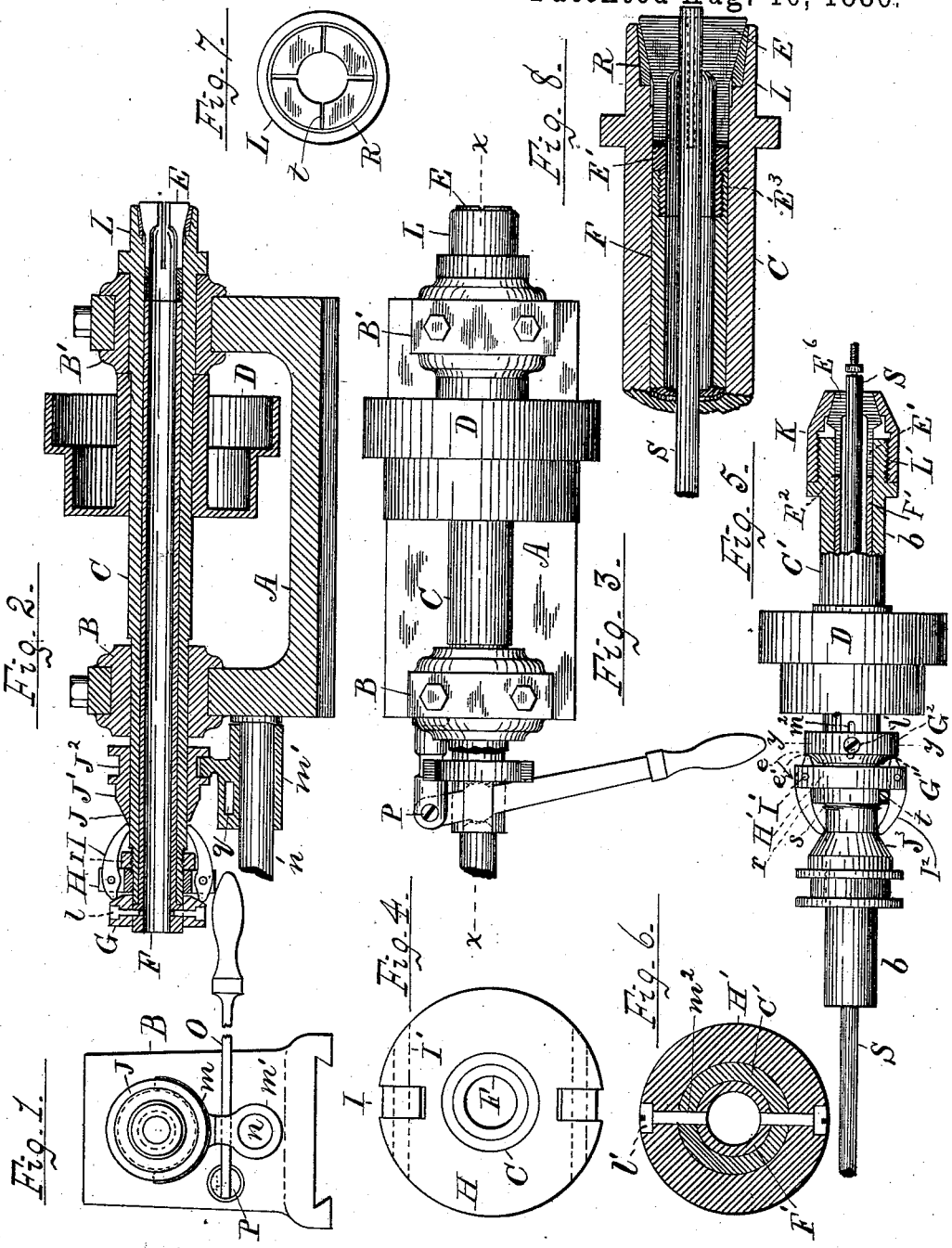
(No Model.)

A. E. ELMER.

HOLLOW SPINDLE CHUCK.

No. 347,167. Patented Aug. 10, 1886.



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UNITED STATES PATENT OFFICE.

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HOLLOW SPINDLE-CHUCK.

SPECIFICATION forming part of Letters Patent No. 347,167, dated August 10, 1886.

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To all whom it may concern:

Be it known that I, ALBERT E. ELMER, a citizen of the United States, residing in Springfield, county of Hampden, and State of Massachusetts, have invented certain new and useful Improvements in Hollow Spindle-Chucks, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates, chiefly, to an improvement in the heads of screw-machines, through the spindle of which rods are fed from the rear end and clamped by a chuck at the nose of the spindle. Such chucks are usually formed by fitting a hollow conical plug to a corresponding seat, the plug being split so as to clamp the rod when forced into its conical seat, which force is exerted by the movement of a hollow sleeve extended backward within the spindle.

The present improvement consists, first, in a novel means for moving the sleeve longitudinally, which means may be applied to the spindle at its rear end, or at any other point, the drawings showing two constructions adapted for location at different points upon the spindle. It also consists in a hardened bushing for the chuck-plug seat.

