No. 862,437. PATENTED AUG. 6, 1907.

H. BERTRAM.

LATHE.

APPLICATION FILED MAR. 11, 1907.

Fig. 2.

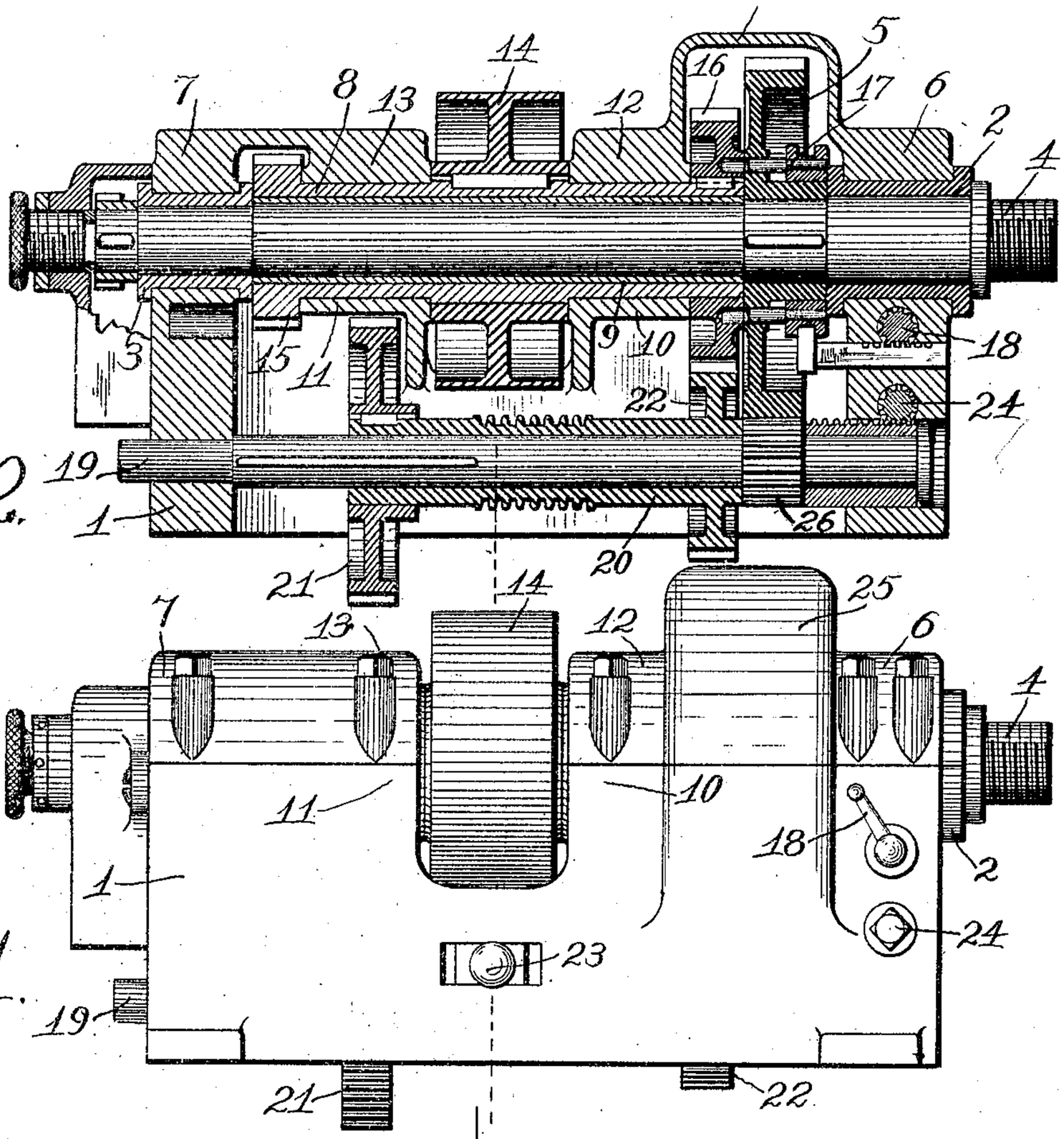
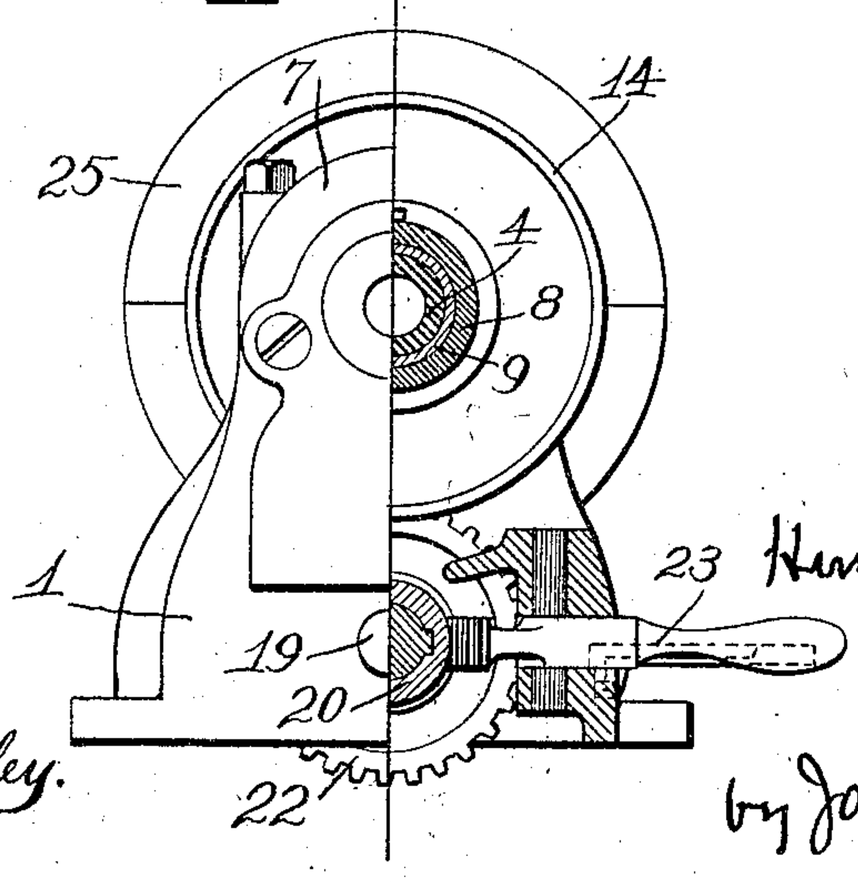



