(No Model.) 2 Sheets—Sheet 1.

A. WHITNEY.

LATHE HEAD.

No. 319,650. Patented June 9, 1885.

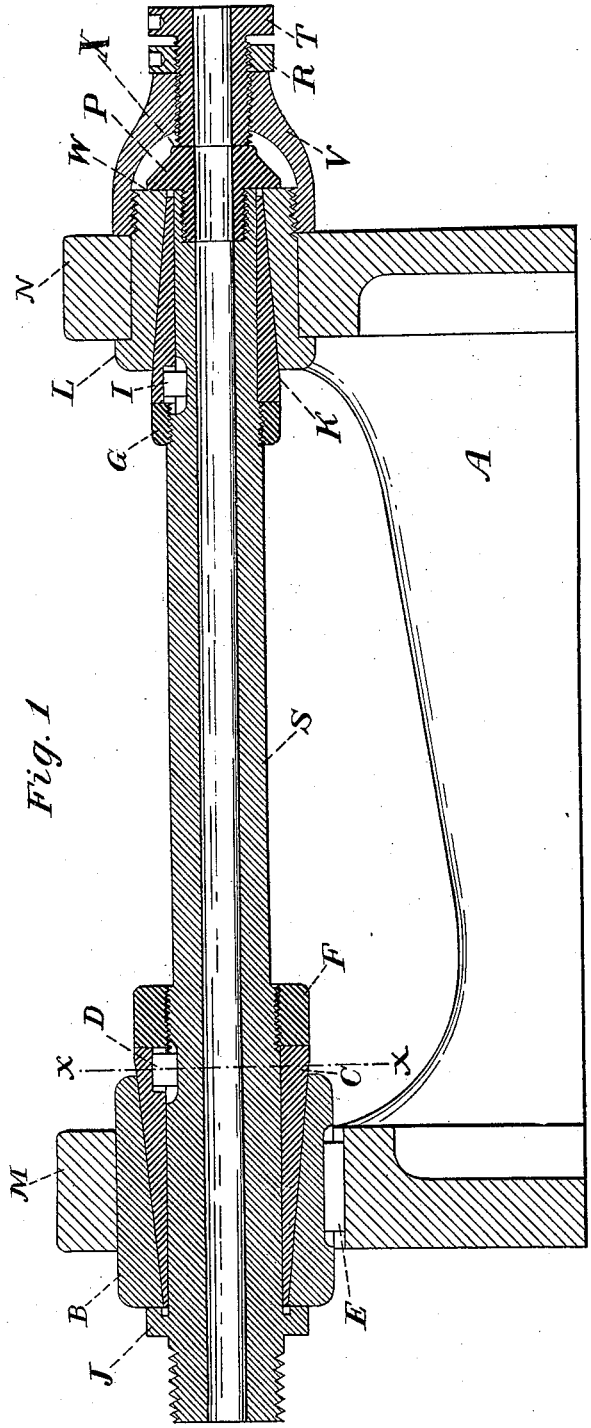

Fig. 1

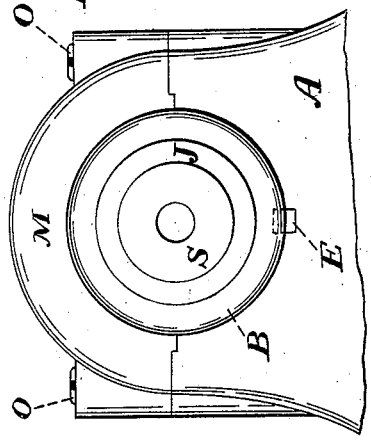

Fig. 2.

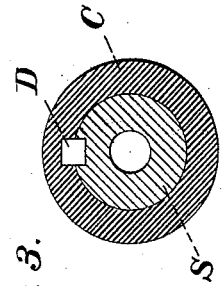

Fig. 3.

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(No Model.) 2 Sheets—Sheet 2.

A. WHITNEY.

LATHE HEAD.

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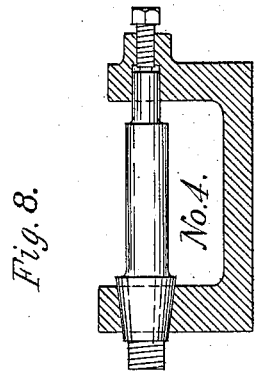

Fig. 8.

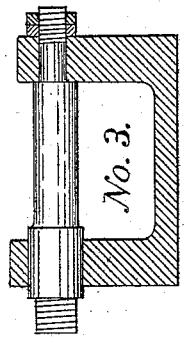

Fig. 7.

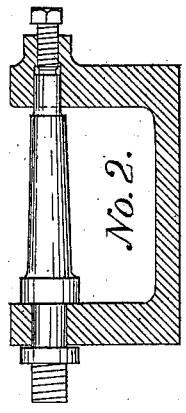

Fig. 6.

