May 9, 1933. J. C. WAHL 1,908,386

MECHANICAL PENCIL

Filed June 14, 1924

Fig. 1.

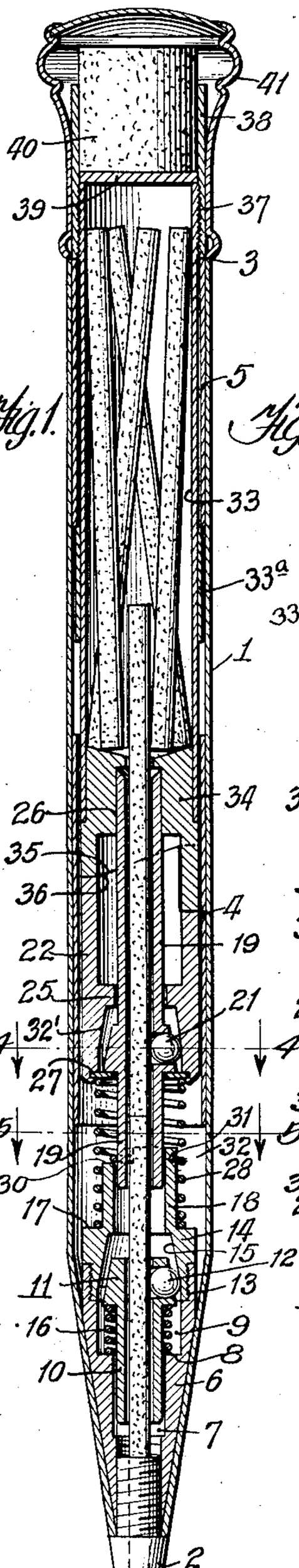


Fig. 2.

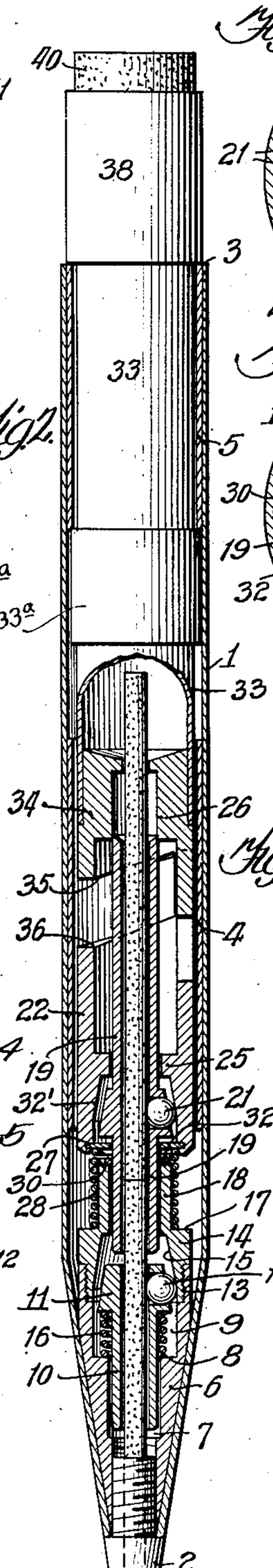


Fig. 4.