Fig. 1.




Fig. 3.




Witnesses:
Elmer R. Shipley.
M. S. Belden.

Inventor
Henry Bertram
by James W. See
Attorney

# UNITED STATES PATENT OFFICE.

HENRY BERTRAM, OF DUNDAS, ONTARIO, CANADA, ASSIGNOR TO THE JOHN BERTRAM & SONS COMPANY, LTD., OF DUNDAS, CANADA.

## LATHE.

No. 862,437. Specification of Letters Patent. Patented Aug. 6, 1907.

Application filed March 11, 1907. Serial No. 361,775.

*To all whom it may concern:*

Be it known that I, HENRY BERTRAM, a subject of Great Britain, residing in Dundas, Ontario, Canada, have invented certain new and useful Improvements in Lathes, of which the following is a specification.

Under modern conditions of lathe use, in which remarkably heavy cuts are taken with the recently developed high speed steels, there has developed a tendency for the lathe arbor to spring into a deflection between its bearings. With extra heavy work being done at the face plate, either boring or turning, the tendency is for the nose of the arbor to spring upwardly and deflect the central portions of the arbor, between its bearings, downwardly.

My present invention aims to so stiffen the arbor as to lessen the evil referred to.

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

Figure 1 is a front elevation of the head-stock of lathe exemplifying my invention: Fig. 2 a vertical longitudinal section of the same: and Fig. 3 a rear end elevation of the head-stock, part vertical transverse section.