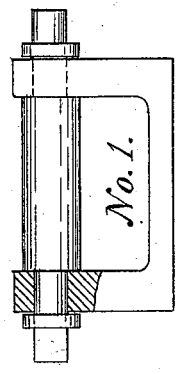

Fig. 5.

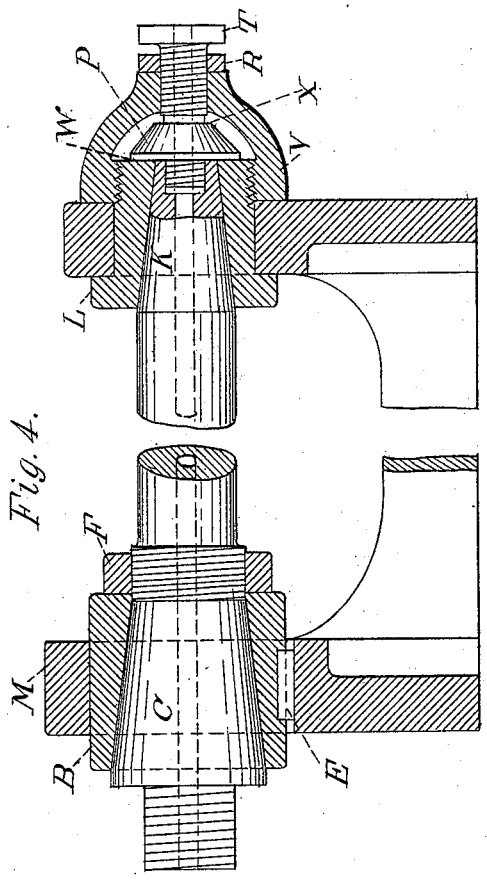

Fig. 4.

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UNITED STATES PATENT OFFICE.

AMOS WHITNEY, OF HARTFORD, CONNECTICUT, ASSIGNOR TO THE PRATT & WHITNEY COMPANY, OF SAME PLACE.

LATHE-HEAD.

SPECIFICATION forming part of Letters Patent No. 319,650, dated June 9, 1885.

Application filed March 27, 1885. (No model.)

To all whom it may concern:

Be it known that I, AMOS WHITNEY, a citizen of the United States of America, residing in the city and county of Hartford, State of Connecticut, have invented certain new and useful Improvements in Lathe-Heads, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 is a longitudinal vertical sectional view through the center of the lathe-spindle of a lathe-head embodying my improvements. Fig. 2 is an elevation of upper part of the front end of the same, which is at the left hand in Fig. 1. Fig. 3 shows a cross-section of the lathe-spindle in line X X, Fig. 1. Fig. 4 shows a modification of Fig. 1. Figs. 5, 6, 7, and 8 illustrate the state of the art, as hereinafter referred to.

Similar letters refer to the same parts throughout the several views.

This invention relates more particularly to lathe-heads for engine-lathes, but it is applicable to machines in general in which the spindles are required to run extremely free from end-play. It is well known to builders of fine machinery, especially of such as runs at high velocities, that this result is always accomplished with difficulty, which becomes more and more serious as the length of the spindle is increased. The difficulty is caused, principally, by the heating of the parts, especially the spindle, by the friction of their bearing-surfaces or otherwise, which, owing to the different coefficients of expansion of different materials, varies the relative adjustment of the parts according to their temperature. This adjustment is also affected by the varying strains upon the parts, due to working the machine, which strains necessarily spring some parts more than others. In the coarser kinds of machinery, where some end-play is not so objectionable, it has been customary to make the spindle with collars upon each side of each bearing, as in Fig. 5, to receive the pressure. In engine-lathes a second form of spindles (illustrated by Fig. 6) has generally been used with such collars or shoulders on each side of the front bearing and a step at the back end. This construction (which is too well known to require a more particular description) for fine, close-fitting machinery is particularly objectionable, as any expansion of the spindle, when the step is set up closely, causes an undue friction against the inner one of the collars, thereby heating the spindle and still further increasing the difficulty. To obviate those objections spindles are frequently made with no collars against the front bearing, but with one collar on each side of the back bearing, as shown in Fig. 7. This mode of construction reduces the difficulty arising from the longitudinal expansion of the spindle in about the same proportion that exists between the length of the back bearing and that length plus the distance between the bearings. (It will be explained hereinafter how I make the corresponding surfaces much nearer together.) This allows the front journal to slide through the front bearing without resistance therefrom.

It is customary to construct the bearings for such spindles, as above described, in two parts, so that as the surfaces of the journal and journal-bearing wear away the two parts may be brought more closely together to correct any inaccuracy arising from such wearing away; but that mode of correction introduces another difficulty hardly less serious than the previous one—to wit, the axis of the spindle is gradually lowered, so that the original and proper alignment of the parts is lost and the machine to that extent depreciated in value.

