(No Model.)

2 Sheets—Sheet 1.

G. F. BALLOU.

DRILLING FIXTURE FOR LATHES.

No. 359,375. Patented Mar. 15, 1887.

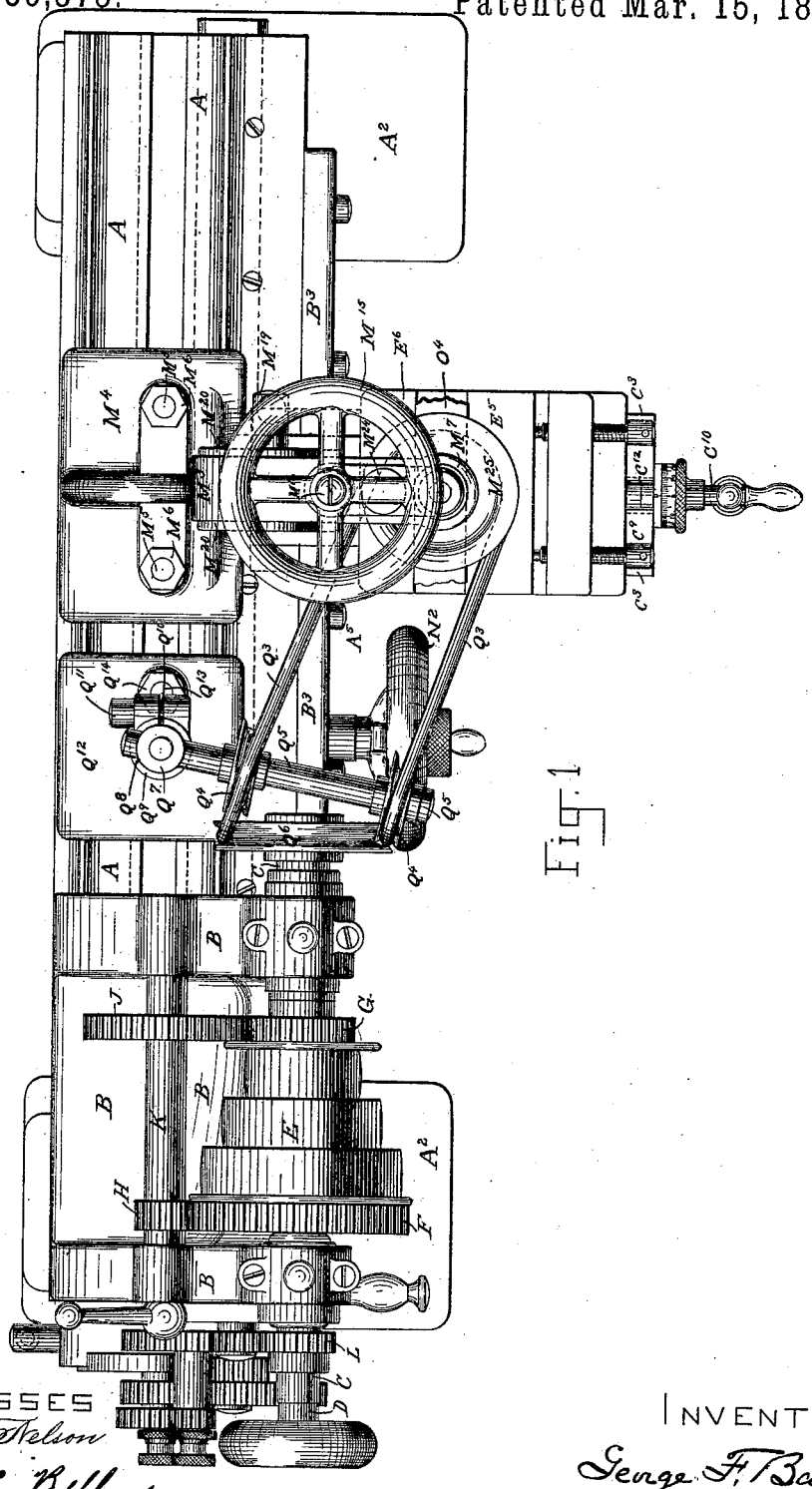

Fig. 1

WITNESSES

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(No Model.) 2 Sheets—Sheet 2.

