

Oct. 13, 1925.

1,556,701

J. G. LIDDELL
MECHANICAL PENCIL
Filed May 10, 1924

2 Sheets-Sheet 1

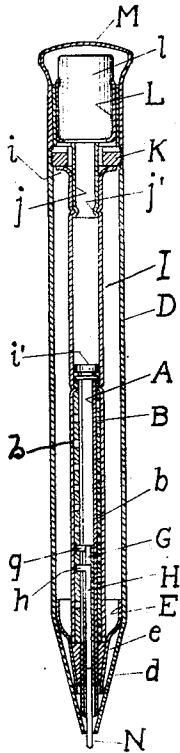


FIG 1

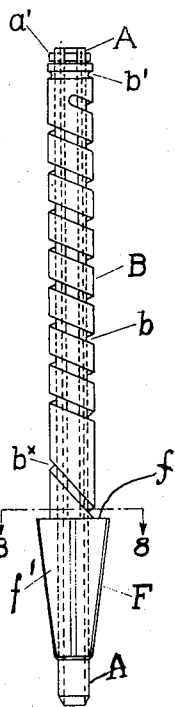


FIG 2

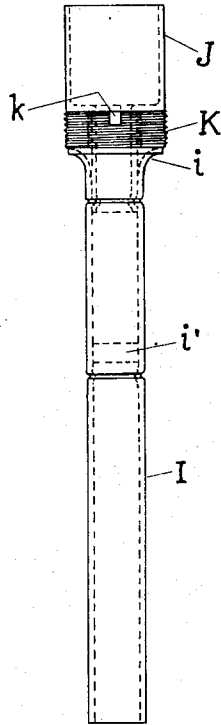


FIG 4

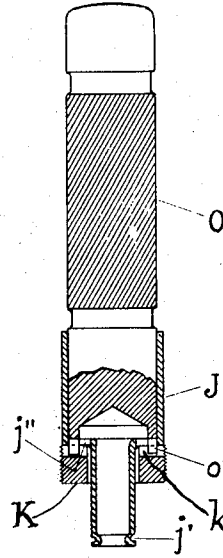


FIG 5

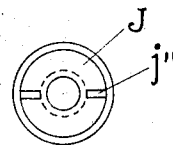


FIG 6

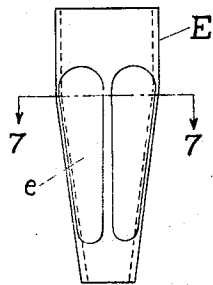


FIG 3

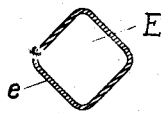


FIG 7

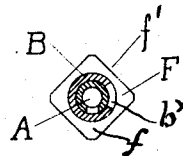


FIG 8

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2 Sheets-Sheet 2

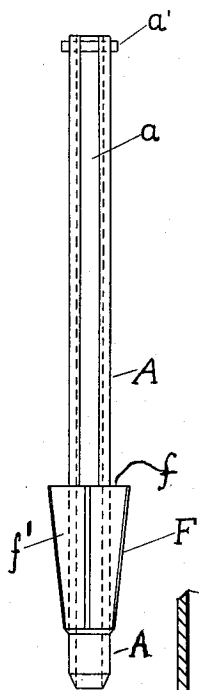


FIG 9

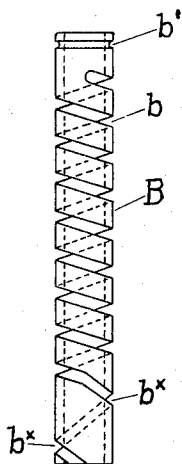


FIG 10

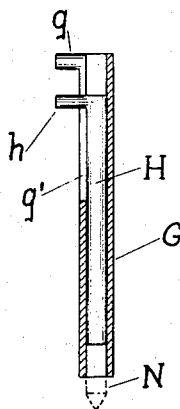


FIG 11

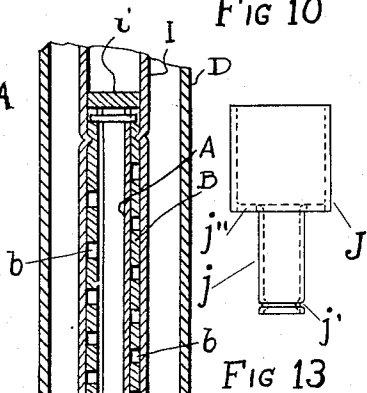


FIG 13

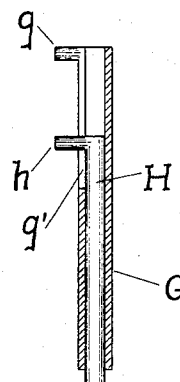


FIG 12

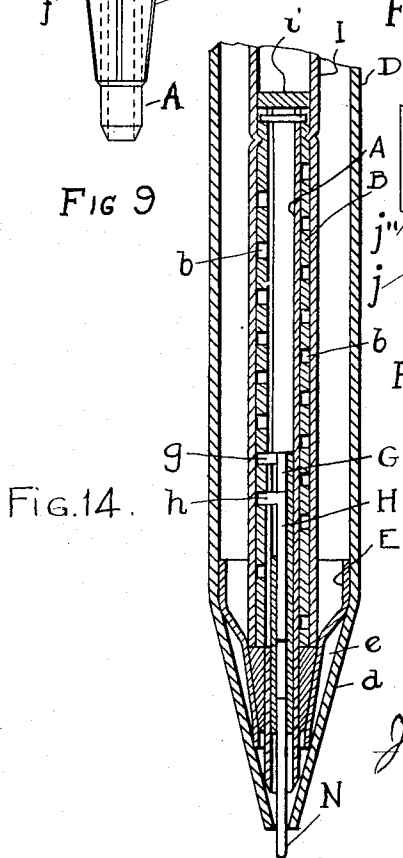


FIG.14.

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UNITED STATES PATENT OFFICE.

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OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

MECHANICAL PENCIL.

Application filed May 10, 1924. Serial No. 712,465.

To all whom it may concern:

Be it known that I, JOHN G. LIDDELL, a citizen of the United States, residing at 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 relates to mechanical pencils and particularly to that class in which the lead is propelled, repelled and expelled from the point of the pencil, at will, by screw mechanism and it consists in the provision of a positively actuated lead carrier and a positively actuated lead expeller, combined with an actuating screw having a thread of two separate pitches, a slow pitch for the major part of its length, by means of which the lead carrier and the lead expeller are moved slowly in unison, except in the expelling function, when the expeller stud travels into a short section of quick pitch thread and the motion of the expeller is thereby quickened, so that it travels more rapidly than the lead carrier, pushing the lead before it and out of the carrier and pencil.

My invention also relates to an organization of the working parts of the pencil, by which they are assembled and secured in a compound-unit and may be thus inserted into the shell or casing and secured or disconnected and removed as a unit.

In the drawings:

Figure 1 is a longitudinal section of my pencil;

Figure 2 is an elevation of the assembly of the slotted tube and hollow screw;

Figure 3 is an elevation of the anchor cone;

Figure 4 is an elevation of the assembly of sheath, cup and nut;

Figure 5 is a detail of the nut-actuating means and the key;