Where the exact alignment of the spindle is very essential, its journals and bearings have frequently been made of the form of truncated cones, so that any wear of the journal could be perfectly corrected and their perfect alignment maintained by a slight longitudinal adjustment of the step or back bearing. This plan, which is extensively employed, and has the advantage of permitting the use of solid bearings, restores the difficulty aforesaid arising from thermal changes which characterized spindle No. 2, above described. In effect, one difficulty is merely substituted for another. It is obvious, therefore, from these references to the state of the art that while each of the spindles No. 3 and No. 4 as heretofore constructed have important advantages, these advantages naturally stand in opposition to each other, there-

by seriously impairing the utility of those forms of spindles. It is the object of my invention to overcome this opposition and furnish a construction which shall secure in one spindle the advantages, respectively, of both of those.

To this end my invention consists in certain combinations of mechanism, which I will first describe in connection with the drawings, and afterward specifically point out in the claims.

In the drawings forming a part of this specification, A is the frame of a lathe-head, of the usual or any suitable form, which may have the caps M and N, (or these parts may be formed integrally with the frame,) and is bored to receive the front bearing, B, and the back bearing, L. The back bearing, L, is rigidly fixed into the frame by means of the nut V. The front bearing, B, is fitted into the frame closely, but not so rigidly as to prevent longitudinal movement, and if of a cylindrical form is kept from rotating by a key, as E, or by an ordinary set-screw. Bearing B is bored tapering to receive the conical journal C of the spindle S. That journal may be a suitably-formed portion of the spindle itself, as in Fig. 4, or may be made separately from the spindle and adjustably secured thereto, as in Fig. 1. Some parts of my invention, however, are not limited to this latter mode of constructing said journal, but, on the contrary, will permit it to be formed as in said Fig. 4. When made separately, this journal is of a tubular form, bored cylindrically to fit and slide on the spindle, and turned to fit the tapered bearing B. If the tube C is not fitted to the spindle closely enough to prevent it from turning thereon, then some device, as key D, should be employed to so prevent it. A nut, F, is provided for adjusting tubular journal C on the spindle, so as to slide the bearing B within the frame and against the fixed collar J. When the journal C is made integrally with the spindle, the nut F acts to slide the bearing, as in Fig. 4, instead of the journal, as in Fig. 1.

By means of the above-described construction it is obvious that all lateral play of the journal in its bearing may be taken up and the bearing slide freely through its support in the frame to accommodate the variations of the length of the spindle due to thermal changes or other cause. It will also be evident that the position relative to the spindle of journal C, bearing B, nut F, and collar J may be reversed without affecting the operation of this part of my invention. Furthermore, it will be understood that this front journal and bearing may be used independently of the back bearing, hereinafter described, in connection with other kinds of bearings.

The back bearing, L, is bored tapering to receive the conical journal K, which is similar to journal C, and it is held in place by nut G and key I, which are similar, respectively, to nut F and key D.

A spindle end, P, is secured to the spindle, and has two bearing-surfaces—one at W, which runs against bearing L similarly as collar J runs against bearing B, and the other at X, which runs against the step T. This step is of the usual description, and is used and clamped in position by nut R in the usual manner. The parts of this back journal and bearing are of course capable of the same modifications as the corresponding parts of the front journal and bearing. When thus modified, as shown in Fig. 4, the lateral play of the back journal is taken up by shortening the spindle at that end and screwing end piece, P, up to the new surface thus formed.

I have described and shown bearings B and L as being made of a cylindrical form; but they are not necessarily so made. They may have externally a rectangular cross-sectional form, and may be made in two parts secured together; but there is, in my opinion, no advantage to be gained thereby.

Having thus described my invention, I claim—

1. The combination of a suitable framework having any suitable back bearing adapted to receive one end of a spindle and to prevent the longitudinal movement thereof, a spindle having a back journal corresponding to said back bearing and a conical front journal, substantially as described, and a front bearing fitting said conical front journal and adapted to slide in said frame, substantially as set forth.

2. The combination of a frame, as A, spindle S, having journal C and nut F, bearing against said journal, and sliding bearing B, substantially as described.

3. The combination of a frame, as A, spindle S, collar J, tubular journal C, nut F, and bearing B, substantially as described.

4. The combination of a frame, as A, spindle S, having journal C and nut F, bearing against said journal, a tubular sliding bearing, B, and key E, substantially as described.

5. The combination of bearing L, a spindle having a conical journal, K, and spindle end P, nut V, and step T, substantially as and for the purpose described.

6. The combination of bearing L, a spindle having the tubular conical journal K, nut G, and spindle end P, the nut V, and step T, substantially as and for the purpose described.

7. In a lathe-head, the combination of a suitable frame, as A, and a spindle, as S, having conical journals C and K, nut F, and spindle end P, bearings B and L, nut V, and step T, all constructed and arranged to operate substantially as described.

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Witnesses:
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