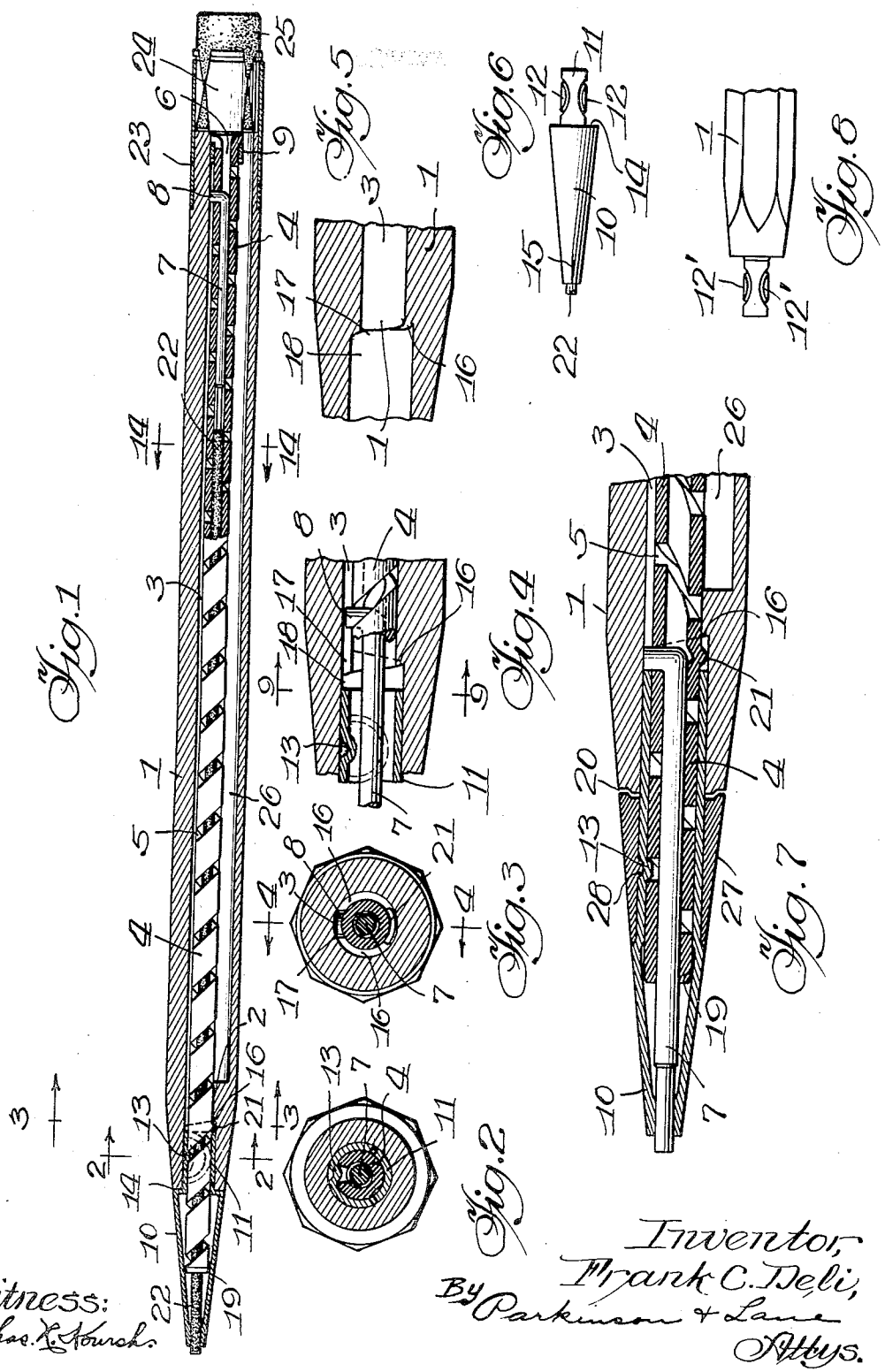
Nov. 7, 1939. F. C. DELI 2,178,626

MECHANICAL PENCIL

Filed Sept. 5, 1935 3 Sheets-Sheet 1



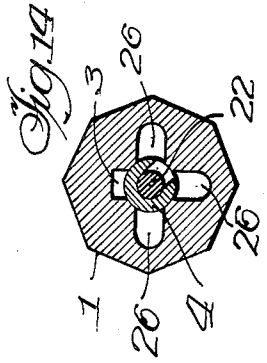
Witness:
Chas. K. Kourch.

