

Feb. 9, 1932.

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1,844,095

MECHANICAL PENCIL

Filed June 2, 1928

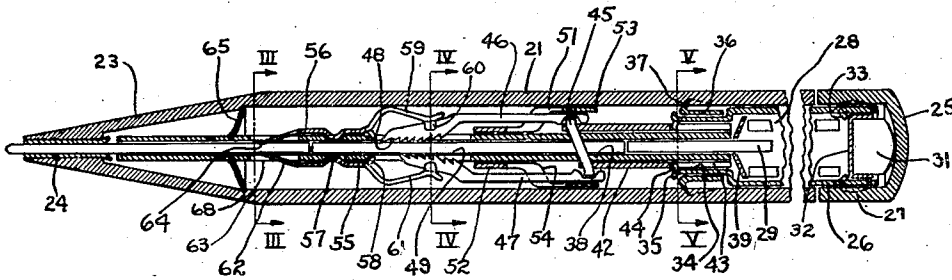


Fig. 1.

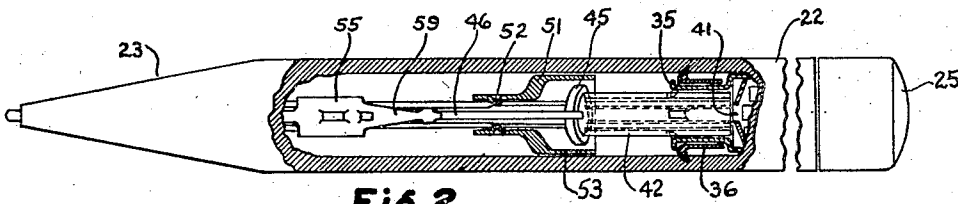
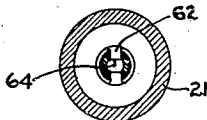


Fig. 2.



UNITED STATES PATENT OFFICE

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MECHANICAL PENCIL

Application filed June 2, 1928. Serial No. 282,480.

My invention relates to mechanical pencils and especially to mechanical pencils of the magazine type, wherein a plurality of leads or units of writing material are successively
5 fed to the point of the pencil for writing purposes, and it has for an object to provide a pencil of the character designated which may operate with an extraordinary degree of reliability and which, in addition, shall be so
10 constructed as to be relatively inexpensive to manufacture.

It has for another object to provide a mechanical pencil in which the several units of writing material may be fed successively
15 and continuously to the point of the pencil without requiring any dismantling or temporary removal of any of the pencil parts.

It has for still another object to provide a mechanical pencil which will not only contain, but will be capable of feeding to the
20 pencil point solely by its own feeding mechanism, a quantity of writing material having an overall length several times that of the pencil.

It has for still another object to provide in such a pencil an actuating mechanism which shall be capable of feeding the writing material to the point of the pencil irrespective of
25 the direction of rotation of the actuating element.

It has for still another object to provide a pencil in which the actuating mechanism is capable of automatically and successively
30 feeding to the point of the pencil the entire number of units of writing material contained in its magazine and which feeding mechanism shall not require any return movement either while the pencil is in use or at
35 such times as the magazine of the pencil is being refilled.

It has for still another object to provide a mechanical pencil which requires no individual insertion or handling of the several
40 units of writing material other than in bulk when refilling the magazine.

It has for still another object to provide a mechanical pencil wherein the mechanism for feeding the element of writing material
45 from the magazine toward the pencil point is actuated by a cam member.

It has for still another object to provide a form of construction for pencils of the above character which will permit of ready assembly of the actuating mechanism within the
50 pencil casing and which will permit the actuating member to be located either at the upper end of the pencil, near the point of the pencil or at any intermediate location between the point and the upper end of the pencil.

