J. G. LIDDELL.

MECHANICAL PENCIL.

APPLICATION FILED DEC. 14, 1921.

1,425,871.

Patented Aug. 15, 1922.

Fig. 1

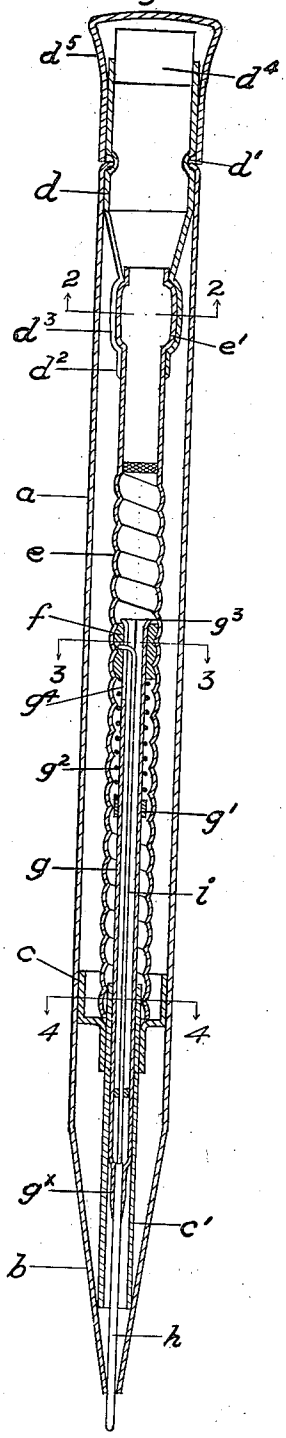


Fig. 5

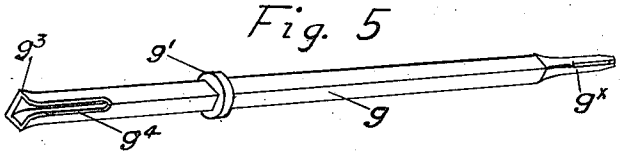


Fig. 2

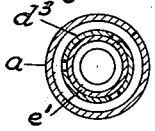


Fig. 6

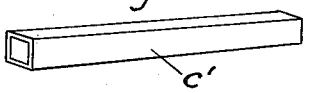


Fig. 7

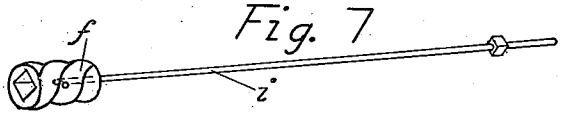


Fig. 3

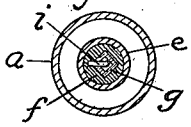


Fig. 8

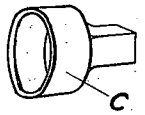


Fig. 9

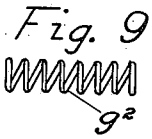
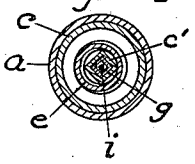


Fig. 4



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UNITED STATES PATENT OFFICE.

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MECHANICAL PENCIL.

1,425,871. Specification of Letters Patent. Patented Aug. 15, 1922.

Application filed December 14, 1921. Serial No. 522,250.

To all whom it may concern:

Be it known that I, JOHN G. LIDDELL, a citizen of the United States, residing at 193 Hancock Street, Everett, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Mechanical Pencils, of which the following is a specification.

My invention is a mechanical lead pencil, in which the mechanism holds and controls the lead and propels or retracts it at will and finally ejects the short stub end when the lead has been worn out.

In the drawings:

Figure 1 is a longitudinal central section of my improved pencil;

Figures 2, 3 and 4 are cross-sections on lines 2—2, 3—3 and 4—4 respectively, of Figure 1; and

Figures 5, 6, 7, 8 and 9 are details, in perspective, of separate parts of the mechanism.