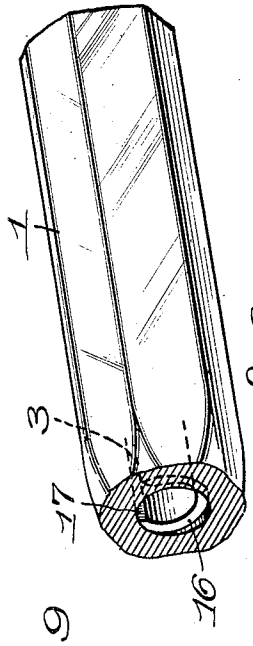
Inventor,
Frank C. Deli,
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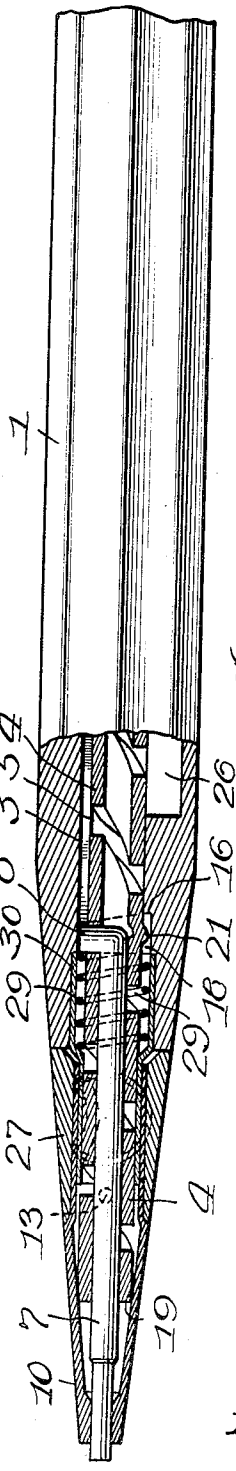
Nov. 7, 1939. F. C. DELI 2,178,626

MECHANICAL PENCIL

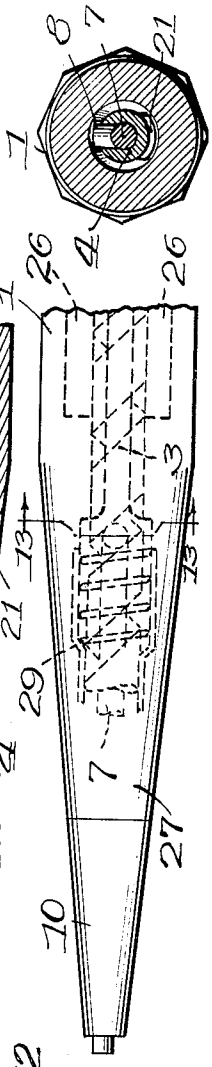
Filed Sept. 5, 1935 3 Sheets-Sheet 2











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Nov. 7, 1939. F. C. DELI 2,178,626

MECHANICAL PENCIL

Filed Sept. 5, 1935 3 Sheets-Sheet 3

Fig. 15

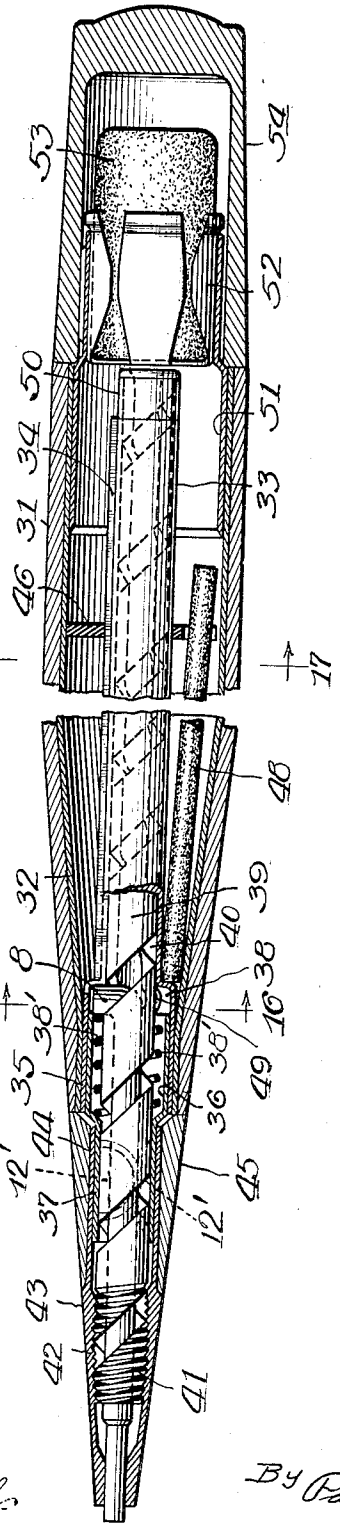


Fig. 16

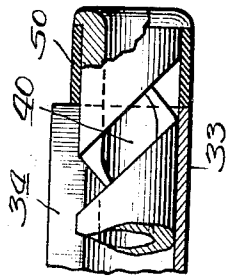


Fig. 17

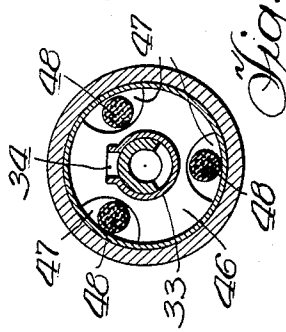
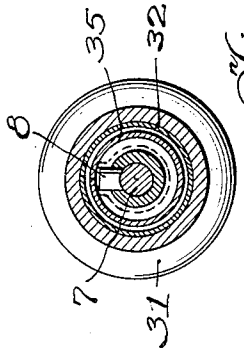


Fig. 16



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UNITED STATES PATENT OFFICE

2,178,626

MECHANICAL PENCIL

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Application September 5, 1935, Serial No. 39,252

18 Claims. (Cl. 120—18)

This invention relates to pencils and more particularly to the type of pencils generally referred to as mechanical pencils, in which two main sections, for example, the barrel and the tip, are rotatable with relation to each other to propel the lead the desired degree through the tip to make the point of the lead available for writing purposes.