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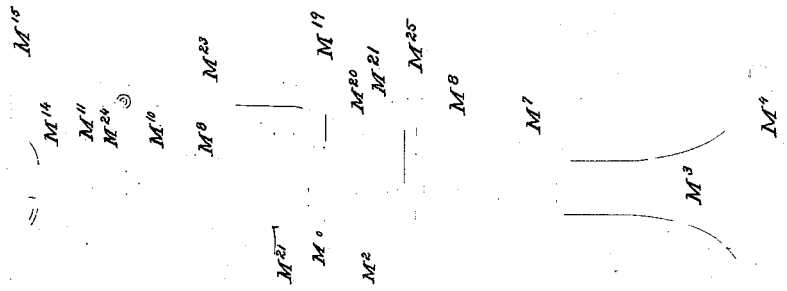

Fig. 3

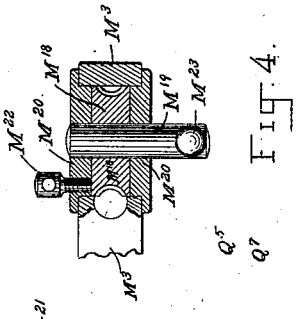

Fig. 4.

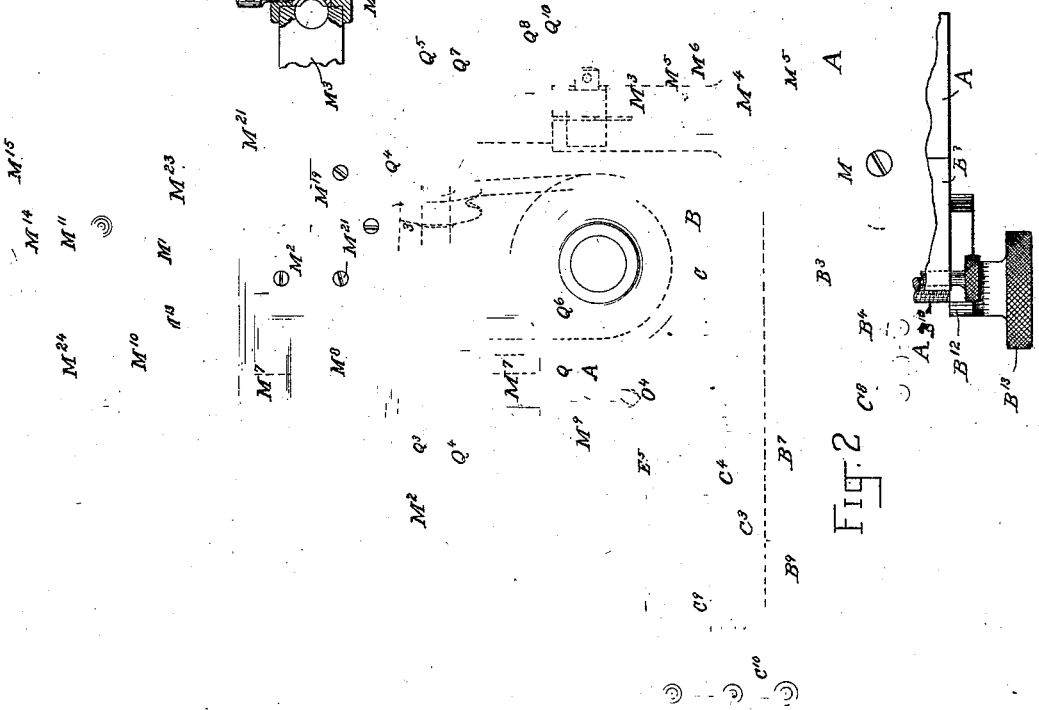

Fig. 2

WITNESSES

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UNITED STATES PATENT OFFICE.

GEORGE F. BALLOU, OF WALTHAM, MASSACHUSETTS.

DRILLING-FIXTURE FOR LATHES.

SPECIFICATION forming part of Letters Patent No. 359,375, dated March 15, 1887.

Application filed June 9, 1886. Serial No. 204,619. (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 Vertical Drilling, &c., Applicable to Slide-Lathes, of which the following is a full, clear, and exact description.

This invention relates to a fixture to be used in slide-lathes for vertical drilling, milling, reaming, and other like purposes, and is more particularly designed and intended for use in a slide-lathe of the general construction and arrangement of its parts, and more especially of its slide-carriage and slide-rest, fully shown and described in a separate application for Letters Patent of the United States of even date herewith, filed June 9, 1886, Serial No. 204,624, and also in connection with a clamp or vise to hold the work to be drilled, and which is carried by the slide-rest of the lathe, and of a construction and arrangement of parts 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 which follows, the fixture of this invention is adapted to be used in slide-lathes and with slide carriages and rests and vises or clamps to hold the work to be drilled of other constructions and arrangement of parts.