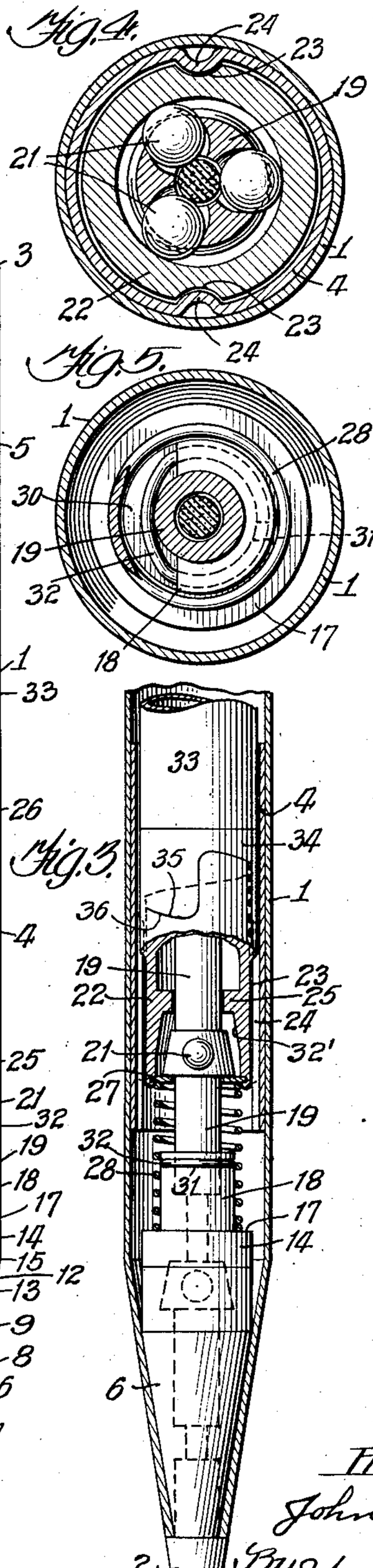
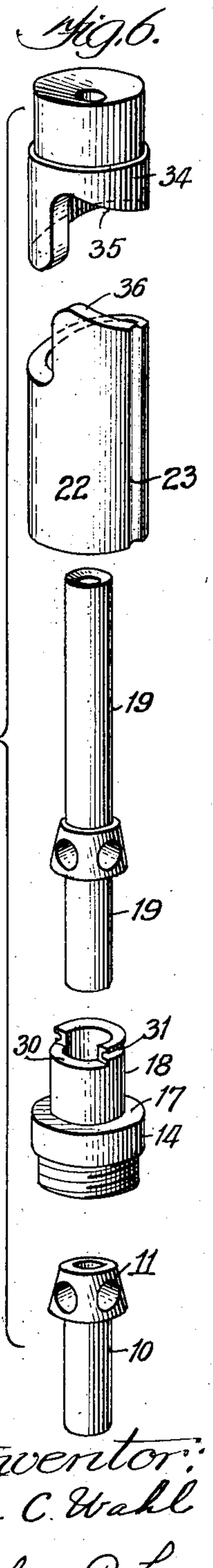


Fig. 5.

Fig. 3.

Fig. 6.



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UNITED STATES PATENT OFFICE

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MECHANICAL PENCIL

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This invention relates to mechanical pencils and more particularly to mechanical pencils of the type wherein the lead propelling mechanism is provided with two clutches or lead-engaging members, one of which is arranged to prevent the recession of the lead during writing, and the other of which is arranged to automatically engage the lead, and when advanced, to propel the lead forwardly. In prior devices of this character the lead propelling clutch has been progressively advanced by pushing forwardly on the top or upper end of the pencil. The present invention has for its object an improved construction of lead propelling mechanism and particularly improved means whereby the lead can be advanced step by step by rotation of the upper cap of the pencil relatively to the pencil casing instead of pushing this cap inwardly as heretofore.

Another feature of this invention relates to the specific details of construction of the lead feeding mechanism whereby when the lead-engaging member has been advanced to its full distance by the rotation of the pencil cap, it will be returned automatically to position for the next feeding movement. With this mechanism is combined the clutch which prevents recession of the lead so that the two clutches cooperate to produce only an advancing movement of the lead through the lead tip of the pencil.

Still another feature of the invention resides in the position of a lead reservoir or storage chamber in the rotary actuator so arranged that rotation of the latter for advancing the lead will induce the feeding of lead sticks to the lead channel leading to the tip of the pencil whereby a succession of leads may be fed from the lead chamber to the pencil tip, under control of the lead feeding clutches heretofore mentioned.

These and other objects of the invention will be apparent from a perusal of the following specification when taken in connection with the accompanying drawing wherein:—

Figure 1 is a sectional view of my improved pencil showing the lead in position for writing.