The nature of these improvements will be understood by reference to the annexed drawings, in which—

Figure 1 is a rear view of the bearing for the hollow spindle, with the collar G and the levers I and their head H omitted, to expose the cone and its shifting device. Fig. 2 is a side elevation of the spindle-head in section on line *x x* in Fig. 3. Fig. 3 is a plan of the same, and Fig. 4 is an end view of the head H and levers shown in Fig. 2. Figs. 5 and 6 represent a modification, in which the cone is applied between the bearings. Fig. 5 is an external view of a spindle detached from the head, and showing the connection of the internal sleeve to an external collar by means of screws inserted through the slots in the spindle, and Fig. 6 is a transverse section of such collar and spindle on line *y y* in Fig. 5. Fig. 7 is an end view of the spindle-nose, and Fig. 8 a longitudinal section thereof. Figs. 4, 6, 7, and 8 are on a larger scale than the other views.

Referring to Figs. 1 to 4, inclusive, A is the body of the casting, upon which the spindle-bearings B B′ are formed.

C is the spindle, and D a cone attached thereto.

E is the conical chuck-plug; F, the sleeve, movable within the spindle, to press such plug to its tapering seat.

G is a collar secured to the sleeve.

H is a head secured upon the spindle adjacent to the collar, and I are levers pivoted in notches in the head H. Both ends of each lever extend longitudinally along the spindle, one end of the lever bearing against the face of the collar G and the other end being actuated by a cone, J, whose sloping sides force such end out from the spindle and press inward the ends in contact with the collar G. The face G of the collar is inclined, beveled, or otherwise shaped in reference to the lever-fulcrum I, so that the lateral movement of the lever thrusts the collar longitudinally, and moves the sleeve F, to press the conical plug E to its seat. The collar G is moved back to its normal position by the elastic pressure of the chuck-jaws against their tapering seats. The sleeve F is extended beyond the rear end of the spindle, and the collar G is attached directly thereto by the screws *l*, and in this construction the spindle C itself is projected beyond the rear bearing, B, to apply the head H and cone J to the spindle adjacent to the collar. The cone J is grooved at J^2, to receive a shifter, the latter being shown only in connection with the construction shown in Figs. 1, 2, and 3, where the collar G is fitted directly upon the end of the sleeve which projects at the rear of the spindle C. The shifter *m* is constructed with a hub, *m′*, fitted to slide upon a stud, *n*, which is projected from the rear side of the bearing B, and a lever, O, is pivoted to a fulcrum, P, adjacent to the stud, and passed through a slot, *q*, in the hub of the shifter. The handle of the lever O thus operates when moved to and fro to shift the cone J and to open or close the conical chuck-plug. It will be noticed that in this invention both arms of the lever I lie outside of the spindle and extend longitudinally along the same between the collar G and the cone J, and to effect a

contact of the collar with the ends of such levers the collar is required to project beyond the periphery of the spindle.

Having thus described a construction with the cone J at the projecting end of the spindle, I will refer to Fig. 5, in which it is applied between the journals *b b'*, at which points the spindle C' is fitted to the bearings B B', and in which figure the chuck is shown of different form. In this figure the plug E^6 is fitted inside a shell, K, which is screwed upon the nose of the spindle, as at L', and is contracted outwardly, so that the plug requires an outward movement to clamp it upon the rod S, the plug being split, as in the other construction shown in Fig. 7. The collar lettered G^2 in Figs. 5 and 6, being applied to the spindle between the journals *b b'*, is secured to the sleeve by means of screws *l'*, inserted through slots m^2 in the spindle, as shown in the section in Fig. 6. The plug is formed, as usual, with a shank, E', extending within the bore of the spindle, and in the construction shown in the shell K the sleeve F' may be made disconnected from the shank E' and operated by mere contact therewith, as at its rear end, E^2.