Among the objects of this invention is to provide an improved pencil in which an extremely long lead may be loaded and used, with the consequent relief from the necessity of frequent reloading by the user.

Another object is to provide a neutral zone for operation when the lead has been exhausted, and of such nature as to prevent jamming and consequent injury to the operating parts when the plunger reaches its extreme forward end of travel.

A further object is to provide in mechanical pencils a neutral zone, in the operation of which the tip is slightly pushed outwardly with relation to the barrel so that when the tip is rotated with relation to the barrel in a reverse direction from that for propelling the lead forward, the plunger head will be caused to positively move backwardly toward the rear end of the pencil, this backward movement being started by a slight pressure upon the tip as it is being rotated in said reverse direction.

A still further object is to also provide means to prevent jamming of the operating parts when the plunger reaches its rear end of travel.

Another object is to provide a mechanical pencil in which when the plunger reaches the rear limit of its movement the tip will be unscrewed from its position on the barrel to perform the double function of preventing jamming of parts as well as removal of the tip preparatory to loading a new lead into the pencil.

A further object is to provide for a slight longitudinal play in the lead guide tube.

A still further object is to provide a neutral zone together with resilient means for insuring return of the plunger head into the longitudinal groove in the barrel immediately following exhaustion of the lead from the tip.

Another object is to provide a novel arrangement of chambers or receptacles for holding spare leads.

A further object is the provision of a mechanical pencil in which a new lead may be loaded without removing the operating mechanism from the barrel, thus eliminating the exposure of such operating mechanism to damage or loss.

Another object is the provision of means in a mechanical pencil whereby the lead advancing element may be returned to proper position for loading a new lead into the pencil with no other effort on the part of the user than the relative rotation of the operating parts in the reverse direction from that employed in advancing the lead and a slight pressure on the tip.

Other objects, advantages and capabilities will later become more fully apparent.

My invention further resides in the combination, construction and arrangement of parts illustrated in the accompanying drawings, and while I have shown therein preferred embodiments I wish it to be understood that the same are susceptible of modification and change without departing from the spirit of my invention.

In the drawings—

Fig. 1 is a longitudinal section taken on a plane passing through the axis of the pencil with part of the lead guide tube, the plunger and the lead being shown in elevation.

Fig. 2 is an enlarged transverse section on the line 2—2 of Fig. 1.

Fig. 3 is an enlarged transverse section on the line 3—3 of Fig. 1.

Fig. 4 is a fragmentary longitudinal enlarged section through that portion of the pencil shown in Fig. 1 adjacent the forward end of travel of the plunger and taken on the line 4—4 of Fig. 3, the removed half of the helical shoulder being shown in dotted lines for clearness.

Fig. 5 is an enlarged fragmentary sectional detail illustrating the helical surface forming the rear edge of the neutral zone space.

Fig. 6 is an elevational detail of the tip of the pencil shown in Fig. 1.

Fig. 7 is an enlarged fragmentary longitudinal section of a pencil similar to that shown in Fig. 1 but having a slightly different form of tip member.

Fig. 8 is a modification showing the friction tube for holding the tip on to the barrel as being carried by the barrel instead of by the tip.

Fig. 9 is an enlarged fragmentary perspective view of a portion of the forward end of the barrel and showing a section taken on a plane passing through the neutral zone.

Fig. 10 is an enlarged fragmentary view of the forward end of a pencil partly in elevation and partly in section showing a modification.

Fig. 11 is an enlarged fragmentary sectional view of the forward end of a pencil embodying my invention and showing a further modification.

Fig. 12 is an enlarged fragmentary elevation of the forward portion of a pencil embodying the modification of Fig. 11, Fig. 12 showing the pencil

as having been rotated through an angle of 90° from the position of that shown in Fig. 11.

Fig. 13 is an enlarged section taken on the line 13—13 of Fig. 12.

Fig. 14 is a transverse section on the line 14—14 of Fig. 1.

Fig. 15 is an enlarged longitudinal section of a further modification of my pencil with parts broken away for convenience.

Fig. 16 is an enlarged transverse section taken on the line 16—16 of Fig. 15.

Fig. 17 is an enlarged transverse section taken on the line 17—17 of Fig. 15.

Fig. 18 is an enlarged fragmentary longitudinal section of the rear end of the lead guide tube and associated parts, a portion of the lead guide tube being shown in elevation.

Referring in detail to the drawings and more particularly to Figs. 1 to 6, inclusive, the pencil comprises the body portion or barrel 1, formed on its interior with the longitudinal bore 2, which bore is formed along one side with the longitudinal elongated groove 3. Positioned within the bore 2 is the lead guide tube 4, which is provided with the spiral slot 5 extending from its upper or rear end to its forward end, the slot 5 being open at the forward end of the lead guide tube but closed at the rear end.