These and other objects, which will be made apparent throughout the further description of my invention, may be attained
55 by the employment of the apparatus hereinafter described and illustrated in the accompanying drawings, in which:

Fig. 1 is a view, in sectional elevation, of one form of mechanical pencil arranged in accordance with my invention;

Fig. 2 is a view, partly in section and partly in elevation, of the pencil shown in Fig. 1;

Figs. 3, 4 and 5 are views in sectional elevation taken on the lines III—III, IV—IV
60 and V—V of Fig. 1, respectively;

Fig. 6 is a view, in elevation, of the member utilized in Fig. 1 for retaining the conveying tube in position within the pencil
65 casing at the point end of the pencil;

Fig. 7 is a view, in sectional elevation, taken on the line VII—VII of Fig. 6;

Fig. 8 is a view, in elevation of another form of retaining member which I may employ in lieu of that shown in Fig. 6;

Fig. 9 is a partial view, in section, of another form of pencil wherein the construction of the point end is somewhat different from
70 that embodied in the pencil shown in Fig. 1;

Fig. 10 is a view, partly in section and partly in elevation, of another embodiment of my invention and shows a form of mechanical
75 pencil wherein the movable element controlling the feeding of the writing material is located at the point of the pencil;

Fig. 11 is a view, partly in section and partly in elevation, of still another embodiment of my invention and shows a form of
80 mechanical pencil wherein the movable element controlling the feeding of the writing material is located at some position intermediate the point and the top of the pencil; and,
85
90
95
100

Fig. 12 is a view, in elevation, of the point of the pencil shown in Fig. 11.

Referring now to Figs. 1 and 2, I show a pencil comprising the casing 21 which, when in writing position, has an upper or cylindrical portion 22 and a converging or tip portion 23. Secured or forced into the tip portion 23 is a small thin tube or tip piece 24 which provides firmness at the orifice in pencils wherein the tip portion may be composed of celluloid, rubber, etc. As shown in Fig. 1, the tip portion 23 and the cylindrical portion 22 of the casing are preferably made of a single, unitary piece of material, preferably composed of rubber, celluloid, etc., while the tip piece 24 is preferably metallic. The tip piece 24 is preferably nicked or provided with suitable means for scoring or scratching the writing material for preventing it from slipping out of the pencil when it is beyond control of the feeding mechanism. As shown, the arrangement is such that the tip piece 24 is relatively short, longitudinally. However, it is to be understood that other forms of tip constructions may be embodied in the pencil which I have invented, one of which will presently be described.

Located at the end 22 of the pencil is a cap 25 frictionally engaging and carried by a tubular member 26 rotatable within the cylinder 22 and suitably notched or embossed as at 27, for engaging the cap 25, the arrangement being such that the cap 25 may be readily removed and replaced upon the tubular member 26 and yet, when in position upon the latter, engages it snugly enough to permit it to be utilized to rotate the tubular member 26 to feed the writing material to the point of the pencil.

The tubular member 26 forms a magazine 28 for retaining a plurality of leads or elements of writing material such as indicated at 29. The proportions of the magazine 28 are preferably such that the magazine will accommodate one complete set or group of leads as sold commercially in individual containers for use in various makes of mechanical pencils. The tubular member 26 is arranged to retain an eraser 31, which eraser is made available upon removal of the cap 25. The eraser 31, is arranged so as to be easily removable from tubular member 26 in order that the eraser either may be replaced or in order that the magazine 28 may be refilled.

The tubular member 26 is provided with a reduced diametral portion 34 having a radially extending flange portion 35, the portion 34 serving as a bearing to engage a cylindrical retaining member 36, shown in elevation in Fig. 5. As shown particularly in the latter figure, the retaining member 36 may be provided with a plurality of circumferentially-spaced, outwardly-extending, star-shaped flexible prongs 37 arranged to grip, or seize, or engage either the pencil casing di-

