

(No Model.)

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W. LODGE.
LATHE.

No. 522,607.

Patented July 10, 1894.

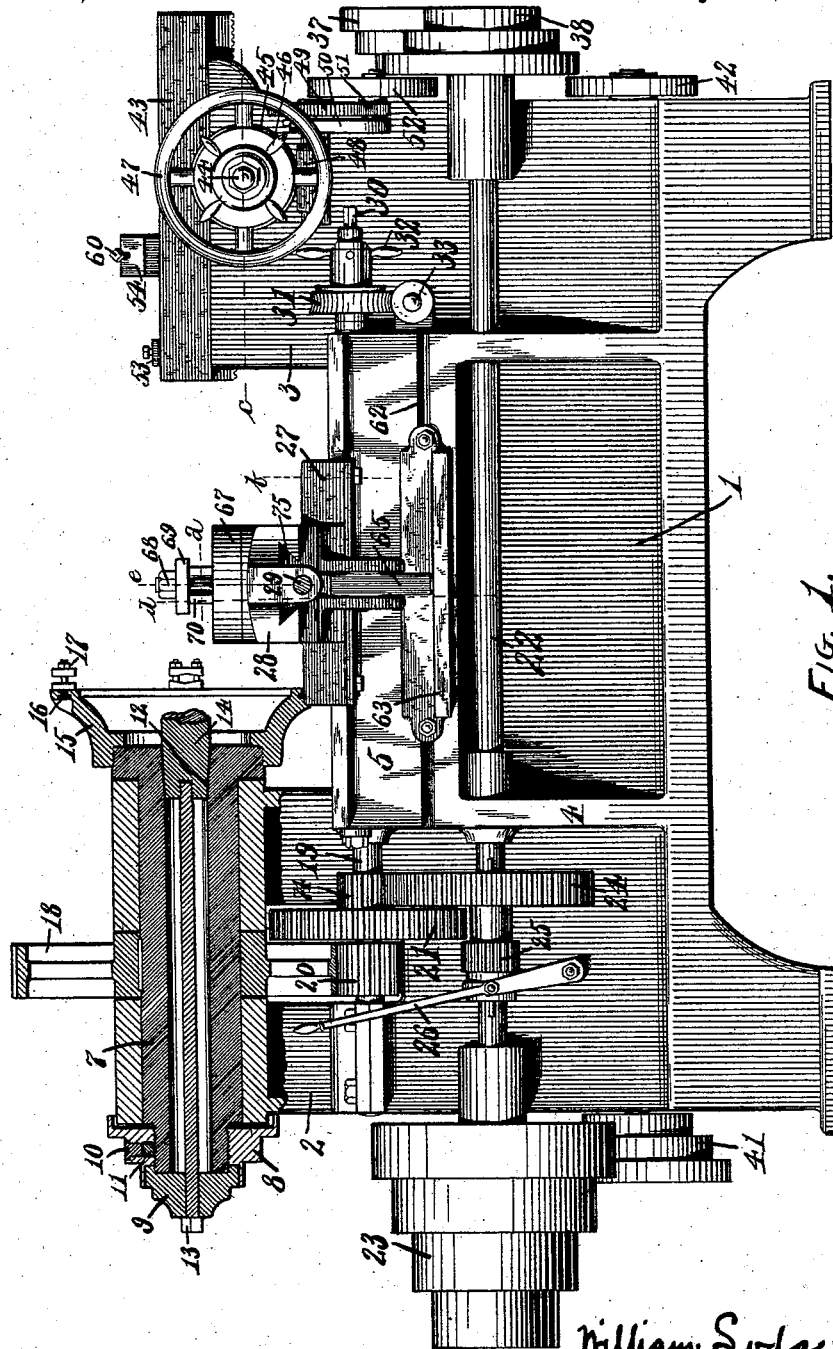


Fig. 1.

