(No Model.) 2 Sheets—Sheet 1.

G. F. BALLOU.

LATHE FOR TURNING BALLS, WHEELS, &c.

No. 359,380. Patented Mar. 15, 1887.

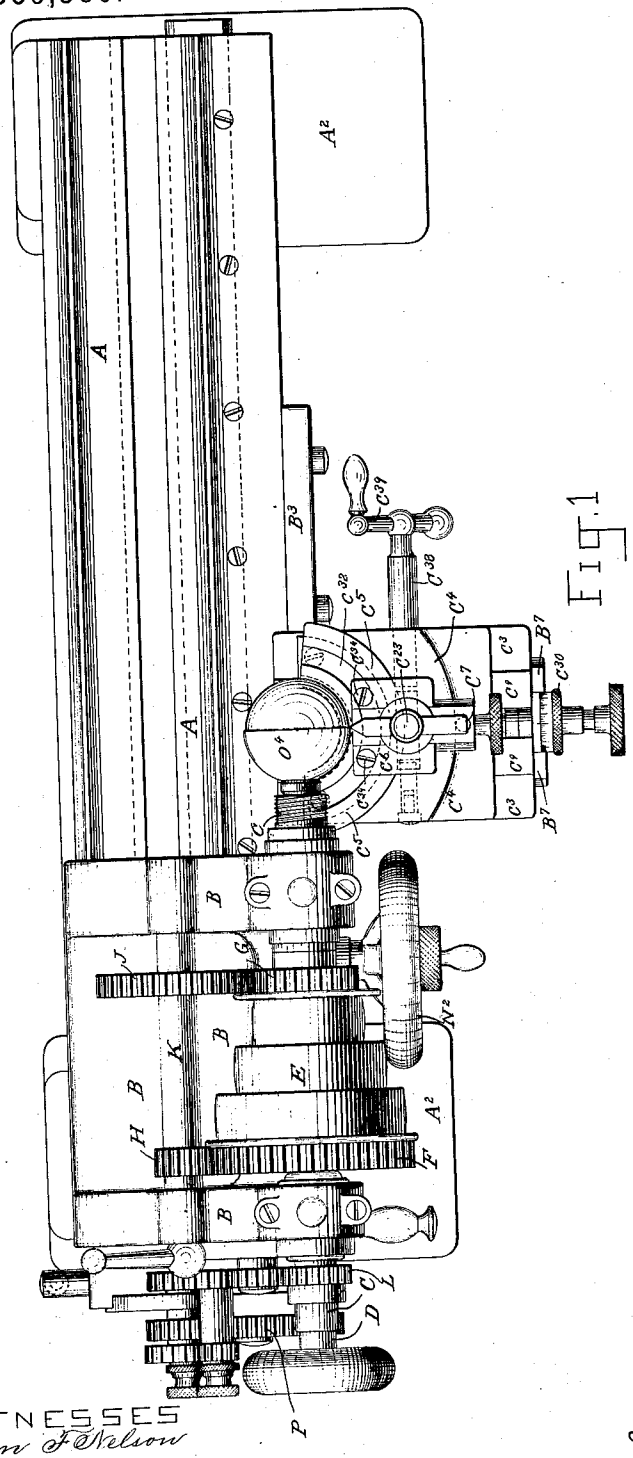


Fig. 1.