Longitudinally slidable within the bore 6 of lead guide tube 4 is the plunger 7 formed at its rear end with the plunger head 8 (which is shown round, but may be flattened on two sides), which extends through the spiral slot 5 and into the longitudinal groove 3. The lead guide tube 4 at its rear end extends through a sleeve 9, which seats within an enlarged portion of the bore 2 at the rear end of the longitudinal groove 3, the rear end of the lead guide tube being swaged, burred or otherwise bent over the rear edge of sleeve 9 in order not to pull forwardly therethrough and also to be fixed with relation thereto. Sleeve 9 has a limited longitudinal sliding movement within the enlarged portion of the bore of the pencil barrel, which enlarged portion is somewhat longer than the combined length of the sleeve 9 and the burred or bent end of the lead guide tube. In Fig. 1 this excess length or space is shown at the forward end of sleeve 9.

At the forward end of the barrel 1 is rotatably mounted the tip 10 which, in the form shown in Fig. 1, has a conical forward portion and at its rear end is reduced in diameter to form the tubular extension 11 of a size to fit snugly but rotatably into the forward end of the bore in barrel 1, this fit being facilitated by one or more spring portions 12 formed in the tubular extension 11 by slitting the metal and causing the slit portion to have a slight tendency to spring outwardly.

The tubular extension 11 of tip 10, as more clearly seen in Fig. 4, is provided with an inwardly extending small projection 13 (which may be formed by forcing the metal a slight distance inwardly at this point), which projection, as seen in Figs. 1 and 4, is of a size to follow along that portion of the spiral slot 5 at the forward end of the lead guide tube 4. In other words, by starting this inwardly extending projection 13 into the open end of the spiral slot 5 the tip 10 may be screwed onto the lead guide tube by relative rotation between these parts until the tapered end of the lead guide tube wedges against the interior of the hollow tip. The tip will then be pushed inwardly by hand until its shoulder abuts against shoulder 14, which longitudinal movement is permitted because of the longitudinal play in the lead guide tube. When the tip is thus positioned so that projection 13 will not advance any further upwardly along spiral slot 5, further rotation of tip 10 with relation to barrel 1, will cause rotation of the lead guide tube 4, which will then cause the plunger 7 to be either advanced or retracted depending upon the direction of rotation.

The tip is provided with the usual opening at its forward end to permit passage of a lead therethrough, the tip at its forward end preferably being slitted at 15 (see Fig. 6) at two diametrically opposite positions to provide in the customary manner a slight gripping action upon the lead to prevent the lead from falling out of the tip. A greater or less number of such slits may be used if desired. As will be understood, that portion of the bore at the forward end of barrel 1 which receives the tubular extension 11 of tip 10 is slightly larger in diameter than that portion of the bore which receives the lead guide tube 4, the outer circumference of that portion of the bore which receives tubular extension 11 being at least in alignment with the outer face of longitudinal groove 3. This forms a shoulder 16 which, as shown in Figs. 4, 5 and 9, is of a helical or spiral contour leading backwardly of the bore and starting from one side of the longitudinal groove 3 and terminating at the other side of this groove. The slope of helical shoulder 16 is opposite in direction from that of the trackway 5 in the lead guide tube 4. This results in one side of groove 3 extending further toward the tip than the other. This extension is indicated at 17 in Figs. 4, 5 and 9 and is for a purpose later more fully pointed out.

The innermost end of the reduced tubular portion 11 of tip 10 is located when the tip is in operating position a slight distance short of the nearest portion of this spiral shoulder 16, so as to form between the end of the longitudinal groove 3 and the adjacent end of the reduced tubular portion 11 an annular space 18 to constitute a neutral zone into which the plunger head 8 will enter when it reaches the tip end of groove 3. The width of a portion of this annular space forming the neutral zone, at the end of groove 3, is slightly less than the diameter of plunger head 8, so that when the latter is forced out of the lower end of groove 3 it will after further rotative movement strike the adjacent end of reduced tubular portion 11 and will push tip 10 a slight distance out of barrel 1, as indicated at 20 in Fig. 7, this being permitted because of the slight amount of longitudinal play which the lead guide tube has. This occurs at the time when the lead has been exhausted and completely expelled from the tip 10. With the plunger head 8 in this annular space neutral zone 18, further rotation of the tip with relation to the barrel in the same direction as for advancing the lead, would merely cause the plunger head to idly rotate in this neutral zone space. To cause the plunger to move toward the rear end of the barrel all that is necessary is to reverse the direction of rotation of the tip with relation to the barrel, at the same time maintaining a slight pressure inwardly on the tip, which pressure due to the slight longitudinal play in the lead guide tube will push the plunger head rearwardly, especially as it nears the extension 17. This will cause the plunger head 8 to be guided by the helical shoulder 16 into contact with the extension 17 (see Figs. 5 and 9), and further continued rotation in

said reverse direction will then cause the plunger head to move rearwardly in groove 3 toward the rear end of the barrel.

As stated above, there is a slight amount of longitudinal play permitted the lead guide tube 4, so that when the plunger head passes into the neutral zone space it will upon continued rotation of the lead guide tube cause the tip to move a slight distance out of the barrel so as to put the tip in a position to push rearwardly on the plunger head when the direction of rotation of the tip is reversed. The grip of the lead guide tube in the tip is facilitated by a slight taper 19 on the free tip end of the lead guide tube, which taper is of the same angularity as the taper on the hollow interior of the tip.