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by James N. See
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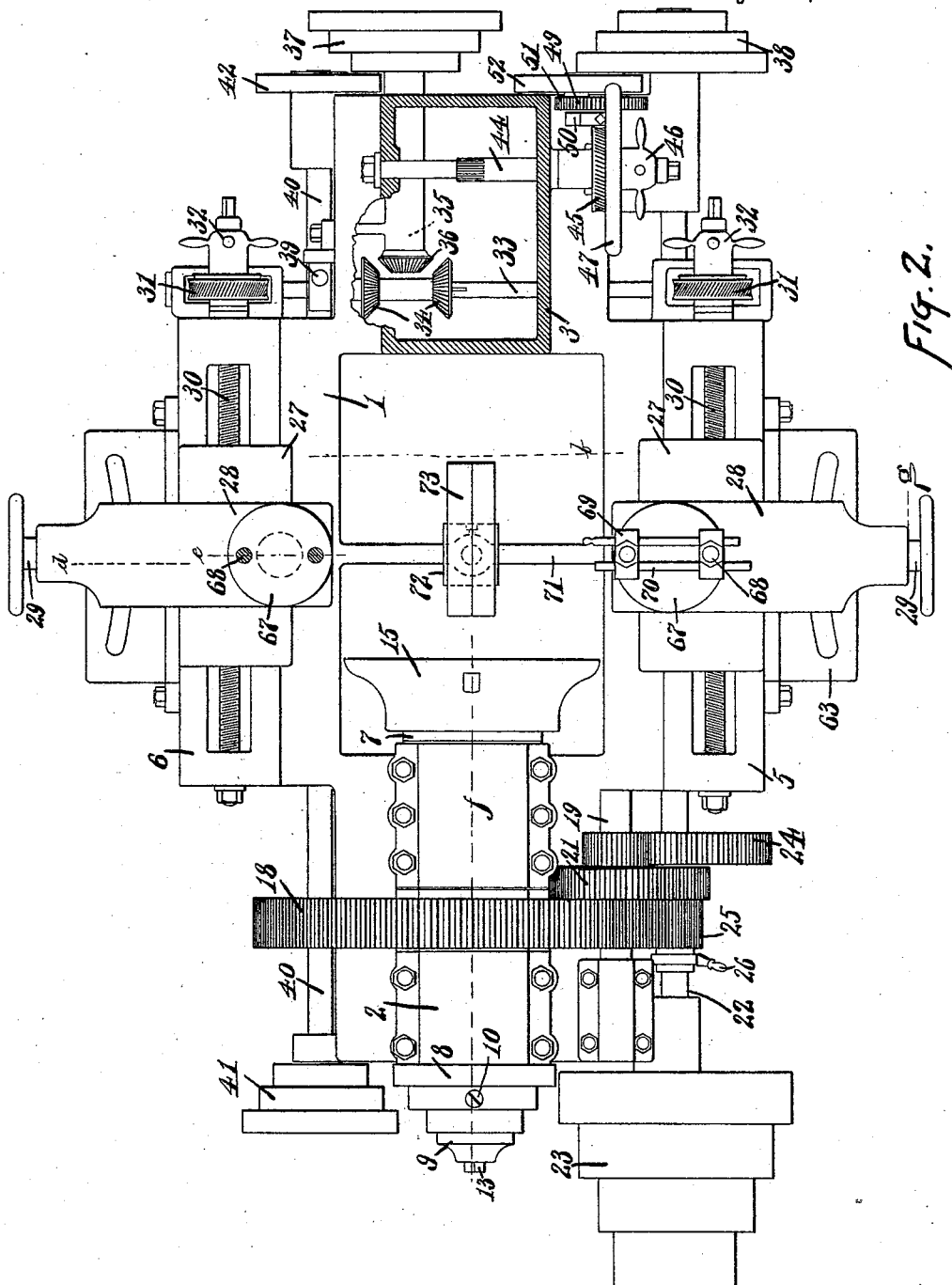
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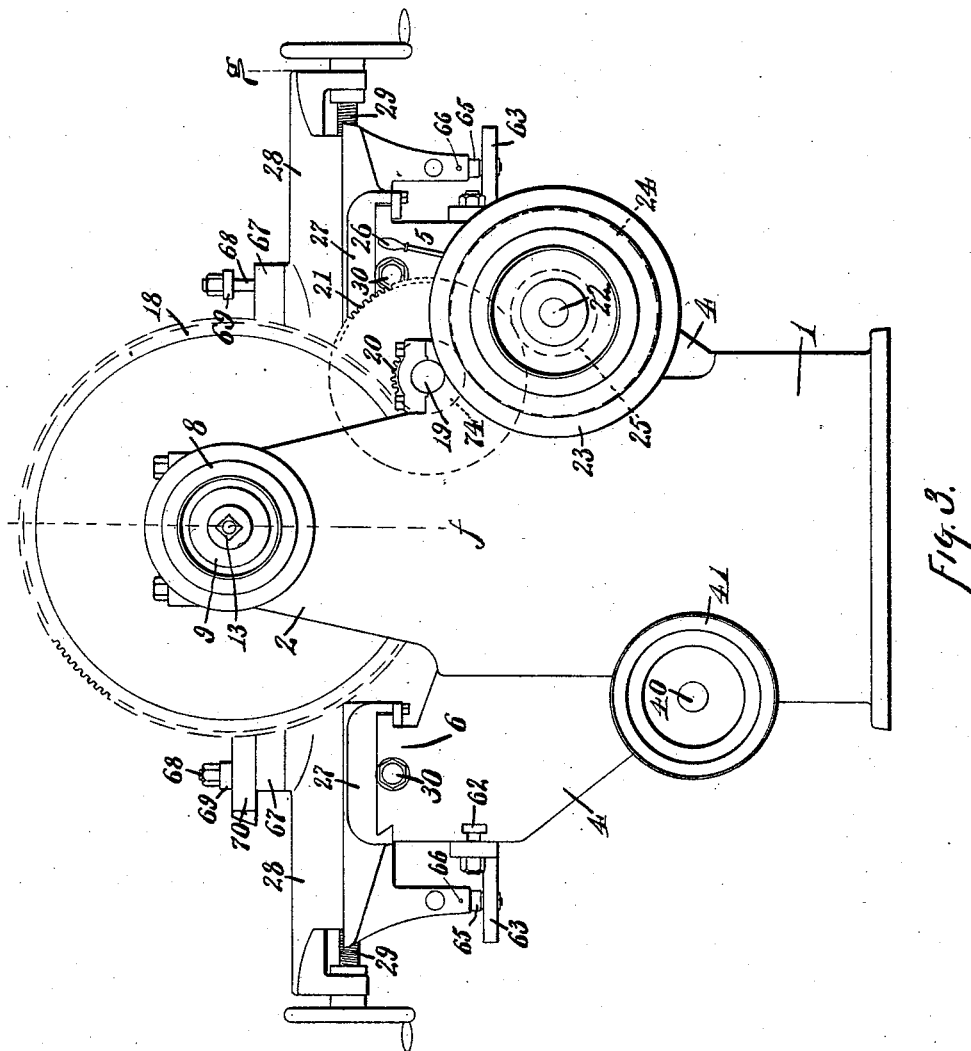
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