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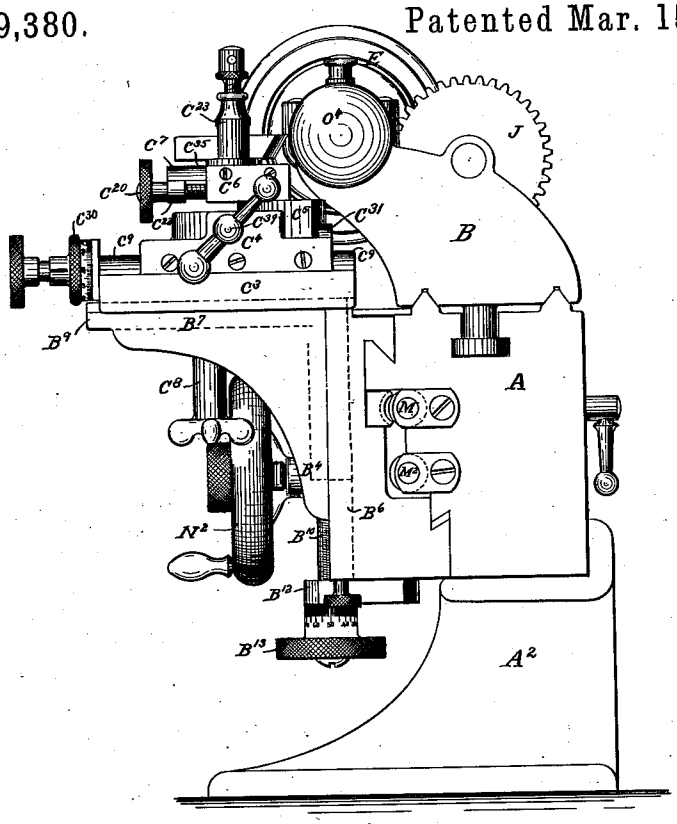


Fig. 2.

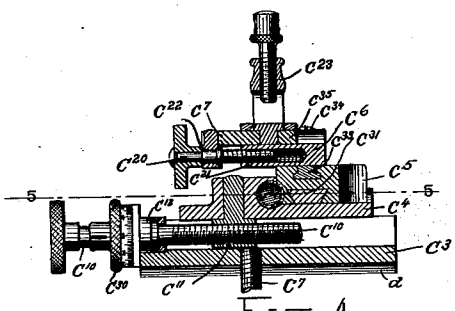


Fig. 4

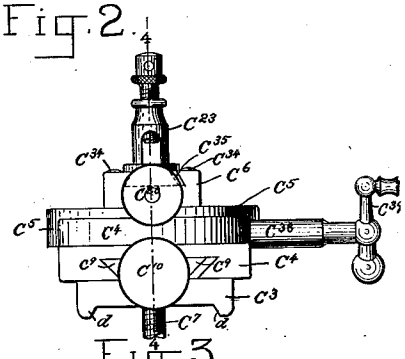


Fig. 3

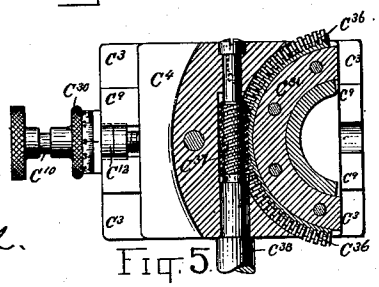


Fig. 5

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UNITED STATES PATENT OFFICE.

GEORGE F. BALLOU, OF WALTHAM, MASSACHUSETTS.

LATHE FOR TURNING BALLS, WHEELS, &c.

SPECIFICATION forming part of Letters Patent No. 359,380, dated March 15, 1887.

Application filed June 9, 1886. Serial No. 204,625. (No model.)

To all whom it may concern:

Be it known that I, GEORGE F. BALLOU, of Waltham, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Fixtures for Slide-Lathes for Turning Balls, Wheel-Rims, &c., of which the following is a full, clear, and exact description.

The fixture for turning balls, wheel and other rims, and such like work of this invention is more particularly designed and intended for use in slide-lathes of the general construction and arrangement of parts, including the slide-carriage and means of moving it horizontally along and vertically in relation to the lathe-bed or shears, fully shown and described in a separate application for Letters Patent of the United States of even date herewith; but, as will be obvious from the description hereinafter given, this fixture is adapted to be used in slide-lathes and with slide-carriages of other constructions and arrangements of parts.

This invention in substance consists, first, of a fixture to be used in slide-lathes for turning balls, wheel and other rims, and such like work, composed of a post or other suitable holder for a tool or cutter, a carrier for said holder, made in parts severally constructed and arranged to slide in rectilinear and curvilinear directions the one upon the other, and mechanism by which to slide or move said parts in a curvilinear direction, all substantially as hereinafter described; second, of a fixture to be used in slide-lathes for turning balls, wheel and other rims, and such like work, composed of a post or other suitable holder for a tool or cutter, a carrier for said holder, made in parts severally constructed and arranged to slide in a curvilinear direction the one upon the other, and mechanism by which to move or slide said parts in a curvilinear direction, in combination with a slide-carriage of a slide-lathe, constructed and arranged upon the lathe-bed or shears for movement and adjustment horizontally and lengthwise thereof and vertically thereon, all substantially as hereinafter described.