To hold the lead guide tube against longitudinal movement in bore 2 of the barrel, except for the slight longitudinal play referred to above, the lead guide tube is formed with a projection 21 which lies within and is movable around the neutral zone 18, and is prevented from being withdrawn rearwardly through the bore of the barrel by reason of the helical shoulder 16, but yet of a size to permit the slight play referred to. Prevention of the lead guide tube 4 from being pulled forwardly out of the bore of the barrel is effected by sleeve 9 secured to the rear end of the lead guide tube. The slight longitudinal play referred to in the lead guide tube 4 is that afforded by sleeve 9 at the rear of the lead guide tube and the projection 21 near its forward end. The circumferential length of projection 21 is greater than the width of longitudinal groove 3 in order to prevent it being pulled through said groove when in registry therewith.

Assuming now that the lead has been exhausted and the plunger is being moved toward the rear end of the pencil, continued movement will ultimately bring the plunger head 8 against sleeve 9 and this will prevent further rearward movement of the plunger, and will also lock the lead guide tube to the barrel 1 for rotation therewith. Continued rotation of the tip with relation to the barrel in the same direction as that employed in moving the plunger rearwardly will cause (after plunger head 8 strikes sleeve 9) the tip to be unscrewed from the lead guide tube by reason of the projection 13 following the spiral slot 5 to and off the free end of the lead guide tube. It should be here kept in mind that the direction of rotation of the tip with relation to the barrel when feeding the lead forward is such as to hold the tip on to the lead guide tube in the position shown in Fig. 1, while rotation in the reverse direction of the tip with relation to the barrel will tend to unscrew the tip from the lead guide tube, this latter, however, occurring only when the plunger head 8 strikes the sleeve 9. This performs the double function of preventing jamming of the parts when the plunger reaches its rearmost limit of movement, and at the same time screwing the tip off of the lead guide tube to expose the end of the latter for insertion thereinto of a fresh lead.

When the fresh lead has been inserted the tip is then screwed back on to the lead guide tube by reason of the projection 13 following the spiral groove 5, until the tapered forward end of the lead guide tube comes in contact with the interior of the tip, so that from then on they will rotate together until the lead is exhausted and the plunger is returned to its rearmost limit of movement, as stated above, which will then result, as explained, in the removal of the tip from the barrel. As shown in Fig. 1, the lead 22 is at its rear end in engagement with the plunger 7, which has just started forward on its forward feeding movement. The rear end of the barrel is slightly reduced in diameter to receive the sleeve 23, into the outer end of which sleeve is inserted the holder 24, within which is gripped the eraser 25.

Extending longitudinally of the barrel alongside of the bore 2 and in open communication therewith, is a plurality of grooves 26, three such grooves being shown in Fig. 14, it being understood, however, that any desired number of such grooves may be provided. Each of these grooves is closed by the lead guide tube 4, and each chamber thus formed opens at the rear end of the barrel under the eraser holder 24 so that when the latter is removed the ends of these grooves or chambers are exposed. Extra leads are stored in these grooves and are readily available upon removal of the eraser holder 24. As the leads used in this pencil are of considerable length, these extra lead holding grooves will extend to a point adjacent the safety zone 18. Each of these grooves will be of sufficient depth to permit a lead to pass the sleeve 9. The tip is shown in the pencil of Fig. 1 as being formed entirely of metal. In the form shown in Figs. 7, 10, 11 and 12, the major portion of the tip is of metal, but it is provided at its upper end with the tapered sleeve portion 27 of Bakelite or other suitable material, which is molded into the depression 28 on the outer side of the projection 13.

In the modification of Fig. 10, a coil spring 29 is seated within the sleeve 30 and around the exterior of the lead guide tube 4. Beyond the end of the barrel 1 sleeve 30 has its diameter decreased and extended to fit within the tip after the manner shown in Fig. 8, this extension carrying the spring-like portions 12', which function in a manner similar to the spring extensions 12 of Fig. 6. The purpose of coil spring 29 is to urge the plunger 8 rearwardly when the same has passed into the neutral zone 18 to cause the plunger head to follow the helical shoulder 16 (when the direction of relative rotation of the tip and barrel has been reversed) and guide it back to the longitudinal groove 3 by striking shoulder 17, in the manner similar to that disclosed above in connection with the form shown in Figs. 1 to 7, with the exception that the spring causes the rearward urge instead of a slight pressure upon the tip.

In Figs. 11 and 12 is shown another modification, in which the spiral shoulder 16 is omitted and in place thereof is used a plane annular shoulder together with the spring 29 which, as in the case of Fig. 10, urges the plunger head 8 rearwardly. The forward corners of the sides of the longitudinal groove 3, as shown in Fig. 12, are more or less rounded or tapered to facilitate entry of the plunger head 8 into the groove 3 when the same has been moved into registry therewith, the plunger head 8, as will be understood, being pushed rearwardly by spring 29 and caused to enter said groove upon reversal of direction of relative rotation of the tip and barrel. Except for the differences pointed out, the form of pencil shown in Figs. 10, 11 and 12 are otherwise similar to the form shown in Figs. 1 to 7.

