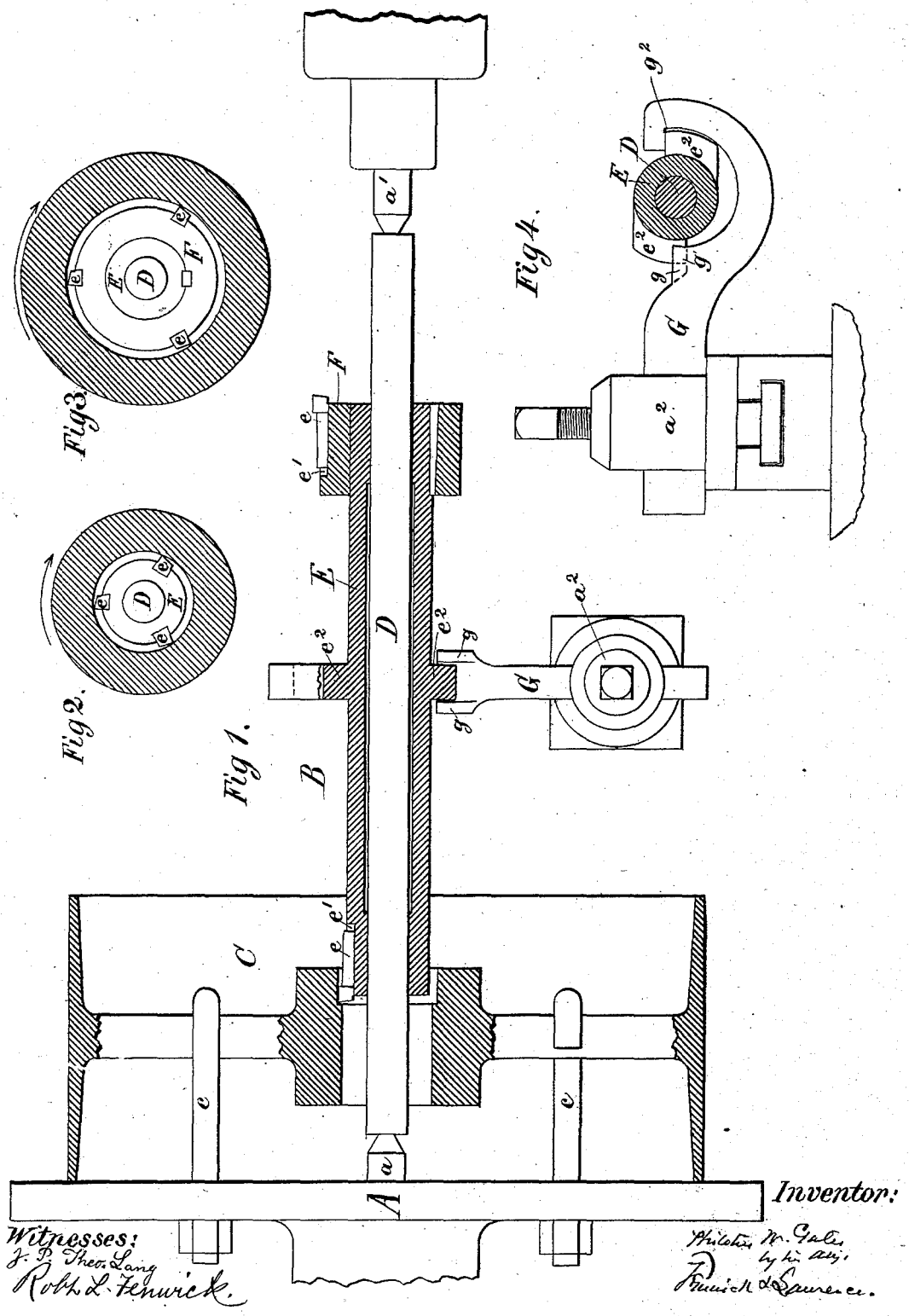
(No Model.) 2 Sheets—Sheet 1.

P. W. GATES.

COMBINED BORING BAR AND CENTERING MANDREL.

No. 315,271. Patented Apr. 7, 1885.



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(No Model.) 2 Sheets—Sheet 2.

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Fig5.