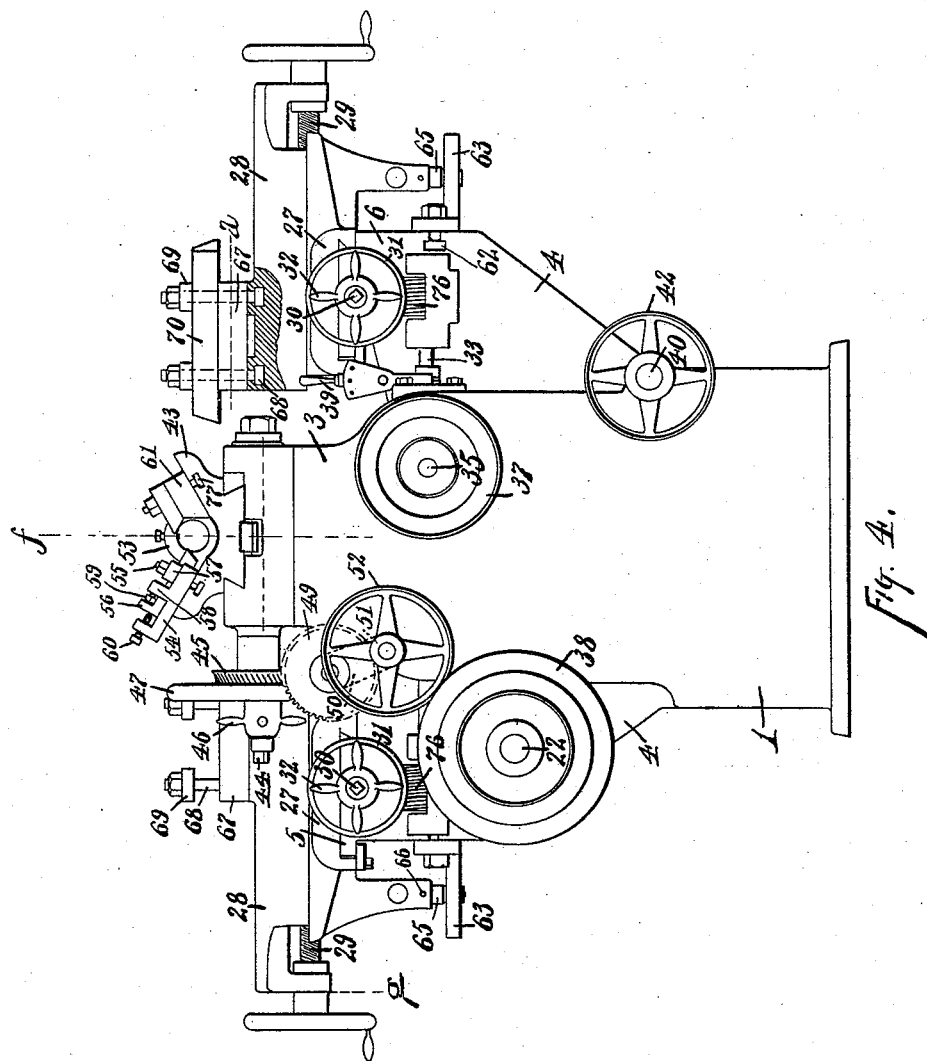
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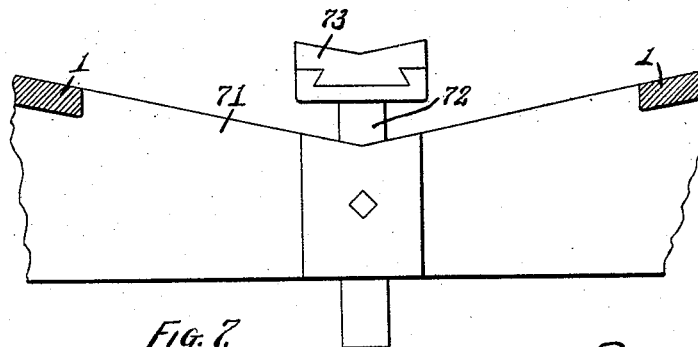
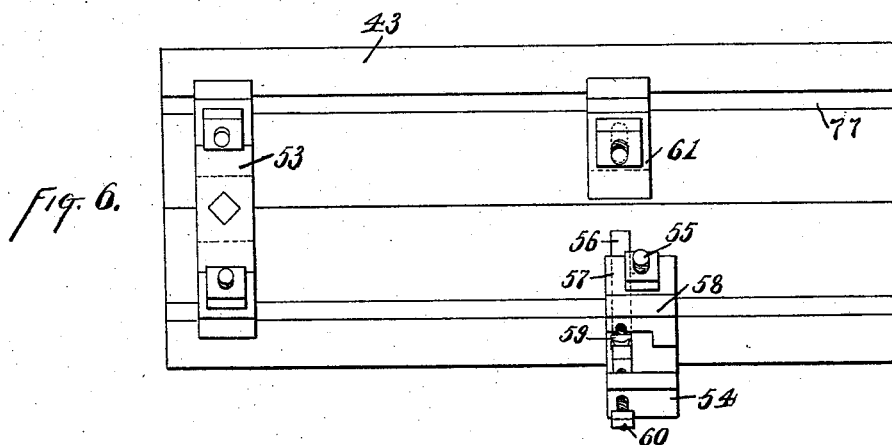
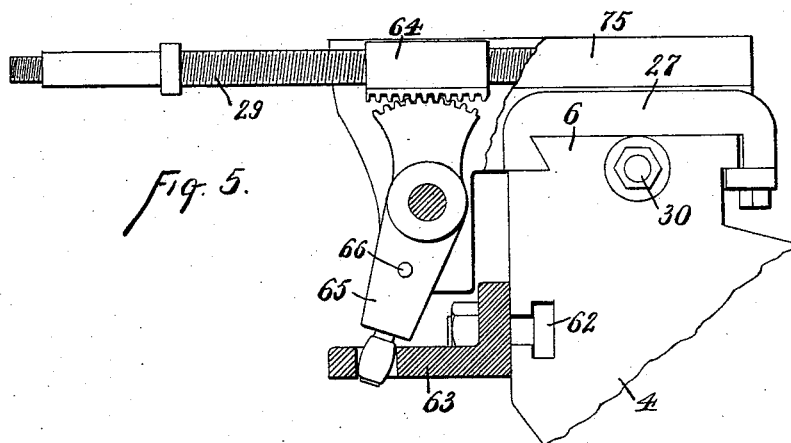
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UNITED STATES PATENT OFFICE.