To produce the forward movement of the collar G^2, the head H' and cone J^3 are therefore shown in Fig. 5 located in the rear of the collar, the sloping face of the latter being inclined at G', so that as the ends of the levers I^2 are pressed toward the spindle in contact with such face the resultant movement of the collar and sleeve F' is toward the nose of the spindle and operates to press the plug toward its seat in the shell K. The ends of the lever which operate with the cone are shown considerably longer than the opposite ends, which thrust against the collar G^2, to secure an increased leverage and augmented pressure of the plug E^6 upon its seat; and as the levers thrust with their ends against the collar the inclination of its face G' (which is nearly at right angles to the shorter ends of the levers,) operates to lock the chuck-plug when pressed upon its seat, and prevents any reactionary movement of the sleeve F' on the levers I^2. In this respect my invention differs from that of any other lever which has been used in a construction for shifting the chuck-plug, as the reaction of the plug has heretofore operated to press such levers sidewise, so that the holding of the plug firmly upon its seat depended upon some additional locking device—as the cylindrical seat J'. (Shown at the base of the cone J in Fig. 1.) While such cylindrical seat serves to lock a pair of clutch-levers in a given position, the force exerted tends to bend such levers sidewise, and is all transmitted through the fulcrum-pins of such levers, which are liable to wear loose and derange the operation of the mechanism. In the construction shown in Fig. 5 the shorter ends of the levers become jammed by their radial bearing against the sloping face G' when the plug is pressed firmly upon its seat, and the plug is thus held firmly without reference to the stiffness or lateral strength of the levers. The inclination of the face G' may be varied to give the plug the desired movement, and a curve eccentric to the fulcrum-pins I' may be formed upon the face of the collar, as shown in Fig. 5, with a concentric portion at the base of such curve, to lock the collar into its final position against the ends of the levers. Such eccentric curve is indicated by the dotted line *e* in Fig. 5, a curve concentric with the fulcrum I' being also indicated at *e'*, to show the difference between the two, and an arrow being carried from the curve *e* to its center to show the location of the latter. With the construction described in Figs. 1 to 4 the cone J and lever I operate to pull the sleeve backward, and the conical plug E is made largest at its outer end, as shown in Figs. 1, 7, and 8, and the plug is fitted directly to the nose of the spindle. My improvement in the chuck-plug bushing is shown in Figs. 1 and 7. As the plug is of hardened steel and slitted, as at *t* in Fig. 7, to permit of its compression, the chips from the rods S are liable to gain access to the tapering seat in the nose of the spindle and to be pressed or stuck therein by the movement of such hardened plug. As it is difficult to harden the nose of the spindle to prevent such adhesion of the chips, I have devised a seat made as a bushing separate from the nose of the spindle and fitted to a slightly-tapering socket therein, so as to be driven tightly into the same and there held by friction. Such separate seat or bushing may be readily hardened, and after its insertion in the spindle be accurately ground to form a true tapering seat, and, being of equal hardness with the split plug E, the chips turned from the rods S are not liable to injure the surface of either the plug or seat.

I am fully aware that it is not new to shift the chuck-plug by a sleeve passing through a hollow spindle, and that bent levers having their ends inserted through slots in the spindle and acting upon sockets formed in the rear end of the sleeve have been used in conjunction with a shifting-cone to actuate the sleeve and chuck-plug. I therefore disclaim such construction because the strain is transmitted through a greater number of joints than in my own, in which the ends of the levers jam against the face of the collar G in such a manner as to be self-locking when the chuck is closed, and operate to hold the chuck-plug firmly upon its seat without producing any transverse or bending strain in the arms of the levers.

In my invention both arms of the levers lie outside of the spindle and extend longitudinally along the same, and the thrust-collar requires therefore to project beyond the periphery of the spindle; and I have therefore claimed my invention as of such specific construction.

To compensate for the wear of the chuck-plug *e* in its seat, or to compress the plug more

closely to fit a smaller rod, the head H may have a longitudinal adjustment upon the spindle, as is indicated in a nut, *r*, shown in Figs. 2 and 5, which is fitted to a screw-thread, *s*, upon the spindle upon the side of the head opposite the collar G or G^2.

The nut I construct with a parting at one side, and insert a clamping-screw, *t*, to pinch it firmly upon the thread *s* when adjusted in its proper position.

Having thus disclaimed the use of the levers I and the cone J, unless combined with the thrust-collar G, operating as described herein, I claim my specific construction as follows:

1. The combination, with the hollow spindle, the conical chuck-plug, and the sleeve for actuating the plug, of the collar rigidly secured to the sleeve and projecting beyond the periphery of the spindle, the cone fitted to slide upon the hollow spindle adjacent to the collar, and one or more levers pivoted to a fulcrum upon the spindle and extended longitudinally between the collar and the cone, with one end against the collar outside of the spindle and operating to thrust the collar longitudinally when such end is pressed toward the spindle by the outward movement of its opposite end in contact with the cone, substantially as and for the purpose set forth.

2. The combination, with the hollow spindle, the conical chuck-plug, and the sleeve for actuating the plug, of the collar rigidly secured to the sleeve beyond the end of the spindle, the cone fitted to slide upon the hollow spindle adjacent to the collar, a longitudinally-adjustable head secured upon the spindle between the collar and the cone, and a pair of levers pivoted opposite to one another in such head with one end against the collar and operating to thrust the collar and the sleeve longitudinally when such ends are pressed toward the spindle by the expansion of their opposite ends in contact with the cone, substantially as shown and described.

3. The combination, with a hollow spindle, its contained sleeve, and the collar secured thereto and projected beyond the periphery of the spindle, of a pair of levers pivoted upon a head and attached to the spindle, as described, and a cone for separating the levers at one end thereof, the aforesaid collar having a beveled or sloping face in contact with the opposite ends of the levers, operating, when such ends are pressed toward the spindle, to produce a longitudinal movement of the sleeve, substantially as and for the purpose set forth.

4. The combination, with a hollow spindle having a recess formed in its nose, of a hardened steel bushing secured within such recess and ground with a conical seat tapering inwardly, a split conical plug fitted to such seat, and a sleeve attached to the inner end of the plug and movable longitudinally to draw the plug into the seat to operate as a chuck, substantially as shown and described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

ALBERT E. ELMER.

Witnesses:
ALLEN WEBSTER,
FRED L. R. BROWN.