In the drawing:—1, indicates the head-stock: 2, the front arbor bearing supported thereby: 3, the rear arbor bearing: 4, the arbor journaled as usual in these two bearings: 5, the usual face gear fast on the arbor between the two bearings and just beside the front bearing: 6, the bearing-cap for the front bearing: 7, the bearing-cap for the rear bearing, none of the parts thus far referred to being necessarily different from what is usual in lathe construction: 8, a stout sleeve encircling the arbor between the face gear and the rear bearing, its bore being considerably larger than the portion of the arbor encircled by the sleeve: 9, a lining, preferably of soft metal, as Babbitt metal, tightly fitting the bore of the sleeve, the bore of this lining having a snug running fit upon the portion of the arbor surrounded by the sleeve: 10, a bearing carried by the head-stock between the two arbor-bearings, this bearing being engaged by the periphery of the sleeve near its front end: 11, a similar bearing carried by the head-stock and engaging the periphery of the sleeve near its rear end: 12, a bearing-cap for the bearing 10: 13, the bearing-cap for the bearing 11, the cap 12 being preferably formed integrally with the cap 6, and the cap 13 integrally with cap 7: 14, a driving device fast upon the sleeve between the two sleeve bearings, which driving device may be either a gear or pulley, the latter being shown in the illustration: 15, a pinion fast with the rear end of the sleeve: 16, a gear fast on the front end of the sleeve between the front sleeve bearing and the face gear fast on the arbor: 17, clutch-mechanism carried by the face gear and adapted to serve in locking that gear to gear 16 when it is desired that the sleeve and arbor turn together: 18, mechanism for throwing this clutch: 19, a back-gear shaft journaled in the head-stock parallel with the arbor and adapted for endwise movement: 20, a backgear sleeve splined on the backgear shaft: 21, a gear carried by this sleeve and adapted to engage pinion 15 of the arbor-sleeve: 22, a gear fast on the backgear sleeve and adapted to engage gear 16 of the arbor sleeve: 23, a handle for shifting the backgear sleeve endwise on the shaft, this handle being illustrated as provided with a gear section engaging a rack formed on the back gear sleeve: 24, a shifting device for moving the backgear shaft endwise, this device being illustrated as a pinion engaging a rack on a sliding block forming one of the bearings of the backgear shaft: 25, a housing connecting the cap of the front sleeve bearing with the cap of the front arbor-bearing and so expanded as to make room for gears 5 and 16: and 26, a pinion fast on the backgear shaft and adapted to engage facegear 5.

As to the general motion effects due to the arrangement of gearing little need be said. When power is applied by belt to pulley 14 and the gearing is in the condition illustrated, then the power is transmitted to the arbor through gears 16, 22, 26 and 5, and the arbor runs slower than the pulley, the sleeve turning freely on the arbor. If the backgear sleeve be shifted to the left so as to disengage gears 16 and 22 from each other and engage gears 15 and 21 with each other then the power will be transmitted from the pulley to the arbor through gears 15, 21, 26 and 5, and the arbor will turn much slower than in the former case. If the backgear sleeve be shifted to the left far enough to disengage gears 22 and 16 from each other without engaging gears 15 and 21 with each other then the backgears become idle and the pulley sleeve would turn freely and idly upon the arbor without turning the latter. But if clutch 17 be thrown so as to lock gears 16 and 5 together then the pulley sleeve becomes locked to the arbor and the arbor will turn at the same rate as the pulley, and under these conditions, in order to lessen friction, the backgear shaft may be shifted to the right so as to disengage pinion 26 from gear 5 and permit the backgear shaft to remain at rest.

When the lathe is doing its heaviest work, as represented by the slower speeds of the arbor, then the normal tendency of the lathe arbor would be to deflect downwardly between its two end bearings this deflection being brought about by the upward strain of the cutting tool, this strain being imposed upon the front end of the arbor whose general front portion acts, lever-like, with the front arbor-bearing as a fulcrum. The surrounding sleeve 8, snugly fitting the general intermediate portion of the arbor, serves of itself to greatly stiffen the arbor at these portions otherwise tending toward downward deflection. This stiffening effect

of the snugly fitting sleeve being in a measure independent of the sleeve bearings and of the pulley and would in considerable degree be realized if the sleeve were without external bearings of its own and if the power was applied to the arbor by other means than through the sleeve. But, notwithstanding this stiffening effect of the sleeve upon the arbor, the sleeve itself is susceptible of some yielding deflection and therefore any supporting bearing underneath the sleeve would be manifestly advantageous. The two sleeve bearings 10 and 11 have this effect of supporting the sleeve against downward deflection, and this supporting effect would be realized to considerable degree if the sleeve was supported by but a single bearing. Again, regardless of the supporting effect given to the structure by the sleeve-bearings, the upward strain of the driving belt upon the pulley serves in a measure in resisting the downward deflection of the sleeve and arbor. The lining 9 within the sleeve is distinctly advantageous in permitting of such reparation as is necessary to maintain the snugness of fitting upon the arbor which is essential in realizing the results aimed at.

I claim:—

In a lathe, the combination, substantially as set forth, of a head-stock, a front arbor bearing and a rear arbor bearing carried thereby, an arbor journaled in the arbor-bearings, a sleeve surrounding and snugly fitting the arbor between the two arbor-bearings and adapted to turn thereon, and a bearing-support carried by the head-stock between the arbor-bearings and engaging below the sleeve and serving to resist the downward flexure of the arbor and sleeve.

HENRY BERTRAM.

Witnesses:
ERNEST G. MACFAY.
RICHARD BUTLER.