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LATHE.

SPECIFICATION forming part of Letters Patent No. 522,607, dated July 10, 1894.

Application filed June 6, 1892. Serial No. 436,714. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM LODGE, of Cincinnati, Hamilton county, Ohio, have invented certain new and useful Improvements in Lathes, of which the following is a specification.

This invention pertains to improvements in metal working lathes, and the improvements are designed to increase the accuracy of the work produced and to increase the rapidity of production, the lathe being designed for general boring and turning within its limits.

My improvements will be readily understood from the following description, taken in connection with the accompanying drawings, in which—

Figure 1, is a front elevation of a lathe exemplifying my present invention, the arbor-bearing appearing in vertical section, plane of line *f* of Figs. 2, 3 and 4; Fig. 2, a plan of the machine, the tail-stock appearing in horizontal section, in the plane of line *c* of Figs. 1 and 4, and the rear main tool-holding bolts appearing in horizontal section in the plane of line *a* of Fig. 1; Fig. 3, an end elevation at the head-stock end of the machine; Fig. 4, an end elevation at the tail-stock end of the machine, a part of the rear tool rest appearing in vertical section in the plane of line *e*, Figs. 1 and 2; Fig. 5, an end elevation at the head end of the rear rail, showing the rear saddle, part broken away, in connection with its cross-feed screw and taper-turning mechanism, the former-plate appearing in vertical section in the plane of line *b*, Figs. 1 and 2; Fig. 6, a plan of the tail-slide; and Fig. 7, a vertical transverse section of a portion of the bed, in the plane of line *b*, Fig. 1, showing the setting-rest. Figs. 5, 6 and 7 are upon an enlarged scale. The lines indicating the planes of sections will be found on all of the figures so far as applicable.