rectly or suitable recesses provided therein. The prongs 37 are preferably inclined toward the top of the pencil so that, in the assembly of the pencil, the retaining member 36 may be readily pressed into the top end of the casing, the prongs 37 being sufficiently flexible to permit this. Upon the retaining member 36 being inserted in the casing to the desired depth, the prongs 37 seize either the casing or suitable recesses therein and thus effect a permanent, reliable and easily constructed retaining means for the upper end of the entire pencil mechanism. In this way, accidental removal of the pencil mechanism from the casing is positively prevented. While I have shown the retaining member 36 as provided with a plurality of star-shaped prongs, it is to be understood that for various forms of pencil casings, the shape and arrangement of the prongs may be varied and in some cases the prongs dispensed with, the periphery of the retaining member serving to engage the inner surface of the pencil casing.

Disposed coaxially within the casing 21 and extending throughout the greater length thereof is a conveying tube 38 which communicates at its upper end with the magazine 28 and at its lower end with the tip piece 24. The conveying tube 38 is provided with a bore to suit the diameter of the writing material 29 and to convey the same to the tip piece 24. Disposed within the magazine 28 is a concave disc member 39 provided with a central opening 41 communicating with the bore of the conveying tube. The arrangement of the concave disc member 39 is such that, when the pencil is in writing position, the various elements of writing material have a tendency to move toward the center of the pencil and to singly and in sequence enter the conveying tube. Surrounding the conveying tube 38 at the magazine end of the pencil is a cam actuating cylinder 42 a portion of which is interposed between the conveying tube 38 and the retaining member 36. The cam actuating cylinder 42 is provided with longitudinally extending slots 43, which slots are slidably engaged by suitable prongs 44, the arrangement being such that angular movement of the pencil cap 25 results in angular movement of the tubular member 26 and consequent angular movement of the cam actuating cylinder 42.

Secured to the cam actuating cylinder 42 is a cam 45 which rotates therewith and slidably engages fingers 46 and 47. While I have described the member 45 as a cam, it is to be understood that my invention is not confined strictly thereto as I may employ any equivalent or spiral or helical form of member capable of producing the required forward and return movement. The cam 45 is preferably so arranged that every point of its periphery is equi-distant from the axis and its plane is at right angles to the axis of

the pencil magazine, presenting a gradual rise over half of the circumference and a corresponding recession over the other half, the amount of maximum rise and fall being determined by the predetermined distance the fingers 46 and 47 are to retreat and advance along the line of axis of the pencil mechanism. The cam 45 may be either formed integrally with the cam actuating cylinder 42 or formed separately and permanently attached thereto.

The arrangement of the actuating mechanism is such that while one finger, such as 46, is moving toward the pencil point the other finger, such as 47, is returning toward the magazine and vice-versa. In this way, any angular movement of the cam 45, no matter in what direction, results in a forward movement of one of the fingers, that is, in a direction from the magazine toward the pencil point so as to feed writing material to the latter. While, in the present embodiment, I show only two fingers, nevertheless it is within the purview of my invention to employ more fingers than this in which case the feeding of the writing material is made even more uniform and in which case the respective fingers would successively feed the writing material and thence return toward the magazine.

Each finger is provided with engaging portions, such as serrated teeth 48, which engaging portions extend into the interior of the conveying tube through suitable longitudinal slots or openings 49 provided in the latter. The teeth 48 are preferably inclined in such a direction as to securely engage the writing material when the finger is moving in a forward direction, that is, from the magazine toward the pencil point and, at the same time, to slip over and not influence the movement of the writing material when moving in the opposite direction, that is, from the pencil point toward the magazine. The teeth near the magazine are preferably stepped or set back somewhat from the axis of the pencil, as shown, in order to permit the writing material to gain entrance between the two opposing fingers at such times as they do not already contain any writing material and, as a consequence, may be disposed in abutting relation.