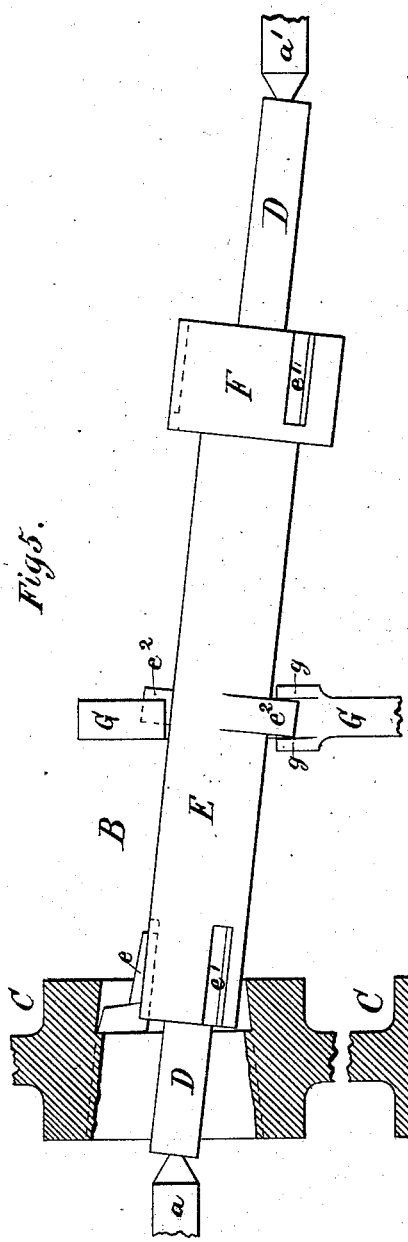


Fig6.

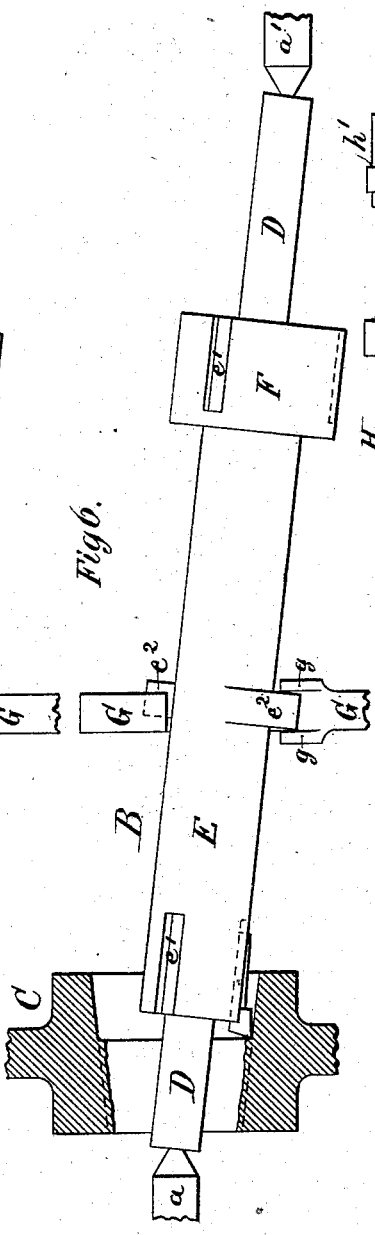
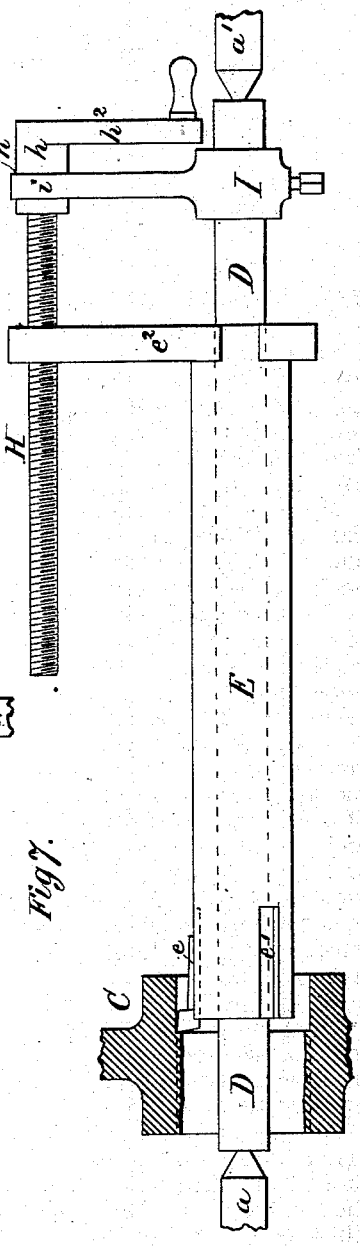


Fig7.