In the drawings, referring to Fig. 1 as far as possible:—1, indicates the bed of the lathe, having the usual rectangular plan: 2, the head-stock projecting upward from the head end thereof and cast integrally therewith: 3, the tail-stock projecting upward from the tail end of the bed and cast integrally with it: 4, brackets projecting outwardly from the front and rear sides of the bed for the support of

the rails on which the tool-carriages slide: 5, the front rail, integrally cast with the bed and with the brackets which support it, this rail forming a rigid slide-way parallel with the axis of the lathe for supporting and guiding the front tool-carriage: 6, (Fig. 2) a similar rail structure at the rear of the bed: 7, the main arbor, journaled in the head-stock, and bored lengthwise, and projecting outwardly through its bearing and having this projection threaded: 8, a nut screwed upon this threaded projection of the arbor and serving as the adjustable outer collar for the arbor, this nut having its exterior formed into a cone pulley, for feeding purposes, the term cone pulley being used as ordinarily applied to stepped cone pulleys: 9, a lock-nut screwed upon the outer projection of the arbor outside the nut 8: 10, a radial set-screw in nut 8 to serve as a means for locking the nut in adjusted position of rotation upon the arbor, this set-screw, however, not going clear down to the arbor: 11, a plug disposed between the arbor and the inner end of the set-screw 10 and serving to prevent the end of the set-screw from marring the threads of the arbor: 12, a taper at the inner end of the bore of the arbor, to receive the tapered ends of mandrels, this lathe being designed to carry its work either in chucks or on firmly held mandrels instead of on centers: 13, a screw bearing in the lock-nut 9 and projecting into the bore of the arbor and adapted to engage a tapped hole in a mandrel held in the taper socket of the arbor: 14, the end of an exemplifying mandrel held in the taper socket of the arbor and drawn tightly home by the screw 13: 15, a chuck screwed upon the nose of the arbor and presenting an annular face toward the tail-stock: 16, an annular T-slot in the face of the chuck: 17, bolts in this T-slot to serve in clamping work against the face of the chuck: 18, a spur-gear fast on the arbor: 19, an intermediate shaft mounted in bearings on the head-stock parallel to the axis of and near spur-gear 18: 20, a pinion fast on this shaft and engaging spur-gear 18: 21, a spur-gear fast on this shaft: 22, a driving-shaft carried in bearings at the front of the bed and extending the whole length of and projecting beyond each end of the bed: 23, driving-cone, fast upon this driving-shaft,

this cone-pulley being the main pulley of the lathe, to be driven by belt from counter-shaft as usual: 24, a spur-gear splined to driving-shaft 22, at the head-stock, and adapted to be slid into engagement with pinion 74 fast on the intermediate shaft 19: 25, a pinion fast with spur-gear 24 and sliding with it, this pinion being adapted to be slid into engagement with spur-gear 21, the arrangement being such that when these sliding parts are moved to the left, as shown, the transmission from the driving-shaft to the intermediate shaft will be through gearing 24 and 74, giving high speed to the arbor, and when the sliding parts are moved to the right the transmission will be through gearing 25 and 21, giving slow motion and great power to the arbor: 26, a lever to serve in shifting the sliding pinion and gear: 27, the saddles, one sliding on each rail, these saddles being provided with the usual cross dove-tails 75 on which the tool-rests may slide: 28, the usual tool-rests arranged to slide transversely upon the saddles, the inner ends of these rests forming flat bases with circular T-slots, precisely the same as is customary in connection with the base portion of compound tool-rests for lathes: 29, the usual cross-feed screws, journaled in the tool-rests 28 and engaging nuts in the saddles, the arrangement of the nuts, however, being peculiar, as hereinafter to be explained: 30, longitudinal feed-screws, one in each rail, and serving to give longitudinal feed motion to the saddles: 31, a worm gear loose at the tail end of each of these rail screws and arranged to be locked to their screws by the usual friction devices: 32, ordinary friction clamping devices, to serve as means by which the worm-wheels 31 may be locked to or unlocked from their screws: 33, a shaft extending across and through the bed under the worm-wheels 31 and having fast upon each end a worm 76 to give motion to the worm-wheels: 34, (Fig. 2) a pair of bevel gears united and fastened to each other and splined to the cross-shaft 33, within the hollow of the tail-stock: 35, a shaft journaled in the tail-stock parallel with the axis of the lathe and on a level with cross-shaft 33: 36, a bevel-gear on the inner end of shaft 35, adapted to be engaged by either bevel-gear 34 according to which way the sliding bevel-gears are shifted: 37, a cone-pulley on the outer end of shaft 35: 38, a cone-pulley on the tail end of driving-shaft 22, in line with pulley 37 and serving to transmit motion by belt to shaft 35: 39, a shifting-lever for moving the pair of gears 34 on their shaft so that whichever gear desired may engage with gear 36, the selected gear determining the direction of motion of the rail screws and, consequently, the direction of feed for the saddles: 40 (Fig. 2) a feed-shaft mounted upon the back of the bed: 41, a cone-pulley fast on the head end of this shaft to permit shaft 40 to be driven by belt from the cone-pulley 8 on the arbor: 42, a pulley fast on the tail end of shaft 40: 43, the tail-slide, sliding longitudi-