In the specification I shall speak of the pointed writing end as the front end and the opposite end as the rear end. My pencil is provided with an outer barrel, *a*, pointed or tapered at the front end, *b*, and hollow throughout. This outer barrel serves as a support and covering for the mechanism which is mounted within, in bearings fitted within or secured to the inner side of the barrel, *a*. These bearings are two in number, a bearing, *c*, at the forward end, secured to the inner surface of the barrel, *a*, and a second bearing, *d*, inserted into the open rear end of the barrel and in frictional engagement therewith. This rear bearing is of tubular form for the greater part of its length and has an annular groove, *d'*, upon its outer surface, into which the rear edge of the barrel, *a*, is spun to connect the parts against relative longitudinal movement while permitting rotation of the parts. The inner end of bearing, *d*, is tapered and carries a tubular extension, d^2, having an enlarged portion, d^3. This tubular extension is split longitudinally to give capacity for yielding outwardly to wedging force and is of resilient material, preferably metal. Within the barrel and with its longitudinal axis coincident with the longitudinal axis of the barrel, is a hollow screw member, *e*, its rear end carrying an annular enlargement, *e'*, which is wedged into the extension, d^2, of bearing *d*, spreading that extension until the annular projection *e'* passes into the enlargement d^3 of the bearing *d* and is frictionally engaged thereby. The other end of the hollow screw receives a tube, *c'*, angular in cross-section, preferably square, as shown, and fast to bearing *c*, so that the screw member is supported along the longitudinal axis of the barrel by an inner support at its front end and by an outer bearing at the rear. Mounted within the tube *c'* at its front end and within a nut, *f*, within the screw, *e*, at its rear end, is a lead-carrier or chuck, *g*, angular in cross-section, and preferably square, as shown. This carrier fits and corresponds to the angularity of the tube *c'*, within which it may slide longitudinally, but cannot turn. The front end g^x of the carrier, *g*, is constricted and split, to receive and hold a section of lead, *h* (see Figure 1). Upon the outer surface of the tube, *g*, is fast a collar, *g'*, and between the collar *g'* and the nut, *f*, is mounted a spiral spring, g^2. At its rear end, beyond the nut, the tube, *g*, is expanded, as at g^3, so that the nut cannot pass over the expanded end and a slot, g^4, is formed in one side of the rear end of the tube and within the tube is mounted a wire, *i*, which normally extends from the front end g^x of tube *g* to the rear end of slot g^4, through which the rear end of the wire is bent at right angles to pass and engage the nut *f*.

Preferably, the rearwardly projecting end of bearing, *d*, carries a rubber eraser, d^4 and is covered by an ornamental cap d^5 which slips over it.

The operation is as follows: Assuming that the parts are in the position shown in Figure 1, to propel the lead out of the writing end, *b*, the rear bearing, *d*, is rotated. Through the frictional engagement of the extension d^2 with the rear end *e'* of the screw member *e*, the screw will be rotated. The nut *f* cannot rotate, being mounted upon a tube, *g*, angular in cross-section, which is in turn mounted in a bearing-tube, *c'*, angular in cross-section and fast to bearing *c* fixed to the barrel, *a*. The nut *f* is therefore forced forward by the rotation of screw *e* propelling the tube, *g*, through the spring g^2 and collar *g'*, until the collar *g'* reaches and abuts upon the rear end of tube *c'*. The constricted front end g^x of the tube *g*, is at this time close to the inside of the extreme end of the point *b* of the barrel, *a*. The tube *g*, being stopped by the engagement of collar *g'* with tube *c'*, continued ro-

tation of bearing, d, will propel the nut f against the resistance of the spring g^2, and with it the ejector wire, i, which is engaged with the nut. The lead carrier tube being stopped in its longitudinal movement, the ejector wire i, will move forward and pass through the lead-holding end, g^x, of tube g, ejecting any lead remaining therein. In case the operator should continue rotation of actuating-bearing, d, after the parts have been actuated to their limit, in either direction, the engagement of the parts d^3 and e' being merely frictional permits continued rotation without injury to the mechanism. To refill, the rotation of the bearing, d, is reversed and the nut f thereupon will travel rearwardly carrying with it the ejector-wire, i, until the expanded inner end, g^3, of tube g is reached. The new lead h, may now be inserted in the holder g^x and then continued rotation of the bearing d will retract the tube g and holder g^x and restore all parts to their initial position, as shown in Figure 1.

My improved mechanical pencil is simple in construction, certain and efficient in operation, of low cost to manufacture and assemble and easy to repair. The spring connection between actuating nut f and the lead-holder tube g permits of the combination with the tube g and the nut f of the ejector, i, and the actuation of that ejector after the carrier, g, has reached the limit of its forward movement. The result is a single element that propels and retracts the lead as desired and expels the short end of lead remaining in the holder when the lead is worn out.

I have in this specification described telescoping tubes, angular in cross-section, as the non-rotatable mechanism and as the best means now known to me for accomplishing the desired results. I do not, however, intend to confine myself to this specific construction, as I am aware that the telescoping tubes might be of oval, corrugated, or other non-circular cross-section or held from rotation by a pin and slot connection, and such constructions I consider inferior mechanical equivalents of the tubes angular in cross-section which I have described.

I claim:

In a mechanical pencil, a barrel, having a fixed hollow bearing, non-circular in cross section, at its forward inner end and a rotatable bearing projecting from its rear end; a hollow screw supported axially of the barrel, between the two bearings, for rotation; a nut, within the hollow screw; a lead-carrying tube, non-circular in cross-section, axially supported at its rear end by the nut within the hollow screw, and supported at its front end within the hollow fixed bearing at the front end of the barrel, the carrier tube being slotted on one side at its rear end and headed behind the nut; a collar fast on the lead-carrying tube; a spiral spring surrounding the carrier tube and interposed between the collar and the nut; an ejector wire within the carrier tube, engaging the nut through the slot in the carrier at its rear end; all combined and operating substantially as described.

Signed at Boston, Massachusetts, this 12th day of December, 1921.

JOHN G. LIDDELL.