Figure 2 is a somewhat similar view showing the lead feeding clutch in depressed position. In this figure the upper portion of the pencil is shown in elevation.

Figure 3 is a view similar to Figure 1 except that certain portions of the propelling mechanism are shown in elevation.

Figure 4 is a section on line 4—4 of Figure 1.

Figure 5 is a section on line 5—5 of Figure 1.

Figure 6 is a group perspective view of the various elements of the lead clutches and clutch assembling members.

Referring now to the drawing in detail, the pencil comprises a casing or barrel 1 of appropriately formed metal. This casing is swedged at its forward end as usual to receive the tip 2 which may be of desired construction. The opposite end of the barrel 1 is open as at 3. The lower portion of the barrel is provided with a lining tube 4 and the upper end is provided with a second lining tube 5. In addition to the tip 2 the swedged forward end of the barrel 1 is provided with a hollow nose or nozzle 6.

The barrel 1 houses a lead propelling mechanism which broadly consists of one or more lead-engaging members adapted to engage a lead stick in the pencil, and upon operation of the propelling mechanism, advance it and thereby feed the lead forwardly for writing purposes as is well known in the art. In addition, the lead propelling mechanism includes certain actuating mechanism for properly operating the lead engaging member so as to propel the lead forwardly. In the present form of the invention there are two lead clutches, one adapted to automatically grip the lead and thereby prevent its recession in the lead tip, as for instance when pressure

is applied to the lead as in writing. This clutch will prevent the lead from backing into the tip. The other clutch is constructed and arranged to automatically grip the lead at such time when, for instance, it is desired to feed the lead forwardly, and this gripping movement of the clutch is utilized so that when the clutch itself is advanced it will carry with it the lead so as to propel the lead to the tip. The actuating means for the clutch is constructed and arranged so that by manual manipulation the actuator will advance the clutch to feed the lead forward and will thereafter permit the clutch to return to take a fresh grip upon a new portion of the lead and thereafter feed it forward, thus advancing the lead to the tip 2.