For preventing dislodgment of the fingers 46 and 47, a retaining member 51 is provided, which retaining member has a cylindrical portion 52 properly supported upon or fixedly retained with respect to the conveying tube 38 and another and larger cylindrical portion 53, the latter portion having its outer diameter snugly fitting the bore of the casing 22. Suitable longitudinal openings 54 are provided in the retaining member and the fingers 46 and 47 extend through these openings and are guided by and freely retained therein, the arrangement

being such that the retaining member 51 does not in any way interfere with the freedom of movement of both finger pieces. The functions of the retaining member 51 are to retain and guide the fingers 46 and 47; to centralize the entire pencil feeding mechanism; and to provide a solid and uniform backing for the fingers 46 and 47 inasmuch as some materials of which the pencil casing may be composed, such as celluloid, may vary considerably in diameter and may, in addition, shrink.

For retaining the fingers 46 and 47 in bearing engagement with the writing material, a spring member 55 is provided, which spring member has a cylindrical portion 56 for supporting it upon the conveying tube. A suitable shoulder, or notch, such as 57, as well as clips 58 are provided for engaging the conveying tube 38 for insuring against any longitudinal displacement of the spring member. Spring clips 59 and 61 are provided on the spring member for engaging the fingers 46 and 47, respectively. As shown particularly in Fig. 1, the spring clips 59 and 61 are so formed in relation to their cooperating fingers 46 and 47 that when the finger 46, for example, is moving in a forward direction, the spring clip 59 abuts against the bore of the pencil casing and consequently exerts considerable thrust upon its associated finger, whereas, when the finger, for example, 47, is at the same time returning toward the magazine, the spring clip 61 is permitted to move inwardly toward the axis of the pencil and is therefore not held in abutting relation with the bore of the pencil casing and consequently exerts very little force upon the finger 47. I have found such an arrangement to be especially advantageous in that it insures a positive gripping of the writing material by the finger moving forward, while, at the same time, the returning finger does not interfere in the slightest with the forward movement of the writing material. The spring clips 59 and 61 are each provided with ears 60 which straddle the ends of the fingers 46 and 47. These ears serve to partially guide the fingers but are provided principally to prevent the serrated ends of the fingers being so held in abutting relation as to effectively close the opening in the conveying tube at such times as no writing material may be present therein. For this purpose the aforementioned ears are so formed as to abut against the outer surface of the conveying tube and thus the inward movement of the spring clips 59 and 61 is limited.

The spring member 55 may be provided at its forward end with two additional spring clips 62 which extend longitudinally through suitable openings 63 provided in the conveying tube. The clips 62 preferably have suitable engaging edges 64 so arranged as to per-

mit the writing material to move freely toward the pencil point, but at the same time, preventing any return movement of the writing material, the sharp edges 64 gripping the writing material upon the application of pressure by the user and thus doubly insuring against the writing material receding back into the pencil. However, as constructed, the clips 62 do not prevent the writing material being forced back into the pencil should, by chance, the user extrude an excessive amount of writing material.

In the form of construction shown in Figs. 1 and 2, the tip piece 24 is preferably forced into the casing. For retaining the forward end of the conveying tube 38 in proper position within the casing I may provide a retainer collar or diaphragm 65. As shown particularly in Figs. 6 and 7, the retaining collar or diaphragm is flat in normal position and its outer diameter is slightly larger than the hole it enters. Being preferably composed of a material such as, for example, tempered spring steel, it assumes a concave form when forced into the pencil casing and assumes a fixed position because of the natural radial spring tension it consequently exerts. It is obvious that such a form of retaining member cannot be retracted but can only be forced through the pencil casing in one longitudinal direction. Being preferably composed of a material relatively harder than the material of the pencil casing, it "bites" into the latter when permitted to remain stationary. It is provided with a central opening 66, as shown, forming flexible prongs 67 which firmly engage the conveying tube 38 when the latter is pressed or forced through the opening 66. The retaining collar 65 is inserted into the casing to the proper depth and I may provide a circular groove 68 for receiving it, although the provision of such a groove may be entirely dispensed with because of the fact that such a form of retaining member is capable of maintaining a fixed and permanent position by engagement with only the smooth bore of the pencil casing. The provision of a retaining member of this character forms a very important part of my invention as it provides a permanent and fixed, as well as easily constructed and readily assembled means for retaining the conveying tube within the pencil casing. As shown in Fig. 8, the retaining collar may, if desired, be provided with a plurality of notches or arcuate recesses 69 disposed about its periphery, the latter being preferably staggered radially relative to the notches or recesses 70 in order to make the retaining member as flexible as possible.