In the drawings forming a part of this specification, the fixture of this invention and its combination with a slide-rest and a slide-carriage of a slide-lathe are illustrated.

In Plate 1, Figure 1 is a plan view of a fixture and of a slide-lathe with a slide-carriage and slide-rest, and showing a ball in position for being turned by the tool carried by the fixture, under suitable movements and adjustments of the fixture, slide-rest, and slide-carriage.

In plate 2, Fig. 2 is a view in elevation of the lathe-bed and of the fixture from the tail-stock end of the lathe. Fig. 3 is a front elevation of the fixture detached. Fig. 4 is a vertical section on line 4 4, Fig. 3. Fig. 5 is a horizontal section on line 5 5, Fig. 4, and showing in plan view position of slide-carriage and lathe-bed.

In the drawings, A represents the lathe-bed or shears supported at each end on legs A^2, and B is the stationary head-stock at one end thereof.

C is a horizontal arbor mounted and turning in the head-stock B, and interiorly carrying a lathe spindle or mandrel, D, for chucking or otherwise securing a tool or piece of work thereto, and through it to lathe-arbor C, all as well known.

E is a cone-pulley of varying diameters and loose, but suitably confined, and F is a gear-wheel fixed on the lathe-arbor C, and adapted in any suitable manner to be locked with and unlocked from cone-pulley.

G is a gear-wheel on cone-pulley E, and H and J are two gear-wheels, which mesh, respectively, with gear-wheel F of lathe-arbor C and gear-wheel G of cone-pulley E, and are both mounted on a common horizontal shaft, K, which is back of the lathe-arbor C, and turns in bearings of the head-stock, and otherwise is arranged, as usual, to be adjusted to place its gear-wheels H J in and out of mesh with the gear-wheels F G of lathe-arbor C and cone-pulley E.

L is a pinion-wheel on lathe-arbor C, and this pinion is connected to the gear-wheel P of a leading-screw, M, through the train of gearing and other mechanism shown in the drawings, and all as fully described in the specification accompanying an application on improvements in slide-lathes for Letters Patent of the United States, Serial No. 204,624, filed June 9, 1886, of even date herewith, and to which reference is hereby had for a particu-

lar description thereof, and whereby said leading-screw M from the rotation of the lathe-arbor can be rotated in either direction, and again, from the rotation of the leading-screw M, a parallel leading-screw, M^2, below and geared with it, can be also similarly rotated in either direction. This train of gearing and said mechanism form no part of this invention.

The rotation of the leading-screws M M^2 is for the purpose of moving a slide-carriage lengthwise along the front-check of the lathe-bed or shears, and which carriage is suitably constructed therefor, and the upper leading-screw, M, which is for fine work, connects with sectional or half screw-nuts D^2 (one only shown) of the slide-carriage, and the lower leading-screw, M^2, which is for general work, connects with the carriage mechanism, consisting, among other parts, of a hand-wheel, N^2, and otherwise all as fully described and shown in the application aforesaid, and the whole such as to enable the slide-carriage to be moved lengthwise of the lathe-bed in either direction, and either from the action of the driving mechanism of the lathe or by the hand-wheel, and also to enable the speed of such movement to be varied and adjusted, and either of the leading-screws to be brought into action upon the slide-carriage, and all as is fully shown and set forth in the application aforesaid. These several parts and combination and arrangement, as above referred to, form of themselves no part of this invention, and so it is not deemed necessary to herein further describe them.

The slide-carriage is in two parts—to wit, a vertical plate or block, B^3, with a front flat face, and a back face of angular shape to fit a corresponding angular-shaped guideway, C^2, therefor of the front cheek of the lathe-bed, and a bracket with an upright portion, B^4, arranged to move vertically in a dovetail way, B^6, of the front face of the block B^3, and a horizontal arm or table, B^7, which projects from the upper end of said upright B^4 and at right angles to the length of the slide-carriage, and which is made of fork shape, and preferably with the space between its tines open at the front end, B^9.