In Figs. 15 to 18 a further modification is shown in which the barrel 31 is formed with a hollow interior, the metal liner 32 fitting within and extending longitudinally of the interior of the barrel. Within the liner 32 and pressed or

otherwise fixed to the lower end thereof is the tubular member 33 formed throughout the greater part of its length with the longitudinal slot 34. Tubular member 33 is formed at its forward end with an enlarged portion 35 which has pressed fit engagement with the reduced forward end of the liner 32. Into the enlarged portion 35 is pressed for fixed engagement therewith the enlarged end of bushing 36 which beyond the end of the barrel is reduced in diameter to form the cylindrical extension 37 provided with friction wings 12' similar to those shown in Fig. 8 and for a similar purpose. Positioned within the bushing 36 is a spring 38' which exerts a rearward thrust upon the plunger head 8 for a purpose similar to that already described in connection with Figs. 10–12. The length of the enlarged portion of bushing 36 is such that when pressed into the enlarged portion 35 of tubular member 33 it will stop short of the inner end of the enlarged portion 35 a sufficient distance to form an annular groove 39 which receives the plunger head 8 when it moves out of the forward end of slot 34 and which functions as a neutral zone similar to that described in connection with Figs. 11 and 12.

Rotatably mounted within tubular member 33 is the lead guide tube 39 formed with the spiral slot 40 within which moves plunger head 8, the latter being held against rotation with relation to the barrel while in the longitudinal slot 34 in a manner similar to that already described in connection with the preceding figures.

Threads 41 are formed upon the forward end of the lead guide tube 39, which threads engage with complemental threads 42 on the interior of the tip 43 and are sloped in the proper direction so that continued rotation in the same direction will unscrew the tip from the lead guide tube when the plunger head reaches its rearmost point of travel in a manner similar to that already described in connection with the preceding views. The reduced portion 44 of the tip rotatably fits over the cylindrical extension 37, it being rotatably held thereon by the frictional engagement of the friction wings 12'. A conical portion 45 of Bakelite or other suitable material is molded on the upper part of the tip as shown in Fig. 15. Near the upper or rear end of tubular member 33 is fixed a washer 46 having cut out portions 47 to receive extra leads 48, this washer being so positioned that the distance from it to the enlarged portion 35 of tubular member 33 is less than the length of the leads 48. The lead guide tube 39 is held against longitudinal movement by the embossed projection 49 and the sleeve 50 in a manner similar to that already described in connection with Fig. 1. At the upper end of the barrel is provided the eraser head 51 which removably receives the bushing 52 and eraser 53 over which is removably fitted the cap 54. The operation of the pencil shown in Figs. 15–18 is in general the same as that already described in connection with the preceding figures.

Having thus described the invention, I claim:

1. In a mechanical pencil, a barrel having a longitudinal elongated bore therein, a tip member, an elongated groove extending longitudinally along one side of said bore, a lead guide tube in said bore, said tube being formed substantially throughout its length with a spiral slot, a plunger longitudinally movable in said tube, said plunger being formed at its rear end with a plunger head extending through the spiral slot and into the elongated groove, the barrel also having a longitudinal opening adjacent its tip end of larger diameter than said bore and coaxial therewith and forming a shoulder at the juncture of the opening and bore, a portion of the tip member and said shoulder forming an annular space constituting a neutral zone, said tip having connection with the lead guide tube so that the guide tube and tip will normally rotate together with relation to the barrel, said shoulder being cut spirally to permit the plunger head to follow the spiral face thereof back into the longitudinal groove upon rotation of the barrel with relation to the tip in the reverse direction from that for feeding the lead forward, and means to positively force said head to be guided by said spiral face back into said elongated groove upon said reverse rotation.

2. In a mechanical pencil, a barrel, a tip rotatably mounted with relation to said barrel, means associated with said barrel and tip for propelling a lead, said means including a plunger longitudinally movable in said barrel, and means for preventing jamming of parts when the plunger is at either end of its travel, the means for preventing jamming of parts when the plunger is at its forward end of travel including means for moving the tip a slight distance longitudinally of the barrel.

3. In a mechanical pencil, a barrel having a longitudinal bore and a longitudinal groove extending along one side of the bore, a lead guide tube in said bore and having a spiral slot extending substantially the full length of the same with the spiral slot open at one end and closed at the other, a plunger having a projection extending through the slot and into the groove, a tip on said barrel and rotatable with relation thereto, a projection on the interior of the tip and threaded into the spiral slot when the tip is in normal position, the tip automatically threading off of the lead guide tube when the plunger strikes its rearmost position and rotation is continued.

4. In a mechanical pencil, a barrel having a longitudinal bore therein, a lead guide tube in said bore, said tube having a spiral trackway therein, a plunger in said tube and having a projection adapted to ride in said trackway, a tip on one end of the barrel and rotatable with relation thereto, said tip having an internal projection adapted to be threaded into engagement with said trackway.