Figure 6 is a similar detail in plan of the bottom of the cup, J, showing the slots j'' ;

Figure 7 is a section on line 7—7 of Figure 3;

Figure 8 is a section on line 8—8 of Figure 2;

Figure 9 is an elevation of the slotted tube with its abutment;

Figure 10 is an elevation of the hollow screw;

Figure 11 is a longitudinal section of the

carrier; the plunger being shown within;

Figure 12 is a similar view to Figure 11, the parts being shown in expelling position;

Figure 13 is a detail of the cup and its extension.

Figure 14 is a view of the lower part of the pencil shown in Figure 1, upon an enlarged scale.

All the Figures 2 to 14 inclusive are on a scale enlarged over that of Figure 1.

In the accompanying drawings, A, is a tube, slotted along one side at a , and B is a hollow screw element, mounted upon and concentric with a tube A, the thread-slot being marked b . D is the outer casing, having at the front end, a conical writing point d .

Mounted within the point, d , is an anchor cone, E having flattened sides, e , rendering it non-circular in cross-section. The front end of the slotted tube A is forced through and beyond a conical head, F, having a cylindrical bore to receive the tube A and having also flattened spaces f' on its outer surface to correspond with the flat sides, e , of the anchor cone E. Anchor cone E is forced to place in the point d , and engages with a tight frictional grip and head F when inserted into cone E engages by its flattened sides the corresponding flats on the cone E, so that it, and its associated parts are locked against turning upon its axis. Within the hollow tube is mounted a lead carrier, G having a slot g' , and a stud, g , which passes through the slot, a , of tube A and into the thread-slot b , of screw B. Within the carrier G is mounted a plunger H having a stud h , projecting through the slot, g' of the slot a , of the tube A and into the thread-slot, b , of screw B.

The tube A being organized with the head F as shown in Figure 9, the lead carrier G with its plunger H is inserted within the tube A, the studs g and h in the slot, a , of tube A. The screw member B is then mounted upon the tube A, the studs g and h being passed into the thread-slot, b , and the screw B is passed down to a seat on the rear end f of head, F. The studs g and h are adjusted in the thread-slot one turn or coil apart. The screw B has at its upper or rear end an annular indentation b' and is secured against rearward movement on the tube A by a pin a' passed through the upper end of tube A above the upper end of screw B. The sheath I is now passed over the