From the foregoing, the operation of my improved form of pencil mechanism will be apparent. Upon the first element of writing material entering the conveying tube 38, it

readily enters into the space intervening between the teeth of the opposing fingers 46 and 37 because, as stated heretofore, the teeth of the fingers nearest the magazine are recessed with respect to the other teeth in order to insure the writing material gaining entrance between the opposing fingers and also because of the fact that the ears 60 rest against the conveying tube 38 and thus prevent the spring clips 59 and 61 from exerting any thrust upon the serrated ends of the finger members 46 and 47 as would hold them in abutting relation and interfere in any way with the entrance therebetween of the writing material.

Angular movement of the cap 25 is transmitted by the tubular member 26 and the cam actuating cylinder 42 to the cam 45. Rotational movement of the latter causes one finger to move forward towards the point of the pencil, thus feeding the writing material through the conveying tube, while the other finger is simultaneously moved toward the magazine in preparation for its feeding stroke. It will be apparent from the foregoing description, that the writing material, while being fed to the pencil point, is not rotated or moved angularly but is fed in a straight axial or longitudinal direction. It will also be apparent that no matter whether the cap 25 is turned in a clockwise or counterclockwise direction, the writing material is nevertheless always fed toward the pencil point. Regarding the automatic or non-mechanical loading of the conveying tube 38 with elements of writing material from the magazine 28, it should be noted that an interval or time-lag is permissible equal to the use or consumption of at least one element before the next element need enter the conveying tube and present itself to the fingers 46 and 47. I have found such a time-lag to be more than ample because, in the normal operation of writing, the pencil is subjected to sufficient agitation to insure prompt discharge of writing material elements out of the magazine and into the conveying tube. Such movement is, of course, greatly facilitated by the concaved disc member 39. With further reference to the time-lag or interval permissible for the entrance of successive elements of writing material into the conveying tube, this time-lag may be equal to two, three or more elements, depending upon the length of the pencil.

From the foregoing it will be apparent that I have provided a form of mechanical pencil wherein successive elements of writing material may be fed in sequence to the pencil point merely by angular adjustment of the cap 25. Of special importance is the fact that with my improved construction, the feeding mechanism need never be reversed preparatory to feeding an additional element of writing material. In other words, every angular adjustment of the cap 25 results in feed-

ing writing material toward the pencil point and no other movement of the pencil cap is ever required except at such times as it may be removed from the pencil casing in order to permit of refilling the magazine in bulk.

One of the most important advantages of my improved form of actuating mechanism consists in that it is susceptible of being so arranged that the actuating element may be located either at the top of the pencil, as shown in Figs. 1 and 2, or near the point of the pencil, as shown in Fig. 10, or at some position intermediate of the point and the top of the pencil, as shown in Fig. 11.

Referring now to Fig. 10, I show a pencil casing 81 provided with a tip piece 82. Interposed between the casing 81 and the tip piece 82 and mechanically joined thereto is an actuating element 83 connected by a cylinder 84 to an actuating cam 85. The actuating cam 85 has associated therewith reciprocating finger members 86 and 87 which act in the manner heretofore described to feed writing material through the conveying tube 88 to the pencil point. A retaining member 89, such as represented by reference character 36 in Fig. 1, is preferably provided as shown. Such an arrangement of the actuating mechanism permits the user to move the actuating element to feed writing material to the pencil point merely by movement of the tips of the fingers without in any way materially altering the position of the pencil in the user's hand. It is therefore apparent that such an arrangement of actuating mechanism possesses extraordinary advantages.