nally in the top of the tail-stock, and having its top surface in the form of a flattened V or gutter below the axis of the lathe, each of the V surfaces being provided with a T-slot 77 extending the length of the slide; see Fig. 6: 44, a feed-shaft journaled across the tail-stock and provided with a pinion meshing with the rack on tail-slide 43, see Fig. 2, so that by turning the shaft the slide may be moved or fed endwise: 45, a worm-gear loose on this shaft: 46, a friction-grip device on the shaft, like the arrangement on the rail-screws, for engaging and disengaging the shaft to and from the worm-wheel: 47, a hand-wheel on this shaft to serve in turning the shaft by hand when the feed is disengaged, a removable crank being used for similar purpose in connection with the rail-screws: 48, the worm for giving motion to worm-wheel 45: 49, a spur-gear fast on the shaft of this worm: 50, an arm swinging on the bearing of the shaft of worm 48 and secured thereon by a set-screw: 51, a pinion engaging gear 49 and mounted loose on a stud carried by the arm 50: 52, a pulley fast with this pinion, and in line with pulley 42, the arrangement being such that a belt may transmit motion from pulley 42 to pulley 52 and thus drive worm 48, the shifting of arm 50 angularly serving to change the position of pulley 52 so as to permit of the tightening of the feed belt: 53, (see Figs. 4 and 6) a bushing-holder bolted to the tail slide and having a bore in the axial line of the lathe, this holder being adapted to receive various sized bushings for the support of the tail end of mandrels being employed or to support work being operated upon by the tool or tools of the tail-slide: 54, a tool-block bolted on the front upper surface of the tail-slide: 55, the bolt which secures this tool-block to the tail-slide by engaging the front slot of the slide: 56, the tail-tool, supported in the tool-block and presenting its cutting end toward the axis of the lathe, the outer end of the tool having an upward projection: 57, a clamp engaging over the tool 56 and held down by the same bolt 55 that bolts the tool-block to the tail-slide: 58, a rigid portion of the tool-block, projecting over the tool outwardly beyond the clamp: 59, a set-screw screwed into the outer surface of this rigid portion and impinging with its head against the upward projection at the heel of the tool: 60, a set-screw screwed inwardly through an upwardly projecting portion at the outer end of tool-block 54, its point impinging against the heel of the tool, set-screws 59 and 60 thus serving in adjusting the tool in and out: 61, a steady block bolted to the rear upper surface of the tail-slide and presenting at its inner end a V adapted to engage the surface of work being operated upon by the tool 56, this steady-block having a slotted bolt hole so that it may be adjusted to and from the work: 62, (Fig. 1) a longitudinal T-slot in the outer face of each of the rails: 63, former-plates bolted in these