In the present construction the hollow nose tip which is located in the swedged portion of the casing 1 is provided with a central bore 7 and a superior shoulder 8 forming a cut-out 9 in which slides the sleeve-like housing 10 for the lower clutch. This sleeve 10 is provided with a bore which registers with the lead channel passing through the tip 2 and the nozzle or nose 6. The upper portion of the sleeve 10 is provided with a conical shaped head 11 formed with radially arranged bores therein adapted to receive a ball or balls 12 forming a portion of the ball clutch. The extreme upper end of the nose 6 is provided with a threaded shoulder 13 adapted to receive a hollow sleeve-like guide 14 formed on its inner surface with a tapering wall 15 which tapers inwardly toward its top and thereby forms a cam surface for the ball or balls so that when the sleeve 10 is raised the ball will be forced inwardly by the inclined wall 15 and will thereupon grip the lead passing longitudinally through the bore of this sleeve 10. The head of the sleeve 10 is shouldered so as to permit a spring 16 to be held in place concentrically around the sleeve 10 and between it and the shoulder 8 of the nose 6. The coupling member 14 is thus rigidly mounted in the swedged end of the casing 1. The upper portion of this coupling sleeve 14 is shouldered as at 17 to provide a horizontally arranged seat which surrounds the hollow extension of the sleeve or coupling member 14 designated by the numeral 18. This sleeve 18 is of sufficient diameter to receive a substantially long intermediate lead guide tube 19 which telescopes within the sleeve 18, as clearly shown in Figs. 1 and 2. Substantially midway of its length this tube 19 is provided with a head similar to the head on the sleeve 10 and this head also is provided with radially arranged bores adapted to receive balls 21, which balls are also constructed and arranged to grip a lead passing longitudinally through the hollow bore of this tube 19. This lead guide tube 19 is guided longitudinal of the casing 1 by means of a slidable sleeve 22 which is of large enough diameter to snugly fit within the lining 4 of the casing 1. This sleeve 22 is provided with a keyway 23 engaging a swedged in key 24 on the inner wall of the lining, to prevent the sleeve 22 from rotating but permitting it to slide longitudinally of the casing 1. This sleeve 22 is hollow and is provided on its interior with lower guiding flange 25, which is constructed to guide the tube 19. The extreme lower portion of this sleeve 22 is notched to receive a washer 27 which washer concentrically surrounds that portion of the intermediate sleeve 19 below the head thereof. This washer thus forms an abutment between which and the shoulder 17 of the coupling sleeve 18 is arranged a spring 28. This spring 28 maintains the sleeve 22 and the longitudinal movable lead guide tube 19 in upper normal position. The upper rim of the sleeve 18 is cut away diametrically thereacross to provide a shoulder 30, and the periphery of the uncut portion of this rim is grooved, as at 31, to provide means for retaining a ring therein. This ring 32 is shown clearly in Fig. 5. That portion of the ring 32 which lies in the cut-out shoulder 30 is distorted inwardly so that it will lie in engagement with and grip the lower tube-like portion of the lead guide tube 19 which is arranged to telescope within the upper portion of the coupling sleeve 18 as hereinbefore described, thereby providing a frictional drag against longitudinal movement of tube 19 so as to release the ball clutch during the return stroke of sleeve 22. The ring 32 has another function of retarding the movement of the sleeve 19 so that on the initial downward movement of the sleeve 22 the ball 21 will be held stationary momentarily and pressed into engagement with the lead. This feature causes the upper clutch to grip the lead almost instantaneously with its initial downward movement. The lower inner wall of the slidable sleeve 22, as at 32′, is flared to provide a cam surface adapted to actuate the clutch ball 21 of the lead feeding clutch. For instance, when the sleeve 22 is forced downwardly, this flared surface 32′ will push the ball 21 inwardly to thereby grip the lead, whereas when the sleeve 22 is returned to its upper normal position, the balls 21 are free to move outwardly to thus release the lead. The spring 28 acts to force the sleeve 22 to its upper normal position.

My invention provides a unique and convenient method of successively directing lead into the feeding channel and thereafter gripping and advancing the lead toward the tip of the pencil. The sleeve 33 provides a chamber in which a number of leads may be stored and has enclosed in its lower end a tapered surface which will tend to guide the lower end of a lead toward the feeding channel which is centrally located in that surface. Gravity and the contour of the

surface will naturally cause a lead to fall into the channel as soon as there is room for another lead to do so. Gravity will further cause the lead to gradually drop down the channel until it may be gripped by the upper clutch, whereupon it comes under the control of the manually actuated feeding mechanism. The lower portion of a rotary actuator sleeve 33 is disposed in the barrel 1 and is provided at its lower end with a hollow tip 34 which tip is provided with a central channel registering with the longitudinal lead channel of the propelling mechanism and with an inwardly inclined upper face concentrically surrounding the central channel therethrough so as to guide the individual leads in the magazine successively into the channel. In addition, this member 34 is hollowed out to guidingly receive the upper end of the tube 19. The lower face of the member 34 and the corresponding upper face of the sleeve 22 are provided with complementary cam surfaces 35 and 36 respectively, which surfaces are so arranged that when the actuator is rotated it will operate to slide the sleeve 22 longitudinally of the pencil. It will be noticed that these cam surfaces are disposed so as to permit rotation of the actuator in one direction only. A collar 33^a is fixed to the sleeve 33 and bears at its upper end against the lower end of tube 5, to hold the actuator sleeve 33 against upward movement in the barrel. The upper end of the actuator sleeve 33 is open and is provided with an external thread 37. A sleeve 38 is adapted to screw upon the outer end of the sleeve 33 and to this end is provided with internal threads to receive the threads 37 thereof. The sleeve 38 abuts at its lower end the upper end of the liner 5, so as to prevent downward movement of the sleeve 33 in the barrel 1. Sleeve 38 is provided midway of its length with a washer 39. This washer thus provides not only a closure for the upper end of the lead magazine in the actuator sleeve 33 but also provides a seat for a rubber eraser 40. This eraser is normally covered with the usual end cap 41 which makes a frictional fit with the outer wall 38 of the sleeve. The lower end of the cap abuts the upper end of the barrel. With this construction, when the cap 41 is rotated in one direction, by reason of its frictional fit with sleeve 38 and the latter's threaded engagement with the sleeve 33, the sleeve 33 will be rotated to move the lead sticks in the magazine and facilitate entry of one or more of them into the lead channel, and at the same time to shift the cam 35 relative to the non-rotatable cam 36. Since this lower cam can slide but not rotate, it will move endwise longitudinally of the casing and in a direction toward the tip 2 of the pencil. And when the cap 41 is rotated in the opposite direction the cam faces will be inoperative to shift the sleeve 22 but on the contrary the cap will unscrew from the sleeve 33, as by means of thread 37.