5. In a mechanical pencil, a barrel having a longitudinal bore therein, a longitudinal groove extending along one side of said bore, a lead guide tube in said bore and provided with a helical trackway, a plunger longitudinally movable in said tube and provided with a projection adapted to ride in said trackway, a tip having a tubular portion rotatably mounted with relation to said barrel, the tip end of said lead guide tube extending through said tubular portion and into the tip, the tip having an internal projection adapted to be threaded into said trackway until the tip reaches its operative position whereby when the tip is in its normal position with relation to the barrel, rotation of the tip will also rotate the lead guide tube, and when the plunger reaches its rearmost position the tip will be threaded off from the lead guide tube, and the free end of the lead guide tube will be exposed to receive a fresh lead.

6. In a mechanical pencil, a barrel having a longitudinal bore therein and a longitudinal

groove extending along one side thereof, a lead guide tube rotatable in said bore and having a helical slot extending for the greater portion of its length, a tip, a plunger having a projection extending through said slot and into the groove, said lead guide tube extending into the tip to be removable therefrom but rotatable therewith during the propelling of a lead, a projection on the interior of the tip adapted to be threaded into the spiral slot until the lead guide tube contacts with the interior of the tip, the plunger upon relative plunger retracting rotation of the tip and barrel reaching its rearmost position and holding the tube against rotation with relation to the barrel so that further rotation will cause unscrewing the tip off from the free end of the lead guide tube.

7. In a mechanical pencil, a barrel having a longitudinal bore therein, a longitudinal groove extending along one side of said bore and in communication therewith, a tip rotatably mounted at one end of said barrel, a narrow sleeve secured inside of said bore adjacent one end thereof, a lead guide tube extending through said sleeve and fixed therein, said tube having its end portion upset to prevent its being pulled through said sleeve, the bore of the barrel being enlarged adjacent the tip end of the barrel, a projection formed on said lead guide tube and seated in said enlarged portion of the bore and so spaced with relation to the end of the enlarged portion of the bore and the said sleeve as to permit said lead guide tube to have a slight longitudinal movement, a plunger in said lead guide tube and means for causing longitudinal movement of said plunger upon relative rotation of the tip and barrel.

8. In a mechanical pencil, a barrel having a longitudinal bore therein, a lead guide tube in said bore, a plunger in said lead guide tube, a tip rotatably mounted on said barrel and having driving connection with said lead guide tube, and means for automatically removing said tip from said barrel when the plunger reaches its rearmost limit of travel.

9. In a mechanical pencil, a barrel having a longitudinal bore and an elongated groove extending alongside of said bore and in communication therewith, said bore having an enlarged portion at the tip end of the barrel, a tip rotatably mounted on said barrel, a coil spring positioned in said enlarged portion of the bore, a lead guide tube in said bore and formed with a spiral slot extending throughout the greater part of its length, the tip having driving connection with said tube, a plunger having a head extending through said spiral slot and into the longitudinal groove, whereby on rotation of the tip with relation to the barrel the plunger will be advanced to propel the lead and when reaching the end of the longitudinal groove the plunger head will compress the coil spring, which upon rotation of the tip with relation to the barrel in the reverse direction from that for propelling a lead forward will automatically return the plunger head into the longitudinal groove and permit the plunger to move backwardly within the barrel, the tip being removably attached to the lead guide tube whereby rotation of the tip will normally rotate said lead guide tube.

10. In a mechanical pencil, a barrel having a longitudinal bore, a lead guide tube in said bore, a plunger longitudinally movable in the lead guide tube, a tip rotatably mounted on said barrel, the tip and lead guide tube being releasably connected together to normally rotate together but separate when the upper end of the plunger reaches its upper limit of travel and relative rotation of the tip and barrel is continued in a direction reverse to that for feeding a lead forward.

11. In a mechanical pencil, a barrel, a lead guide tube, a tip member rotatably mounted at one end of the barrel, means including a plunger for advancing a lead when the tip is rotated in one direction with relation to the barrel, a head on said plunger, the barrel having a central longitudinal opening of a certain diameter throughout a portion of the length of the barrel and a longitudinal opening of larger diameter and shorter length adjacent its tip end, a shoulder at the junction of said two longitudinal openings, the tip member having an extension extending into the opening of larger diameter but not contacting said shoulder whereby to form an annular space therebetween to receive the plunger head to prevent jamming of parts when the lead is exhausted, the plunger head contacting said extension of the tip member as the head is moved around the annular space and moving the tip slightly outwardly, and means to insure that the plunger will be moved rearwardly when the tip is pressed slightly inwardly and rotated with relation to the barrel in a reverse direction from that for advancing a lead, the tip having connection with the lead guide tube for normally causing these parts to rotate together during longitudinal movement of the plunger.

12. In a mechanical pencil, a barrel having a longitudinal opening therein formed with a longitudinal groove along one side, the barrel also having an opening of larger diameter to form a shoulder adjacent its tip end, a lead guide tube rotatably mounted in the barrel and having a spiral slot, a plunger formed with a head to extend through said spiral slot and into the longitudinal groove, a tip rotatably connected to said barrel, said tip having connection with the lead guide tube so that the latter may be rotated by the former with relation to the barrel, the opening of larger diameter together with the associated parts of the barrel and tip forming an annular space constituting a neutral zone to receive the plunger head and prevent jamming of parts when a lead is exhausted, a portion of said annuular space being of a width less than the diameter of said head, and means to cause the plunger to move rearwardly along the lead guide tube after a lead is exhausted and the direction of rotation of the tip with relation to the barrel is reversed.