The bracket B^4 B^7 is vertically adjustable on the slide-carriage through the turning of a vertical screw-rod, B^{10}, engaging with a vertical screw-nut portion (not shown) of the upright, and turning loosely within a horizontal bearing-block, B^{12}, but suitably confined against lengthwise movement by the rest of its shoulder (not shown) on a shoulder (not shown) of the bearing-block. This screw-rod B^{10}, by which to adjust the bracket B^4 B^7 vertically, as above stated, at its lower end has a milled head, B^{13}, peripherally and properly graduated in one hundred equal parts or divisions, each representing a one-thousandth of an inch, and figured for the rise and fall of the bracket from the turning of said screw to be measured and determined in one-thousandth parts of an inch, using a suitable index-mark (not shown) at the front of the bearing-block B^{12} of the screw-rod.

The fork-shaped table B^7 of the vertically-adjustable bracket B^4 B^7 supports a slide-rest and the fixture and mechanism of this invention, to be now particularly described, and which is composed of five separate moving and adjustable horizontal parts or slides, C^3 C^4 C^5 C^6 C^7, placed upon each other. Slide C^3, the lower slide, has parallel flaring edges *d* running along its length and setting over corresponding parallel flaring edges of the bracket-table B^7, and which run at right angles to the lathe-bed.

C^7 is a screw-bolt projecting downward from slide C^3, and passing between the tines of the table B^7, and C^8 is a screw or thumb-nut screwing on said bolt, all for fastening slide C^3 to and against movement on table B^7. Slide C^4, the slide next above slide C^3, fits by the rectilinear dovetail way on its under side over a corresponding dovetail projection, C^9, on the upper side of the lower slide, C^3, both running in the direction of the slideways of slide C^3 on bracket B^4 B^7, and thus slides C^3 C^4 are adapted for a movement of one upon the other in a horizontal plane parallel with and in the direction of the horizontal slide C^3 on bracket B^4 B^7 of slide-carriage.

Slide C^4 on its upper side has a circular running projection, C^{31}, of dovetail shape in cross-section, engaging with a corresponding dovetail groove in the under side of slide C^5, next above slide C^4. This circular running dovetail projection C^{31} and groove-connection between slides C^4 and C^5 has its center coincident with the central axial line of rectilinear movement of slide C^4 on slide C^3, and slide C^5 in its upper side has also a circular running groove or way, C^{32}, of T shape in cross-section, and concentric with the center of the circular running dovetail groove and projection C^{31} of slide C^4, and this way C^{32} receives a bar or rail, C^{33}, correspondingly curving from end to end, and of a corresponding T shape, and to which on its upper side is secured a block or the slide C^6 by two vertical and headed set-screws, C^{34}, passing loosely through the thickness of the slide C^6, and screwing into said bar C^{33}, and all so that slide C^5 can be fastened to said curved bar C^{33}, and said curved bar made fast or bound to slide C^5. The set-screws C^{34} are at opposite ends of the curved bar C^{33}. Slide C^6 on its upper side has a dovetail groove or way engaging a corresponding dovetail projection, C^{35}, of slide C^7, which is the upper slide of the series of slides, and this dovetail projection C^{35} and its groove are in a direction coincident with a radial line of the curved ways and projections of the slides between the upper and lower slides, C^3 C^7, all as herein before described. The upper slide, C^7, and slide C^6, next below, connected by dovetail projection and groove, as described, are thus made capable of rectilinear movement and adjustment upon each other, and the upper slide, C^7, has a tool-post or holder, C^{37}, of the usual or

any suitable construction, secured to it for holding a tool.

A horizontal screw-rod, C^{10}, is provided for the rectilinear movement of slide C^4 on lower slide, C^3, and a similar screw-rod, C^{20}, for the rectilinear movement of the upper slide, C^7, on slide C^6, next below, and in each instance the screw works in a stationary screw-nut, C^{11} and C^{21}, respectively, of the one slide and turns loosely in a bearing-block, C^{12} and C^{22}, respectively, of the other slide of the pair of slides to which it directly belongs, and all otherwise, so that by turning the screw-rod the slides of the pair of slides to which it is connected will be moved or adjusted rectilinearly upon each other.

