angles at which the cranks are usually relatively set in crank-shafts having two, three, four, five and six cranks, and said notches are engaged by a spring-bolt, 42, upon the face of the disk. It is evident that the foot-flange may have notches at points registering with the angles of one particular form of crank-shaft, only. A clamp, 43, is provided upon the foot-flange and has a shank, 44, projecting from the face of the flange and formed with a rigid jaw, 45, parallel with the face of the foot-flange. The clamping notch or recess, 46, of this jaw is concentric with the foot-flange. At one end of the clamping edge of the rigid jaw are formed two ears, 47, between which the reduced end of a movable jaw, 48, is pivoted upon a pin, 49. The outer end of the movable jaw has an open-ended slot, 50, which is engaged by a latch, 51, pivoted in a registering slot, 52, in the rigid jaw, and said latch has a screw-stud, 53, at its free end, carrying a nut, 54, by means of which the latch may be clamped in the slot of the movable jaw. The clamping notch or recess, 55, of the movable jaw registers with that of the rigid jaw and is concentric with the foot-flange. Each face-plate has a concentric, circular T-groove or otherwise undercut groove, 56, in its outer face, and the heads, 57, of screw bolts, 58, fit and slide in said groove. Semi-circularly curved weights, 59, have each two parallel slots, 60, through which the bolts pass, and such weights may be adjusted nearer to or farther from the center of the face-plate by moving them in or out upon the bolts in said slots and adjusting them by means of nuts, 61. By adjusting the bolts in the circular groove, the weights may be placed so as to be diametrically opposite and to counterbalance the predominating weight of one or more unbalanced cranks and the shaft, and by adding or removing weights and by moving and adjusting the same inward or outward unbalanced cranks and the shaft may be balanced, it being understood that the chank-shaft is clamped in the jaws and the crank-pin to be turned is concentric with the face-plates and with the axial line of the same.

An annular head, 62, has rotary bearing in an annular upright frame, 63, the base, 64, of which is supported to slide longitudinally upon the ways or shears 18 of the lathe-bed. Said base has an over-hang, 65, in which is journaled a short shaft, 66, having a polygonal outer end for applying a crank or handle for turning it, and a pinion, 67, at its inner end, meshing with the rack 23 upon the bed. The outer periphery of the annular head has a cogged rim, 67×, and a pinion, 68, having a hub-sleeve, 69, meshes with said rim. The hub-sleeve is journaled in a bearing, 70, depending from the base of the annular frame, and said sleeve and pinion has a spline, 71, engaging and sliding in the longitudinal groove 28 of the shaft, so that the pinion turns with and slides upon the shaft, together with the upright annular frame or head-support.

The annular head has an annular T-groove or otherwise undercut groove, 72, in the face opposite the movable face-plate, and two sector-shaped jaw-supports, 73, and an end-jaw support, 74, have headed screw-bolts, 75, inserted through holes in the same, and the heads of said bolts engage and slide in said groove and have nuts, 76, which clamp said supports or holders upon the head. The supports have radial grooves, 77, which are engaged by tongues, 78, upon the inner sides of two cheek-clamping jaws, 79, and an end clamping jaw, 80, so that said jaws may move radially. Said jaws are formed with longitudinal slots, 81, parallel with the tongues, and bolts, 82, projecting from the supports, and through the slots, have nuts, 83, by means of which the jaws may be secured in their radially adjusted positions. The check-clamping jaws have internally screwthreaded ears, 84, engaged by adjusting screws, 85, which are journaled in ears, 86, upon the supports, and the jaws are radially adjusted to clamp the cheeks of a crank by said screws and are then secured in their adjusted positions by the clamping bolts 82 and nuts 83. All shearing strain upon the jaws will be borne by the tongues and grooves, so as to relieve the clamping bolts from such strain.

A suitably adjustable tool-post, 89, is arranged on the frame between the head and the movable face-plate, and has a cutting tool, 90, secured in it to act upon the crank-pin when suitably centered and secured. The face-plates and the head are centered

to have their centers in one axial line and their cog and pinion connection to the main shaft is such that they revolve in unison. When a crank-shaft is to be turned in the lathe, the ends of the shaft are secured in the chucks of the face-plates, which chucks are arranged to be in axial alinement. The crank, the pin of which is to be turned, is now adjusted so as to bring said pin in the axial line of the face-plates and head. This is accomplished by the eccentric arrangement of the chucks upon the face-plates, as illustrated in Figs. 12 and 13 of the drawings. The machine is adapted to turn the pins of cranks of different lengths of throw and standing at different angles to each other. After the shaft has been clamped in the chucks of the face-plates, the crank pin may, for instance, be considerably out of center and radially removed from the center, as shown in Fig. 12. The eccentrically pivoted disks on the face-plates are first loosened and thereupon rotated to bring the centers of the foot-flanges and chucks at a distance from the axial line of the plates and head equal to the throw of the crank, whereupon the chucks and their foot-flanges are rotated to bring the crank-pin into such axial line, when the spring-bolts will lock such chucks and flanges in position and the clamping nuts be tightened on their bolts. The jaws and their supports are now adjusted in the annular groove of the head, and the clamping bolts tightened, and the clamping jaws are adjusted by their screws and secured by their clamping bolts, as is also the end-jaw, so as to hold one cheek of the crank in the head with the clamping jaws against its edges and the end-jaw against the end of the cheek, and with the pin centered, as seen in Fig. 13, in which figure and in Fig. 12, the jaws are indicated in dotted lines. Fig. 9 also illustrates the crank clamped,—the shaft in the drawings being indicated by the numeral 86, the cheek by 87, and the crank pin by 88. After the disk has been adjusted to the throw of the cranks, other cranks at varying angles to each other may be centered by rotating the foot-flanges and chucks to bring the centers of the pins concentric with the head, and the notches and spring-bolts secure the chucks in their adjusted positions. The adjustable counterweights upon the face-plates are adjusted to counterbalance the shaft and cranks eccentric to the head and face-plates by adjusting them diametrically opposite the greatest eccentric load of such shaft and cranks, and the counterbalance may be increased and decreased by adding and removing weights and by adjusting them farther from and nearer to the centers of the face-plates, so that perfect balance and, consequently, perfect centering may be attained in turning the crank-pins.