13. In a mechanical pencil, a barrel having a longitudinal opening, a lead guide tube in said opening and having a spiral slot, a longitudinal groove extending along one side of said opening and communicating therewith, a plunger in said guide tube and having a head extending through the spiral slot and into the longitudinal groove, a tip rotatably connected to the barrel and having connection with the guide tube so that the guide tube and tip will normally rotate together with relation to the barrel, said opening having a portion of its length adjacent the tip end of larger diameter forming a shoulder, the inner end of the tip member being rotatably mounted in said larger diameter portion of the opening but spaced from said shoulder to form an annular space constituting a neutral zone into which the plunger head moves when a lead is exhausted to prevent jamming of parts, said shoulder being

formed with an incline, the annular space for at least part of its circumference being of a width less than the diameter of the plunger head so that when the plunger head enters the annular space it will upon continued rotation strike the inner end of the tip member and move it a slight distance longitudinally of the barrel whereby a pressure inwardly upon the tip when the barrel and tip are relatively rotated in a reverse direction from that for advancing the lead will cause the plunger head to follow the inclined edge of the shoulder and be guided back into the longitudinal groove for movement back again toward the rear end of the pencil preparatory to loading the pencil with a new lead.

14. In a mechanical pencil, a barrel having a longitudinal opening of one diameter throughout the greater portion of its length and a coaxial opening of greater diameter adjacent the tip end of the barrel, a tip having a tubular extension normally inserted into the opening of greater diameter but stopping short of the adjacent end of the first mentioned opening to form a space therebetween which constitutes a neutral zone, the tip being rotatable with relation to the barrel, a lead guide tube, a plunger longitudinally movable in said lead guide tube and having a head, the tip having connection with the lead guide tube such that rotation of the tip will rotate the lead guide tube, the neutral zone preventing jamming of parts when the plunger head has reached the position at which a lead is exhausted, and means for positively causing the plunger to move backwardly into the barrel when the relative rotation of the tip and barrel is reversed from that for feeding a lead forwardly, said means including parts for moving the tip a slight distance longitudinally of the barrel when the plunger head is moved in one direction around the neutral zone.

15. In a mechanical pencil, a barrel having a longitudinal opening and an internal shoulder, the opening on the tip side of the shoulder being of greater diameter than on the other side of the shoulder, a longitudinal groove extending along that portion of the opening of smaller diameter and terminating at said shoulder, a lead guide tube rotatably mounted in said longitudinal opening and having a spiral slot, a plunger having a lateral projection extending through said slot and into the groove, a tip rotatably connected to the barrel and connected to the lead guide tube whereby said tube and tip will rotate together when desired, the inner end of the tip and the shoulder forming an annular space constituting a neutral zone to prevent jamming of parts when a lead has been exhausted, a portion of said annular space normally being of less width than the thickness of said projection in a direction longitudinally of the pencil whereby to move said tip a slight distance longitudinally forward of the barrel when the projection is moved around the annular space.

16. In a mechanical pencil, a barrel having a longitudinal opening therein, a lead guide tube rotatably mounted in said opening, a propeller in said tube, a tip rotatably associated with said barrel and threaded onto the forward portion of the lead guide tube, the gripping action between the tip and tube being sufficient to cause the tip and tube to rotate together at all times when the tip is rotated except when the plunger strikes its rearward limit of movement, at which time continued rotation of the tip in the same direction will unscrew the tip from the tube.

17. In a mechanical pencil, a barrel having two longitudinal coaxial openings therein of different diameter to form a shoulder, a lead guide tube in said barrel, a plunger in said tube, a lateral projection on said plunger, a tip rotatably associated with said barrel and having driving connection with said tube, said tip having an extension insertable into the larger of said openings to bring its inner end near said shoulder, said shoulder being inclined to assist in starting the plunger on its rearward movement when a lead is exhausted and rotation of the tip is reversed.

18. In a mechanical pencil, a barrel comprising a longitudinal opening and a longitudinal groove, a tip rotatably associated with said barrel, a lead guide tube rotatably mounted in the opening, a helical trackway in said tube, a plunger longitudinally slidable in the tube and having a projection slidable in the trackway and groove, said longitudinal opening adjacent the tip end of the barrel having an enlargement of greater diameter than the remaining portion to form a shoulder, a spring in the enlarged portion of the longitudinal opening against which spring the plunger projection presses to compress the same when said projection is passing from the open end of the longitudinal groove into the enlarged portion of the longitudinal opening, said spring acting to return the plunger projection to the longitudinal groove when the tip is rotated in reverse direction with relation to the barrel from that for propelling a lead forward, said lead guide tube having an outwardly extending projection extending into said enlarged portion of the longitudinal opening adjacent the shoulder but slightly spaced therefrom to permit a small amount of movement of the lead guide tube but prevent undue longitudinal movement thereof with relation to the barrel.

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