This improved vertical-drilling fixture is composed of an upright or standard, which is suitably constructed to be placed and longitudinally adjusted and secured upon the lathe bed or shears, and has a vertical bracket projecting at right angles to the length and in front of the lathe-bed, a vertical spindle or mandrel arranged to rotate in and to move vertically through suitable bearings therefor of said bracket, and its lower end receiving and securing the drill or other tool, in combination with a vertical screw-rod and a vertical worm gear-wheel, both carried by said standard, and the one—the screw-rod—connected to said tool carrying and rotating spindle and arranged to move vertically through a suitable guideway of the standard, and the other—the worm gear-wheel—arranged to turn by its arbor in suitable bearings of the standard and to mesh with and on being turned to move said screw-rod vertically, and also adapted to be made fast to and loose from said standard, all substantially as hereinafter described.

Again, this invention consists in the combination, with a vertical-drilling fixture substantially such as above described, of veritcal idler pulley-wheels which are carried by and turn on a support horizontally and vertically adjustable in relation to a shoe-plate, suitably constructed to be placed and longitudinally adjusted and secured on the lathe-bed, and all so that belt-connection may be made between the pulley-wheel of the vertical tool-spindle of the fixture aforesaid and a pulley-wheel attached to and rotating with the rotating arbor or mandrel or spindle of the head-stock of a slide-lathe for the purpose of rotating said drill-spindle from the rotation of said lathe arbor or mandrel.

In the drawings forming a part of this specification the present improved fixture is illustrated in connection with a slide-lathe and slide-carriage and clamp or vise to hold a piece of work to be drilled by the fixture of a construction and arrangement of parts such as referred to.

In Plate 1, Figure 1 is a plan view of the slide-lathe and of the fixture of this invention applied to its bed or shears, and of the clamp or vise for securing work in position to be operated upon by the drilling-fixture.

In Plate 2, Fig. 2 is an elevation of the lathe-bed and fixture of this invention and other parts as the same are shown in Fig. 1, and from the tail-stock end of the lathe, the tail-stock, however, being removed. Fig. 3 is a front view of the drilling part of the fixture detached from the lathe-bed; and Fig. 4 is a horizontal section in detail on line 4 4, Fig. 2.

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 a piece of work thereto, and through it to the arbor of head-stock, all as well known.

E is a cone-pulley of varying diameters, and loose but suitably laterally confined, and F is a gear-wheel fixed on the 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 of head-stock and gear-wheel G of cone-pulley E, and are both mounted on a common horizontal shaft, K, which is back of the 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 arbor C and cone-pulley E.

L is a pinion gear-wheel on lathe-arbor C, and this pinion is connected to a leading-screw, M, Fig. 2, 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-lathe for Letters Patent of the United States, hereinbefore referred to, and to which reference is hereby had for a particular 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 (not shown) 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 referred to is for the purpose of moving a slide-carriage lengthwise along the front cheek 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 of the slide-carriage, and the lower leading-screw, (not shown,) which is for general work, connects with the slide-carriage by 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 application aforesaid. These several parts and their 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 bracket, with an upright portion, B^4, arranged to move vertically in a dovetail way 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 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 the vertical screw-nut portion B^{11} of the bracket, and turning loosely within a horizontal bearing-block, B^{12}, of the slide-carriage, and therein confined against lengthwise movement in any suitable manner. This screw-rod B^{10}, by which to adjust the bracket B^4 B^7 vertically, as above stated, has at its lower end 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 at the front side of the bearing-block B^{12} of the screw-rod.