By having the counterweights upon the sides of the face-plates opposite the sides having the adjustable clamping means, and having such weights circularly adjustable entirely around the faces of the face-plates, perfect counterbalancing of the shaft in the lathe is attainable, no matter how irregular the disposition of the cranks may be in their relative projection from the shaft and no matter how counterweights, eccentrics or other bodies, not cranks, may be disposed upon a shaft.

By providing radial and circular adjustment for the shaft and crank-cheek clamping means in the face-plates and heads and by constructing the lathe with one of said face-plates and the head having the cheek-clamps longitudinally and independently movable, the pins of crank-shafts of different lengths, having cranks of different throws and standing at different angles to each other, may be turned on the one lathe, and the crank, the pin of which is being turned, will be steadily supported, so as to be turned absolutely even and true.

We are aware that face-plates for lathes have been constructed with a disk pivoted eccentrically upon one face of the plate and having the disk or foot-flange of a shaft-chuck eccentrically pivoted upon its face, and we are also aware that counterweights upon face-plates or lathe-heads are not broadly new, but the lathe herein illustrated and described embodies such devices in a manner not heretofore embodied in one machine, and thus our machine accomplishes novel and useful results not heretofore attained in a shaft-turning lathe.

It will now be apparent that we have devised a novel and useful construction of a crank shaft lathe which embodies the features of advantage enumerated as desirable in the statement of the invention and the above description, and while we have, in the present instance, shown and described a preferred embodiment thereof which has been found in practice to give satisfactory and reliable results, it is to be understood that the same is susceptible of modification in various particulars without departing from the spirit or scope of the invention or sacrificing any of its advantages.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent, is:

1. In apparatus of the character stated, a rotating face-plate having on one face circularly and radially adjustable means for eccentrically supporting a crank-shaft to have a crank-pin concentric with it, and a circularly and radially adjustable counterweight on the opposite face of said face plate, such circular adjustment extending entirely around the face of the face-plate.

2. In apparatus of the character stated,

a rotating face-plate having circularly and radially adjustable means on one face for eccentrically supporting a crank-shaft to have a crank-pin concentric with it and having an annular undercut groove in its opposite face extending entirely around and concentric with the same, a weight having slots parallel with each other and with a radius of the face-plate, and bolts having their heads engaging and sliding in the annular groove and projecting through the slots and having nuts clamping the weight against the face of the face-plate.

3. In apparatus of the character stated, an annular rotating head, and cheek-clamping jaws circularly and radially adjustable upon the face of and in their relation to the center of the same.

4. In apparatus of the character stated, an annular rotating head, jaw supports secured to be circularly adjustable upon one face of said head, and cheek-clamping jaws secured to be radially adjustable upon said supports.

5. In apparatus of the character stated, an annular rotating head formed with an annular undercut groove in one face, supports having radial grooves in their outer faces, headed bolts having their heads engaging and sliding in said annular groove and passed through holes in the supports and provided with nuts clamping said supports, cheek-supporting jaws having tongues engaging and sliding in the grooves in the supports and formed with parallel slots, and bolts in the supports and passing through the slots and having clamping nuts securing said jaws.

6. In apparatus of the character stated, an annular rotating head formed with an annular undercut groove in one face, supports having radial grooves in their outer faces, headed bolts having their heads engaging and sliding in said annular groove and passed through holes in the supports and provided with nuts clamping said supports, cheek-supporting jaws having tongues engaging and sliding in the grooves in the supports and formed with parallel slots, bolts in the supports and passing through the slots and having clamping nuts securing said jaws, and adjusting screws rotatably supported in two diametrically opposed supports and having threaded engagement with the jaws thereon.

7. In apparatus of the character stated, a bed, an annular head supported to be longitudinally moved and adjusted upon said bed and provided with circularly and radially adjustable cheek-clamping jaws on one face, two face-plates at opposite sides of the head and having each a disk upon its face rotatably adjustable on a center eccentric to the plate and a chuck rotatably adjustable on a center eccentric to that of the disk, means for rotating the head and face-plates in unison, and means for longitudinally and independently moving and adjusting the head and one of the face plates upon the bed.

8. In apparatus of the character stated, a bed, an annular head supported to be longitudinally moved and adjusted upon said bed and provided with circularly and radially adjustable cheek-clamping jaws on one face, two face-plates at opposite sides of the head and having each a disk upon its face rotatably adjustable on a center eccentric to the plate and a chuck rotatably adjustable on a center eccentric to that of the disk, means for rotating the head and face-plates in unison, counterweights supported circularly and radially adjustable upon the face-plates, and means for longitudinally and independently moving and adjusting the head and one of the face-plates upon the bed.

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