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screw B until its front end rests upon the flat rear end *f*, of head F. The sheath is preferably a close fit and, as shown in Fig. 1 is considerably longer than the screw B and tube A. In the upper, open, flared end *i* of sheath I, is inserted a cup J having an extension, *j*, fitting within the sheath I, the extension being provided with an annular indentation *j'*. Before the extension *j*, is passed into the sheath I a perforated nut, K having a threaded outside periphery, is mounted upon the extension, so that in the assembly it is loosely held between the flared end, *i*, of the sheath and the bottom of the cup J (see Fig. 4). When the parts have been brought together the sheath I and the screw B are connected by rolling sheath I into annulus *b'* and sheath I and cup J are connected by rolling sheath I into annulus *j'* on extension *j*, the contact and connection thus established being so close that the parts thereafter turn as one. The result is that the entire working mechanism of the pencil is assembled and secured together in one unit or organization. The interior of the case D at its rear open end is provided with screw threads corresponding to the threads on nut K and the mechanism unit is inserted into the rear of the case, the conical head F first, the nut K is engaged with the threads on the interior of case D and the nut screwed down, carrying all the parts until head F engages, flats *f'* to flats *e*, with the interior of anchor cone E, thus removably securing the interior parts in the case, against longitudinal, rotary or lateral motion, the axis of the interior parts unit and the casing being identical. The operation of the nut K is accomplished by forming apertures in the bottom of cup J, through which may pass the prongs O' of a key O (see Fig. 5) to engage recesses *h* in the opposed surface of nut K, by means of which the nut K may be operated. Within the cup J a ferrule L holding a rubber *l* may be inserted. When this ferrule is withdrawn a passage is open through the extension *j* into the interior of the sheath I and this interior may be utilized as a spare lead magazine by providing a stopper, *z'*, at a suitable point within the sheath. A cap M covers the rubber and tightly fits the outside of cup J, so that by rotation of cap M the motion is frictionally transmitted to the moving parts through cup J, extension *j* engaged with sheath I which in turn is engaged with screw B within the thread-slot of which the stud *g* of carrier G and the stud *h* of plunger H, project.

The operation is as follows; the parts being assembled as described above and shown in Fig. 1, by revolving the cap M contra clockwise the carrier G and plunger H are drawn upwards by means of the studs *g* and *h* working in the slot *b* of the screw

B. When the cap is rotated in the opposite direction the movement of the carrier and plunger will be toward the point of pencil. It will be observed that the thread-slot *b* of the screw is of two pitches at different points along the screw. For the major portion of its length the pitch is relatively slow while at the lower or front end the pitch is increased (see Figs. 2 and 10). It will also be observed that the plunger H is within the carrier G, and its stud *h* is in advance of the carrier stud *g*, the two studs being in adjacent threads one turn apart, so that for the major part of their course the plunger and carrier progress in unison without relative movement and the lead N is propelled and repelled in accordance with the movement of the carrier. When it is desired to replace the lead the screw is rotated to move the carrier forward and as the forward end of the carrier approaches the interior of the point, *d*, the stud *h* of the plunger reaches the section *b** of greater pitch of the thread and is rapidly accelerated so that, while the stud, *g*, of the carrier is moving the distance between two adjacent thread-turns of *b*, the stud *h* has been advanced a greater distance by the thread-turns *b**. The effect of this is that the plunger H moves forward relatively to the carrier G pushing the lead N before it, out of the carrier and pencil. To insert a fresh lead the screw is reversed one turn, restoring the plunger and carrier to their normal relationship, when a lead may be inserted in the carrier and the carrier withdrawn to the upper limit of its motion. At both limits of the carrier motion, the provision of a frictional driving engagement between the cap M and the moving parts prevents strain or breakage of the moving parts, the cap slipping when the parts have moved as far forward or back as they can.

It will be obvious that the organization of the interior working parts of the pencil as a compound-unit is of great practical value, reducing the cost of assembly and rendering it easy to remove damaged working parts without marring the case, which is frequently of precious metal or of other expensive material highly ornamented.

I have shown in Fig. 5 a means for operating the nut K, namely a key or wrench O having two or more prongs projecting from its lower end which may be inserted into cup *j* the prongs O' passing through slots *j''* in the bottom of the cup J and reaching slots *h* in the surface of nut K. The key O being turned the nut K may be caused to move in either direction.

I am aware that certain variations of the organization of the parts may be effected, without varying the essential mode of operation of the mechanism, for example the hollow screw may be arranged within the

slotted tube, the carrier and plunger studs projecting through the slot of the screw into the slot of the tube, and I do not therefore intend to limit myself to the exact organization which I have described and which is the best now known to me, the two organizations suggested being mechanically equivalent.

I claim:

10 In a mechanical pencil, a longitudinally slotted guide tube; a hollow screw revolvably mounted upon the tube and having a thread of one pitch from its rear end to near its forward end and a thread of a greater pitch
15 for the balance of its length; a slotted car-

rier mounted within the tube and having an actuating stud passing through the slot of the tube into the hollow screw-thread; a plunger mounted within the slotted carrier and having a stud projecting through the carrier slot, the tube slot and into the hollow screw thread, in advance of the carrier stud, the carrier and plunger being independently and positively actuated by the hollow screw, as and for the purpose described.

Signed at Boston, Massachusetts, this first day of May, 1924.

JOHN G. LIDDELL.