Downward movement of the sleeve 22 and the lead guide tube 19 compress the spring 28 and put it under tension such as is indicated in Fig. 2. During this lead feeding movement by the upper ball clutch 21 it will be noted that the lower clutch, consisting of the ball 12, is idle. In other words, the balls 12 do not positively grip the lead as it advances through the lead tip. In the event however, that writing pressure is exerted upon the projecting end of the lead, the slight preliminary recession of the lead will tend to drag the balls 12 along with it and thus tend to move the balls backwardly. This backward movement will cause the balls 12 to be forced against the inwardly inclined wall 15 of the coupling sleeve 14 which movement will force the balls inwardly to grip the lead. Hence there will be a movement of the balls against the inclined wall 15 and hence the balls against the lead which will prevent any further recession of the lead in the lead tip. This action will effectively operate to prevent the lead from being moved rearwardly through the lead tip. During the lead feeding operation by the upper clutch ball 21 it will be noted that the reverse operation takes place. In other words, the forward advance of the lead will tend to drag the balls 12 downwardly but since the incline 15 is outwardly in this direction it will not force the balls 12 inwardly toward the lead so that no gripping action will take place on the forward feed of the lead. Moreover, by reason of the spring 16 the forward movement of the balls 12 during the lead feeding action is permitted since the clutch head or sleeve 10 can be moved forwardly during this lead feeding movement.

After the sleeve 22 has been advanced the distance of the height of the cam 36, which corresponds to a complete rotation of the actuator 33, the spring 28 having been compressed will force the sleeve 22 upwardly to its normal uppermost position such as is indicated in Fig. 1, whereupon further rotation of the actuator 33 will again advance the slidable sleeve 23 to feed an additional amount of the lead forwardly. During this upward movement of the sleeve 22 the lower ball clutch 12 operates to hold the lead so that it will not recede in the lead tip.

While I have shown and described a preferred embodiment of my invention, I desire the same to be understood as illustrative only and not as limiting the scope of my invention.

Having thus described my invention, I claim:

1. In a mechanical pencil, the combination of a casing having a tip, a lead propelling mechanism arranged therein and provided with a lead guide member arranged to guide

a lead stick toward said tip, said propelling mechanism including means adapted to advance a lead stick toward the tip, an actuator for said propelling mechanism comprising a member rotatable relative to said casing and lead guide member, said rotatable member having an inner chamber for holding a plurality of lead sticks and provided with a passage connecting with said lead guide member whereby to feed lead sticks in succession to said propelling mechanism incident to rotation of said rotatable member.

2. In a mechanical pencil, the combination of a casing having a tip, a lead propelling mechanism therein including a lead guide tube extending toward said tip, said propelling mechanism including reciprocable means adapted to advance a lead stick toward said tip, an actuator for said propelling mechanism comprising a member rotatably operable in said casing and adapted on rotation relative to the lead-propelling mechanism to actuate said reciprocable means, said rotatable member having an inner chamber affording a magazine for a plurality of lead sticks and having a bottom opening communicating with said lead guide tube, the basal wall of said chamber being suitably inclined toward said opening to direct the lead sticks thereto incident to rotation of said rotatable member.