The bearing-block C^{12}, for the operating screw-rod C^{10} of the slide C^4 on slide C^3, is made in parts, secured together and to the slide C^3, and it is engaged with the rod C^{10}, and again the screw-rod is provided with a friction-tight milled head, C^{30}, peripherally graduated and in one hundred equal parts or divisions, each representing, with the screws turned through the space between any two of the graduations of the milled head, using a suitably-located stationary index-mark, Fig. 5, as a guide, a one-thousandth of an inch in the movement of slide C^4, operated by it, and the whole representing with the screw turned a complete rotation a movement of the slide operated by it through one-tenth of an inch. Further than this, the operating-screw C^{10} and its bearing-block and milled head are all otherwise constructed and arranged as fully described in the application aforesaid.

C^{36} is a curving and toothed rack of the curvilinear moving slide C^5, and concentric with the curving dovetail projection C^{31} of said slide, and C^{37} is a worm on a horizontal shaft, C^{38}, and meshing with the teeth of the curving toothed rack C^{36}. The axis of the worm-shaft C^{38} is parallel with a tangential line of the toothed rack C^{36} of slide C^5, and the shaft is arranged to turn, being confined against lengthwise movement in suitable bearings of slide C^4.

C^{39} is a handle at one end of worm-shaft C^{38} for convenience in turning it, and by turning the shaft through the mesh of its worm C^{37} with the curving toothed rack C^{36} of slide C^5 such slide is moved in a curvilinear direction on slide C^4.

Having secured the work to be turned to the lathe-arbor and the tool to the tool-post of the fixture and slide-rest of this invention, and as herein described, the parts of said fixture and slide-rest are then moved and adjusted upon each other for the proper and desired presentation of the cutting-edge of the tool to the work—such, for instance, a ball, C^4, as shown. With the tool thus presented, and the slide-lathe adjusted, as well known, for the movement, from the turning of either leading-screw M M^2, the slide-carriage is moved lengthwise of the lathe-bed, carrying with it the slide-rest and the tool secured to its tool-post, in a direction across the work or ball to be turned, and parallel to the longitudinal axis of the lathe-arbor, the tool at the same time being given another and curving movement in relation to the ball so being turned, by turning the worm-shaft C^{38}, and thus the work on, and rotating with, the lathe-arbor is turned of the spherical other round shape desired, all as is obvious or without further description.

A fixture and slide-rest such as described, and the tool fixed on its tool-post, and the slide-rest supported on a slide-carriage, having a movement lengthwise of an adjustment vertically in relation to the lathe-bed, all as described, plainly with rectilinear and curvilinear movements and adjustments of the parts or slides of the slide-rest upon each other herein described, the work secured on the lathe-arbor can be turned within given limits to a curvilinear or round form of a greater or less radius in the longitudinal direction of the lathe-bed and at a greater or less distance from the center of rotation of the work.

If desired, two or more cutting-tools may be used at one time, each tool carried by a separate tool post or holder—such as C^{23}, of separate slides, such as C^6 and C^7—and the slide C^6 of each pair of slides C^6 C^7 arranged to be placed and adjusted in and around a common circular T-shaped way of slide, C^5, all as has been fully described.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a slide-lathe, a fixture to turn balls, wheel-rims, &c., composed of a suitable tool-holder, a carrier for the tool-holder, made in separate parts or slides constructed and arranged together for rectilinear and curvilinear movements and adjustments thereof, and mechanism to move its curvilinear moving part or slide, in combination with a slide-carriage receiving said fixture, and it and the fixture constructed for a horizontal adjustment of the fixture on the carriage, and the carriage arranged for a longitudinal and vertical adjustment in relation to the lathe-bed or shears, substantially as described, for the purpose specified.

2. In a fixture for slide-lathes to turn balls, wheel-rims, &c., a suitable tool-holder, a carrier for the tool-holder, made in separate parts or slides C^3, C^4, C^5, C^6, and C^7, respectively constructed with engaging dovetail projections and ways, in combination with a circular toothed rack, C^{36}, of slide C^5 and meshing worm-gear C^{37}, supported and turning upon slide C^4, substantially as described, for the purpose specified.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

GEO. F. BALLOU.

Witnesses:
ALBERT W. BROWN,
FRANCES M. BROWN.