slots against the faces of the rails, the form-portion consisting of a horizontal member having a longitudinal slot of a form suited to the contour to be produced upon the work by the action of the cutting tools carried by the saddles, it being understood, however, that the form of the slot is to be the reverse of the desired path for the tool guided by it: 64, (Fig. 5) the saddle nuts of the cross-feed screws 29, these nuts, instead of being fixed to the saddles, being capable of in and out motion therein, but incapable of rotation, the nuts being carried in slots in the saddles: 65, a lever, one at each saddle, pivoted to the saddle and provided at its lower end with a pin or roller engaging the slot of the former-plate, the contour of the pin or roller being such as to permit of the oscillating motion of the lever under the influence of the form slot, the upper end of the lever being provided with a segment of teeth engaging a rack formed on the nut of the cross-feed screw, the arrangement being obviously such that as the saddle moves along the rail the lower end of the lever will move in or out according to the form of the slot and thus cause the cross-feed screw and the tool rest to move in or out, thus causing the turning tools to produce contours the reverse of the form slots: 66, pin holes through levers 65 and the saddle portions which support the levers, the insertion of pins in these holes serving to lock the levers 65 fast when the lathe is to be used without the form plates, the effect of the pin being to lock the nuts 64 against motion in the saddles: 67, a turret mounted for rotation on each of the tool-rests 28, on a vertical axis, like the upper portion of an ordinary compound rest: 68, (Fig. 2) two bolts passing vertically through each of the turrets, and arranged diametrically opposite each other in the turrets, the heads at the lower ends of these bolts engaging the annular T-slots in the tool-rests: 69, clamp plates upon each of these bolts: 70, the turret-tools, a pair for each turret, the pair of tools straddling the bolts and being clamped to place by the bolts, the bolts at the same time serving in clamping the turrets to the tool-rests, the two tools of a pair being reversed, so that the cutting end of one tool and the heel of the other tool project in the same direction, the cutting ends however projecting outwardly beyond the heels: 71 (Figs. 2 and 7), a cross-girt extending across the bed, inwardly beyond the face of the chuck, and some distance below the lowest plane swept by a radius representing the swing of the lathe, this girt being cast with the bed and having a vertical socket vertically beneath the axis of the lathe: 72, a shank vertically adjustable in this socket, and clamped therein, as by a set screw, the upper end of this shank being jawed lengthwise of the lathe: 73, a rest-piece sliding endwise in the jaws of the shank: 74, (Fig. 1) the pinion previously referred to as engaging gear 24: 75, the dove-tailed cross-slide ways of the saddles, pre-

viously referred to: 76, the worms previously referred to as engaging worm-wheels 31 on the rail screws: 77, the T-slots of the tail-slide, previously referred to.

The very peculiar form of the main framing of the lathe gives the lathe a stiffness and renders it capable of superior steadiness in action and renders possible the taking of heavier cuts than other forms have rendered consistent with accuracy. For heavy work the arbor will be driven through the slow motion gearing, and for light work, or for the polishing of large work, the quick motion gearing may be readily brought into action.

The chuck is adapted especially for pulleys and other armed structures and the clamping bolt 17 may be readily adjusted around the chuck to suit the position of the arms to be clamped. Plug 11 has its inner end threaded to fit the threads of the arbor. The hole for set-screw 10 is first drilled in the collar 8 and plug 10 is driven tightly into the hole. The collar is then bored and threaded, thus also threading the inner end of the plug. The plug is then driven out and the hole tapped the proper depth for the set screw, and the plug is slightly reduced in size so as to be free in the hole.

When work is to be finished upon a mandrel, the mandrel is held in the taper socket of the arbor and its tail end may run in a bushing carried in the bushing-holder of the tail-slide, thus giving a stability not obtainable when the work is carried on centers. Bolt 13 draws the mandrel tightly into the socket and may serve as means for knocking the mandrel out of the socket, in an obvious manner.

For straight work to be done by carriage tools, the pins are used in holes 66, and the form-plates 63 are removed. Form-plates with different guide-slots may be applied as needed.

One tool of a turret may be used, and then the turret may be turned around and the opposite end of the other tool employed, the two tools of a pair being different, as, for instance, one a roughing tool and the other a finishing tool. As the work revolves in the usual direction, it is obvious that the thrust is upward upon the tool of the rear carriage, and it will be observed that the tool clamping arrangement is such that one of bolts 68 which meets the strain is brought extremely close to the work. In previous constructions of lathes the disposition of joints and bolts has been such as to make the taking of heavy cuts inconsistent with accuracy of production.

With the bevel gears in the position shown in Fig. 2 there will be no motion of shaft 33. Shifting-lever 39 is to be operated to determine the direction of feed. The feeds at the rails are installed and arrested independently by the friction devices 32, and shifting lever 39 may be employed to install or arrest both rail feeds simultaneously, while friction

devices 32 are in active engagement. The rate of rail feeds may be altered by shifting the belt on cones 38 and 37. The rate of the tail-slide feed may be altered at cones 8 and 41.

- 5 For work on shafts and such like pieces, the work is to be held in suitable chuck substituted for the chuck shown. The work slides through a proper bushing carried in the bushing-holder and is operated upon by
10 tool 56, or a series of similarly arranged tools, and steadied at the back by steady-block 61, the feed being produced by the movement of the tail-slide, the entire arrangement at the tail-slide constituting, in effect, a massive "box-tool."

- 15 Work like pulleys and gears, may, if desired, be simultaneously turned and bored. While being turned the work may be bored by a suitable boring bar with one end supported in the bore of the arbor and the other
20 end held in the bushing-holder of the tail-slide.