3. In a mechanical pencil, in combination, a barrel having a writing tip at its lower end, an actuator rotatable in the barrel and having a part affording a magazine chamber for accommodating a plurality of lead sticks side by side, said magazine having an outlet at the bottom for passage of lead sticks singly therefrom, a clutch reciprocable longitudinally in the barrel below the magazine and adapted to engage a lead stick emitted through said outlet, means rendered effective by unidirectional rotation of said actuator relative to the barrel to reciprocate said clutch and thereby propel a lead stick step by step, and means effective to retain the propelled lead stick against retraction by said clutch.

4. In a mechanical pencil, in combination, a barrel having a writing tip at its lower end, an actuator having a portion rotatable with respect to the barrel and forming a magazine for containing a plurality of lead sticks side by side, said magazine having a bottom opening for passing lead sticks singly therefrom toward the tip, a clutch reciprocable longitudinally in the barrel below the magazine and adapted to engage a lead stick emitted through said opening, means operable by rotation of the actuator to move the clutch downwardly to propel a lead stick toward the tip, means to restore the clutch to its upper limit position after completion of its propelling movement, and means to hold the propelled lead stick against retraction by the clutch in its return movement.

5. In a mechanical pencil, in combination, a barrel having a writing tip at its lower end, a sleeve rotatably operable in the barrel, the upper portion of said sleeve affording a magazine chamber for holding a plurality of lead sticks side by side, a bottom for said magazine chamber having an opening for passing lead sticks singly from the chamber toward the tip, a clutch reciprocable longitudinally in the barrel below the magazine chamber and adapted to engage a lead stick emitted through said opening, means operated by rotation of said sleeve to move the clutch downwardly to propel a lead stick toward the tip, and means effective independently of the sleeve to return the clutch to its upper limit position.

6. In a mechanical pencil, in combination, a barrel having a writing tip at its lower end, a guide tube in the barrel for guiding a lead stick toward the tip, a magazine rotatable with respect to the barrel and adapted to hold a plurality of lead sticks side by side, said magazine having a bottom opening accommodating passage of lead sticks singly from the magazine into the lead guide tube, a lead-engaging member reciprocable in the barrel below the magazine and adapted to engage a lead stick in the lead guide tube, means operable by rotation of the magazine to move said lead-engaging member downwardly and propel a lead stick in the lead guide tube toward the tip, and means for returning the lead-engaging member to its upper limit position independently of the magazine.

7. In a mechanical pencil, in combination, a barrel having a writing tip at its lower end, an actuator rotatable with respect to the barrel and comprising a magazine for holding a plurality of lead sticks side by side, said magazine having a bottom opening accommodating passage of lead sticks singly therefrom toward the tip, a lead-engaging member reciprocable in the barrel below said magazine, means operable by rotation of said actuator to move the lead-engaging member downwardly in the barrel, and means for moving the lead-engaging member upwardly in the barrel while the actuator is at rest.

8. In a mechanical pencil, in combination, a barrel having a writing tip, an actuating member manually rotatable in the barrel and comprising a lead stick magazine having a restricted lead discharge opening at its bottom, a lead-engaging member reciprocable longitudinally in the barrel below the magazine for propelling a lead stick discharged through said opening, means for moving the lead-engaging member in one longitudinal direction by rotation of the actuating member, and means for automatically moving the lead-engaging member in the other longitudinal direction with the actuating member stationary.

9. In a mechanical pencil, in combination,

a barrel having a writing tip at its lower end, a lead-engaging member reciprocable longitudinally in the barrel below the magazine for propelling a lead stick toward the tip, an actuating member rotatable unidirectionally in the barrel to move the lead-engaging member longitudinally in one direction, and means effective automatically to move the lead-engaging member longitudinally in the opposite direction when the actuating member reaches a predetermined rotational position.

In witness whereof, I hereunto subscribe my name to this specification.

JOHN C. WAHL.