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UNITED STATES PATENT OFFICE.

PHILETUS W. GATES, OF CHICAGO, ILLINOIS.

COMBINED BORING-BAR AND CENTERING-MANDREL.

SPECIFICATION forming part of Letters Patent No. 315,271, dated April 7, 1885.

Application filed May 26, 1884. (No model.)

To all whom it may concern:

Be it known that I, PHILETUS W. GATES, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Combined Tubular Boring-Bar and Centering-Mandrel, of which the following is a specification.

My invention consists in a tubular boring-bar provided with cutters or a cutter-head, and which slides longitudinally on a mandrel held between the centers of a lathe, the bar being so attached to the carriage of the lathe that it cannot turn but slides with the carriage along the mandrel, the article to be bored being fastened to the lathe-spindle and revolving with the same.

In the accompanying drawings, Figure 1 represents a horizontal section of my boring-bar and centering-mandrel, the hub and rim of a pulley fastened to the face-plate of a lathe, and the tool-feeding post, the face, face-plate, and the tool-feeding post being shown in plan view. Fig. 2 is a cross-section of a collar or hub to be bored, and an end view of the boring-bar with a cutter applied. Fig. 3 is a cross-section of a collar or hub, and an end view of the other end portion of the boring-bar having a cutter-head with cutters attached to it. Fig. 4 is a cross-section of the said boring-bar just in front of its two fastening-lugs, and a clamping-iron fastened to the tool-post of the lathe. Fig. 5 is a horizontal section of a pulley-hub, being bored tapering, and a top view of the said boring-bar held at an inclination between the lathe-centers. Fig. 6 is a similar view illustrating the operation of boring with a taper the reverse of that shown in Fig. 5; and Fig. 7 is a horizontal section of a collar being bored and a top view of a boring-bar of modified construction.

A represents the face-plate of a lathe; *a a'*, the front and back centers; a^2, the tool-post, and B the boring apparatus. A pulley, C, is represented fastened by the ordinary means of hook-bolts *c* to the face-plate A, in order to be bored out.

Between the lathe-centers *a a'* a truly turned and centered rod, D, of the boring apparatus is fastened, and upon this rod D a sleeve or boring-bar, E, is fitted, which carries the cutters *e*, used for boring. The end portions of this sleeve or bar are provided with dovetailed grooves *e'*, into which the cutters *e* are inserted and driven "home" on an incline plane until they are seated firmly enough to operate without becoming loose by jar or strain. A removable cutter-head, F, will be fitted upon one end of the sleeve E and keyed thereon when holes of large diameter are to be bored, and this cutter-head F is provided with grooves *e'*, above described, for the purpose of holding the cutters *e*. The middle portion of the sleeve E is provided with two lugs, e^2, standing in diametrically-opposite directions and interlocking with a retrorse clamp-arm, G. This clamp-arm G has two bearings, g' g^2, one at either side of the sleeve E, and both in line with the axis of the sleeve. By these bearings g' g^2, the lugs e^2 are prevented from turning and from springing the rod D, the strain of resistance being equally divided at either side of the sleeve. The clamp-arm is suitably adjusted and fastened in the tool-post a^2 of the lathe, and thus the working strain of the sleeve E is firmly resisted by the sliding carriage of the lathe. The clamp-rod G is also provided with two cheeks or side projections, *g*, which stand right and left of one of the lugs e^2, and cause the sleeve E to longitudinally slide upon the rod D when the said carriage and tool-post are moved. When a pulley, C, which has been cast with an eye in its hub, is to be bored or reamed, it is centrally fastened to the face-plate of the lathe, and the rod D, having the sleeve E on it, is fastened in the usual way between the lathe-centers *a a'*, and cutters *e* of suitable size and shape for the desired size of hole in the pulley are selected and fastened in the grooves *e'*, whereupon the clamp-rod G and lugs e^2 are locked together, and the former properly fastened in the tool-post. The lathe is then set in motion, and by means of the lathe-carriage and tool-post the sleeve or boring-bar E is moved upon the rod D toward the hub of the pulley, and the cutters *e* caused to enter the same and bore it the required size. In this case the lathe-centers *a a'* stand in line, and a hole with parallel sides is bored. When a tapered hole is desired, the lathe-centers are moved out of line either to the right hand or left, as seen in Figs. 5 and 6, according to the desired inclination of the taper to be cut, and

in such case only one cutter *e* need be employed, the operation in all other respects being the same as above described.