- When the lathe is to operate on quite a number of pieces, like pulleys, for instance,
25 of the same size, the rest-piece 73 will be found extremely useful in assisting in the chucking operation. The first pulley of the lot having been chucked central, the rest-piece 73 may be adjusted to have a fair bearing below the pulley and this adjustment may
30 be retained for the lot of pulleys, the rest piece serving to support the pulley in fairly central position while being chucked. After a pulley has been chucked, the rest-piece 73
35 may be slid to the right out from under the pulley so as not to be rubbed by irregularities of the pulley.

- Two tools may be fixed in one of the turrets with their cutting ends pointing opposite,
40 site, the cutting end of one tool projecting beyond the heel of the other tool. One tool may be a roughing tool and the other a finishing tool, and after the first has been used, the turret may be turned to bring the other
45 one into position for action. Or, the two tools of a pair may be of any similar or diverse character called for by the requirements of the work. Or, both tools may be double ended, that is, a cutting end at each end of each tool,
50 thus permitting four cutting tools to be brought successively into action by suitably turning the turret and moving the tools endwise so that the active one will project beyond the inactive one. Where many pieces
55 of work, like gear blanks, are to be faced on both edges of the rim and to uniform thickness, the two turret tools may have their cutting ends project the same way and be set the proper distance apart, and the double facing thus done by one in-feeding of the tools,
60 and, in such case, the tools may be double ended, one end doing the rough facing and the other end of the tools doing the finishing. The system also permits of accurate gaging
65 for this class of double facing as it permits of the turrets being grooved to receive and

hold the tools at an exact proper distance apart to suit special work, special turrets being provided for special work, the turrets thus serving as tool-supports and as gages. 70

I claim as my invention—

1. In a lathe, the combination, substantially as set forth, of a chuck having an annular T-slotted rim projecting inwardly toward the tail-stock beyond the end of the lathe-arbor, 75 and clamp-bolts engaging said slot.

2. In a lathe, the combination, substantially as set forth, of a saddle, a tool-rest, a cross-feed screw journaled in the tool rest, a nut for said screw fitted for endwise motion in 80 the saddle, a form-plate secured to the slideway on which the saddle moves, and a lever pivoted to the saddle and engaging said nut and form-plate.

3. In a lathe, the combination, substantially 85 as set forth, of a saddle, a tool-rest, a cross-feed screw journaled in the tool-rest, a nut for said screw fitted for endwise motion in the saddle, a form-plate secured to the slideway on which the saddle moves, a lever pivoted to 90 the saddle and engaging said nut and form-plate, and a locking device, as a pin, to prevent the movement of said lever on its pivot.

4. In a lathe, the combination, substantially as set forth, of an annularly slotted tool-rest, 95 a turret thereon, tool-clamping bolts diametrically arranged in and engaging the slot of the tool-rest and passing through the turret, and a pair of tools resting on the turret and straddling said bolts. 100

5. The combination, substantially as set forth, of a bed with two rails, a feed screw in each rail, a driving-shaft extending the length of the bed, gearing connecting said shaft with the lathe-arbor, a cross-shaft geared to the two 105 rail-screws, a shaft parallel with said driving-shaft and geared to said cross-shaft, and aligned pulleys on said driving-shaft and parallel shaft.

6. In a lathe, the combination, substantially 110 as set forth, of substantially a V-shaped tail-slide provided with a pair of longitudinal T-slots disposed at an angle to each other and a tool-holder bolted thereto.

7. In a lathe, the combination, substantially 115 as set forth, of a tail-slide provided with a pair of longitudinal T-slots disposed at an angle to each other, and a bushing-holder and tool-holder bolted thereto.

8. The combination, substantially as set 120 forth, of a T-slotted slide, a tool-holder thereon, a tool having an upward projection at its heel, a tool-clamp over the tool, a bolt passing through said clamp and tool-holder and engaging the slot of the slide, and a pair of 125 set-screws carried by the tool-holder and engaging the opposite faces of the said tool-projection.

9. In a lathe, the combination, substantially as set forth, of a socketed cross-girt in the bed 130 of the lathe, a shanked rest having a vertical movement carried by such socket, and a

rest-piece fitted to slide horizontally in such shanked rest.

10. In a lathe, the combination, substantially as set forth, of a taper mandrel-socket in the inner end of the lathe-arbor, a mandrel adapted to fit said socket, and an axially disposed holding bolt connected directly to said mandrel, and a tail-slide, and a bushing-holder bolted to the tail-slide.

11. In a lathe, the combination, substantially as set forth, of a hollow lathe-arbor, having an axial bearing throughout the same, a tail-slide, and a holder bolted to said tail-slide and adapted to carry the tail end of a bor-

ing bar while its head end slides in the lathe-arbor. 15

12. The combination, substantially as set forth, of a threaded arbor, a nut screwed thereon and radially tapped for a set-screw, a plug in the set-screw hole with its inner end formed to correspond with the threads of the arbor, and a set-screw in the collar bearing on the outer end of said plug. 20

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