The vertically-adjustable bracket B^4 B^7 of slide-carriage supports and carries a slide-rest in two horizontal parts or slides, C^3 and C^4, placed upon each other. Slide C^3—the lower slide of the slide-rest—is made with flaring edges, which fit and set over corresponding flaring edges of the bracket-table B^7. The direction of these flaring edges transversely to the width of the bracket-table B^7, and as shown, is preferably such as to permit slide C^3 to be set bodily upon the bracket-table B^7 without requiring it to be slid lengthwise along the same, and otherwise all arranged for slide C^3, with the other slide of the slide-rest, to be moved horizontally on the table B^7 forward to and backward from the axial line of the lathe-arbor. A screw-bolt (not shown) projects downward from slide C^3 of slide-rest and between the tines of the forked table B^7, and C^5 is a screw or thumb nut screwing on said bolt and fastening said slide C^3 to table B^7 and against movement thereon. Slide C^4 of the slide-rest fits by a dovetail way in its under side over a corresponding dovetail projection, C^9, on upper side of lower slide, C^3, and thus slides C^3 C^4 are adapted for a movement of the upper slide on the lower slide of the two and in a horizontal plane, and one parallel with and in the direction of the horizontal slide of the lower slide, C^3, on bracket B^4 B^7. Slide C^4 has a circular and vertical edge, and it is marked off or graduated in representation of the degrees of a circle, Fig. 2, and it is provided with a horizontal screw-rod, C^{10}, which engages with a screw-nut (not shown) and turns loosely in a bearing-block, C^{12}, of the lower slide, C^3, and by peripheral collar and groove (not shown) is engaged with said bearing-block C^{12}, and thus screw-rod C^{10}, when turned, is confined against lengthwise movement through said block.

E^6 is the adjustable jaw and E^5 is the stationary jaw of the work-clamp or vise carried

by slide C^4 of the slide-rest, and all as fully described and shown in the application before referred to. These clamp-jaws E^5 E^6 form no part of this invention, and in lieu of them other clamps or vises may be used for securing work to the slide-rest; but the clamp shown is deemed to be a most preferable one for use in connection with the vertical-drilling attachment of this invention, to be now particularly described.

M^3 is an upright or standard rising from a shoe-plate, M^4, which sets upon the lathe bed or shears A, and has screw-bolts M^5 and nuts M^6 for fastening it thereon and against movement.

M^7 is a vertical bracket, consisting, in substance, of two horizontal projecting arms at one side of the standard M^3 and to and forward of the front A^5 of the lathe-bed. This bracket M^7 carries a vertical spindle, M^8, which turns and is free to be moved up and down in suitable bearings thereof.

M^9 is a drill secured in the lower end of the spindle M^8, and M^{10} a horizontal arm at one end secured to drill-spindle, and its opposite end has a vertical sleeve, M^{11}, loosely surrounding the upper and plain portion of a vertical screw-rod, M^{12}, and confined against endwise movement between a shoulder, M^{13}, thereof and the end of the hub M^{14} of a hand-wheel, M^{15}, secured by the overlapping head of a headed screw, M^{16}, entered into the upper end of the screw-rod M^{12}. The screw-rod M^{12} is free to turn in the sleeve M^{11} of the arm connecting it to drill-rod M^8, and it extends downward and enters loosely into a vertical socket or bore, M^{17}, of the standard M^3, and therein it meshes with a vertical worm gear-wheel, M^{18}, having a horizontal arbor or shaft, M^{19}, turning in suitable bearings of cap-plates M^{20} on opposite sides of the worm gear-wheel M^{18}, and shouldered and fitted into the end openings on each side of the chamber of the standard M^3, and which receives the worm-gear M^{18}. The cap-plates M^{20} are secured by fastening-screws M^{21}, entered through them into the standard M^3.

M^{22} is a set-screw, which screws through one of the cap-plates M^{20} and in a direction to be brought to a bearing against one side of the worm-gear M^{18}, and thus brought to such a bearing to fasten the gear against movement, making of it a screw-nut to the screw-rod M^{12}, so that by the then turning of the screw-rod, using the hand-wheel M^{15}, it will be caused to move vertically, carrying with it, and because of its described connection with the drill-spindle M^8, such spindle and its drill, and either up or down, according to the direction in which the hand-wheel is turned. Releasing the set-screw M^{22} from the bearing against the side of the worm-gear M^{18} leaves the worm-gear free to be turned through its shaft M^{19}, which has a handle, M^{23}, for convenience in turning it, and on so turning worm-gear M^{18} screw-rod M^{12}, and through it the drill-spindle M^8, are both moved vertically, and either up or down, according to the direction in which the worm-gear is turned.

M^{24} is an adjustable screw-stop to the downward movement of the drill-spindle. This stop M^{24} is carried by the horizontal arm M^{10}, making connection between the drill-spindle M^8 and its operating screw-rod M^{12}, and in the downward movement of the drill-rod it comes to a stop against the upper edge of the side bracket, M^7, of the standard M^3.