If the lathe-beds to which my invention is to be applied are not provided with sliding tool-carriages and tool-posts, as above described, the boring apparatus represented in Fig. 7 may be adopted. In this apparatus one of the lugs e^2 is provided with a feed-screw, H, which is longitudinally fixed to the rod D by means of a grooved head, *h*, and a forked arm, I, fastened to the rod. The forked end *i* of the arm I occupies a portion of the annular groove *h'* of the head *h*, and thus prevents the screw from longitudinal motion. A crank, h^2, on the head *h*, or a suitable hand-wheel, enables the operator to turn the screw, and thus move the sleeve E from or toward the object on the face-plate of the lathe, the operation of the cutters on the sleeve being the same as above described.

I am aware that "cutter-heads" which slide upon longitudinally rigid center-shafts have been devised; but my invention differs essentially from these constructions in several particulars, to wit: My center shaft is held rigidly between the lathe-centers, so that it cannot move longitudinally nor laterally or transversely; but should the lubricating material at the live-center be wholly absorbed without observation of the operator, the center shaft would by means of the ensuing friction between the shaft and live-center be caused to revolve, thus avoiding the danger of hav- the live-center point wrested off by reason of friction and over heating. It must be understood, however, that the cutter-bearing sleeve is fitted snugly enough upon the center shaft to prevent its revolving under ordinary circumstances, while the revolving of the center shaft is a signal for the operator to either renew the lubrication of the live center, or, if that should not be accessible, to keep up a sufficient supply of lubricating material between the cutter-bearing sleeve and the center shaft in order to keep down the friction between the said parts and offer the least possible resistance to the revolution of the center shaft, lest the live-center be damaged. In other constructions a longitudinally-rigid center shaft is employed and is prevented from turning by means of an ordinary lathe-dog, said shaft being provided with a longitudinal groove into which a tongue of a cutter-head is fitted, and by which means the cutter-head is prevented from turning around the center shaft. This construction might appear to be well enough in theory; but the practical experience with it has proved it to be unsatisfactory, inasmush as, first, the center shaft and cutter-head have to be of larger diameter in order to compensate for weakening effect of tongue and groove; second, the strain upon the center shaft by means of the said lathe-dog is a one-sided strain and tends to spring the center shaft, increase its friction between the lathe-centers, and cause the cutters to make an uneven and untrue cylindrical surface. In contradistinction to this my construction keeps all strain from the center shaft and concentrates it upon the cutter-bearing sleeve where it is diametrically balanced by means of the lugs e^2 and the double-acting clamp G, as hereinbefore fully described. It is seen by this construction that the only strain the center shaft has to withstand is that caused by the non-uniform surface of the hole to be bored smooth, which is the utmost reduction of such strain ever to be attained. In my construction, a sleeve, E, and cutter-head F are rigidly connected, so that the cutter-head can be withdrawn from the hole by means of the sleeve at any time desired. This cannot be done in any other construction where sleeve and cutter-head are separate pieces, and the sleeve is only used to feed the cutter-head forward, but not back.

The dovetailed side bearings of the cutter-seats in my construction are preferable to the parallel side bearings in other constructions, for the reason that in the latter construction the cutters will soon become loose by means of wear during their use and have to be laid aside as unserviceable, while in my construction the cutters can be driven back firmly into their dovetailed bearings upon the slightest indication of looseness and without a moment's delay.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a boring-tool, the combination of a center rod, D, secured between the live and dead centers of a lathe, a sleeve, E, longitudinally sliding on said center rod, a suitable clamping device for holding the sleeve firm with the lathe-carriage, and suitable cutters inserted into the end of said sleeve, substantially as and for the purpose described.

2. The combination of the guiding center rod, D, longitudinally-sliding sleeve E, and the removable cutter-head F, suitably fitted and keyed to said sliding sleeve, substantially as and for the purpose described.

3. The combination of the guiding center rod, D, sliding cutter-bearing sleeve E, having lugs e^2, and the clamp-rod G, having suitable diametrical bearing for said lugs, and side projections, *g*, substantially as and for the purpose described.

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