The drill-spindle, arranged as above described, has a horizontal pulley-wheel, M^{25}, partially surrounded by a belt, Q^3, the two lengths of which extend to and over the upper side of separate vertical idler-pulleys, Q^4 Q^4, of a common horizontal shaft, Q^5, supported as hereinafter described, and thence around a vertical pulley-wheel, Q^6, secured to and turning with the lathe-arbor, and all so that the rotation of the lathe-arbor rotates the drill-rod. The shaft Q^5 of the idler-pulleys is horizontal, and at one end it turns in the upper end of a standard, Q^7, fitting within and vertically adjustable, as also capable of being swung, in the vertical socket Q^8 of a post, Q^9, split, as at Q^{10}, for a portion of its length, and provided with a screw, Q^{11}, for tightening its so split portion upon and loosening it from the standard Q^7. The post Q^9, making the bearings for the standard on which the shaft Q^5 of the idler-pulleys turns, is carried by a shoe-plate, Q^{12}, setting upon the lathe bed or shears, and adapted to be adjusted and secured against movement by a fastening screw-bolt, Q^{13}, and screw-nut Q^{14}, the same as described for the shoe-plate M^4, carrying the standard M^3, with the vertical drill-spindle M^8 and its attachment and connections, as has been described.

In the use of the vertical-drilling fixture herein described it and its idler-pulleys Q^4 are placed upon the lathe-bed, and, having made all adjustments and connections necessary to present the idler-pulleys in relation to the driving-pulley of the lathe-arbor and the drill and work in the proper relation to each other, the drill-spindle is set in motion, and with the worm gear-wheel M^{18} tightened or secured against movement and made a screw-nut for the screw-operating rod M^{12}, the drill, through the turning of the hand-wheel M^{15}, is gradually advanced and entered into its work O^4, clamped between the clamping-jaws E^5 E^6 of the slide-rest, and when the desired depth of bore has been secured—regulated or determined, if so desired, by a previous adjustment of the stop-screw M^{24} therefor—the vertical drill is then withdrawn through the turning of the worm gear-wheel, which for such purpose is unbound or released from the standard M^3 by loosening the set-screw M^{22}, and, with the drill out of the hole just bored, if the drill is again to be returned to bore the work clamped in the lathe, the worm gear-wheel is again tightened up and the drill advanced, as

has been described, by the turning of the hand-wheel, and so on.

Tools other than drills may be used in the fixture of this invention and herein described—as, for instance, a reaming, a milling, or a boring tool—and therefore the invention is not to be limited in that relation.

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

1. A vertical fixture for drilling, reaming, milling, and other purposes, composed of a standard having a side projecting bracket, a rotating vertical spindle for the drill or other tool turning in and vertically movable through bearings of said bracket, a vertical screw-rod carried by and having a vertical movement through said standard and connected to said tool-carrying spindle, and a worm-gear meshing with said screw-rod and its arbor, supported and turning in bearings of the standard and adapted to be made fast to and loosened from said standard, substantially as described, for the purpose specified.

2. In the combination, with the lathe bed or shears of a slide-lathe, of a vertical fixture for drilling, reaming, milling, and other purposes, composed of a standard constructed for longitudinal adjustment upon and to be fastened to the lathe bed or shears, and having a side projecting bracket, a rotating vertical spindle for the drill or other tool turning in and vertically movable through bearings of said bracket, a vertical screw-rod carried by and having a vertical movement through said standard and connected to said tool-carrying spindle, and a worm-gear meshing with said screw-rod and its arbor, supported and turning in bearings of the standard and adapted to be made fast to and loosened from said standard, substantially as described, for the purpose specified.

3. In the combination, with the lathe bed or shears of a slide-lathe, of a vertical fixture for drilling, reaming, milling, and other purposes, composed of a standard constructed for longitudinal adjustment upon and to be fastened to the lathe bed or shears, and having a side projecting bracket, a rotating vertical spindle for the drill or other tool turning in and vertically movable through bearings of said bracket, a vertical screw-rod carried by and having a vertical movement through said standard and connected to said tool-carrying spindle, and a worm-gear meshing with said screw-rod and its arbor, supported and turning in bearings of the standard and adapted to be made fast to and loosened from said standard, a pair of idler-pulleys of a common horizontal shaft turning in suitable bearings of a vertical and horizontal adjustable support, constructed for a longitudinal adjustment upon and for being fastened to the lathe bed or shears, and a pulley-wheel of head-stock spindle or arbor of the lathe, substantially as described, for the purposes 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.