Referring now to Fig. 11, the actuating element is shown at 91 and is located at some point intermediate of the top of the pencil and the point of the pencil. In this embodiment the actuating element is cylindrical and has provided in its bore a helical groove 92 which engages fingers 93 and 94, the arrangement being such that the latter are reciprocated by the angular movement of the actuating member 91 so as to feed writing material through the conveying tube 95 in the manner heretofore described. In both the pencil shown in Figs. 10 and 11, a cap 96 is provided but in both of these embodiments the cap is made removable merely for permitting access to the eraser and for refilling the pencil magazine in bulk and is not utilized in any way to actuate the pencil feeding mechanism.

In Fig. 11 I show another form of pencil point 97 which I may employ. The point 97 is preferably screwed into a converging portion 98 of the pencil casing and need not connect mechanically with the conveying tube 95. The pencil point end of the conveying tube 95 may, however, be supported or aligned with respect to the tip piece 97 by having it engage a suitable bore 99 provided in the pencil casing. As stated heretofore, the bore of the tip piece 97 is preferably

nicked or deformed so as to score or scratch the writing material and prevent its slipping out of the pencil when beyond the control of the finger members and may, in addition, be provided, as shown in Fig. 12, with longitudinally extending grooves or channels 100 to prevent any accumulation of writing material dust as would clog or prevent the ready extrusion of writing material from the pencil point.

While in Fig. 1 I show a form of mechanical pencil wherein the converging portion 23 and the cylindrical portion 22 are formed from a single or unitary piece of material, nevertheless, it is to be understood that I may form these two portions of the pencil casing separately and then join them together, as shown in Fig. 9. In this figure, 101 represents the pencil casing and 102 the converging portion of the pencil casing, the latter being secured, as by screw threads 103 or otherwise, to the cylindrical portion 101. A tip piece 104 is provided in the usual manner. With such an arrangement, the conveying tube 105 may be supported in the converging portion 102 and need not be mechanically connected to the tip piece 104. With this arrangement, I may also provide a retaining collar 106, similar to that shown in Figs. 6, 7 or 8, for facilitating assembly of the pencil feeding mechanism within the pencil casing. However, it is obvious that with the form of construction shown in Fig. 9, the retaining collar may, if desired, be dispensed with.

While each of the embodiments of my invention which I have disclosed relate to pencils of the magazine type, that is, pencils wherein the various elements of writing material feed successively and automatically from the magazine to the pencil point, nevertheless it is to be understood that the form of feeding mechanism which I have disclosed is also applicable to pencils of the more conventional type wherein each successive element of writing material must be separately and manually inserted into the feeding mechanism.

Furthermore, while I have disclosed a form of pencil wherein each and every angular adjustment of the actuating cam member results in a feeding action of the writing material from the magazine to the pencil point, nevertheless it is to be understood that my cam-actuating form of feeding mechanism is also applicable to pencils wherein the feeding action is not responsive to every angular adjustment of the cam member.

While I have shown my invention in several forms it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are

imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:

1. In a mechanical pencil, the combination
 5 of a casing having a point for the projection
 of leads, a magazine for leads carried by the
 casing and spaced from the point thereof,
 means for guiding the leads from the maga-
 zine to the point, an adjustable actuating ele-
 10 ment having a portion disposed exteriorly
 of the casing for grasping, and means respon-
 sive to any adjustment of the actuating ele-
 ment for effecting a continuous feeding action
 for moving successive leads from the maga-
 15 zine through the conveying means toward the
 pencil point.
2. In a mechanical pencil, the combination
 of a casing having a point for the projection
 of leads, a magazine for leads carried by the
 20 casing and spaced from the point thereof,
 means for guiding the leads from the maga-
 zine to the point, a rotatably adjustable actu-
 ating element having a portion disposed exte-
 25 riorly of the casing for grasping, and means
 responsive to angular movement of the actu-
 ating element, in either direction, for effecting
 a continuous feeding action for moving suc-
 cessive leads from the magazine through the
 conveying means toward the pencil point.
3. In a mechanical pencil, the combination
 30 of a casing having a point for the projection
 of leads, a magazine for leads carried by the
 casing and spaced from the point thereof,
 means for guiding the leads from the maga-
 35 zine to the point, an angularly adjustable
 actuating element having a portion disposed
 exteriorly of the casing for grasping, and
 means responsive to angular adjustment of
 40 the actuating element, in either direction, for
 moving successive leads through the guiding
 means in one direction only, that is from the
 magazine toward the pencil point.
4. In a mechanical pencil, the combination
 45 of a casing having a point for the projection
 of leads, a magazine for leads carried by the
 casing and spaced from the point thereof, a
 conduit communicating with the magazine
 for conveying leads to the pencil point, said
 50 conduit having openings provided in its sides,
 means provided within the magazine for
 guiding the leads toward the conduit, an an-
 gularly adjustable actuating element having
 a portion disposed exteriorly of the casing
 55 for grasping, and means extending into the
 openings in the conduit and responsive to
 angular adjustments of the actuating ele-
 ment, in either direction, for exerting an
 action for moving successive leads through
 the conduit toward the pencil point.
5. In a mechanical pencil, the combination
 60 of a casing having a point for the projection
 of leads and a magazine for leads spaced
 from and located above the point when the
 pencil is in writing position, a tube having
 65 openings in its sides and freely communicat-
 ing with the lower end of the magazine for
 conveying leads to the pencil point, said tube
 being so connected to the magazine as to effect
 gravity feed of successive leads from the
 magazine into the conveying tube, an angu- 70
 larly adjustable actuating element having a
 portion disposed exteriorly of the casing for
 grasping, and means extending into the open-
 ings in the conveying tube and responsive to
 any angular movement of the actuating ele- 75
 ment for exerting a positive feeding action
 upon the leads in the conveying tube for mov-
 ing the same through the tube in a direction
 toward the pencil point.
6. In a mechanical pencil, the combination 80
 of a casing having a point for the projec-
 tion of leads, a magazine for leads carried
 by the casing and spaced from the point
 thereof, means for guiding the leads from
 the magazine to the point, members recipro- 85
 cable within the casing for feeding succes-
 sive leads through the guiding means from
 the magazine toward the pencil point, means
 to cause said feeding members to engage the
 lead, and adjustable actuating means for re- 90
 ciprocating said feeding members, said actu-
 ating means being arranged to both retract
 and forward different feeding members si-
 multaneously so as to effect a feeding action
 for any movement of the actuating means. 95
7. In a mechanical pencil, the combination
 of a casing having a point for the projection
 of leads, a magazine for leads carried by the
 casing and spaced from the point thereof,
 means for guiding the leads from the maga- 100
 zine to the point, reciprocating members op-
 erable one after the other for feeding succe-
 ssive leads through the guiding means from
 the magazine toward the pencil point, means
 to cause said feeding members to engage the 105
 lead, and means for actuating said feeding
 members, said actuating means including a
 portion disposed exteriorly of the casing for
 grasping.
8. In a mechanical pencil, the combination 110
 of a casing having a point for the projec-
 tion of leads, a magazine for leads carried
 by the casing and spaced from the point
 thereof, means for guiding the leads from the
 magazine to the point, reciprocable members 115
 having portions engaging the leads for feed-
 ing the same through the guide means from
 the magazine toward the pencil point, each
 of said reciprocating members having their
 engaging portions so formed as to feed the 120
 leads during forward movements only,
 spring means for retaining the feeding mem-
 bers in engagement with the leads, and means
 for actuating said feeding members, said ac-
 tuating means having a portion disposed ex- 125
 teriorly of the casing for grasping.
9. In a mechanical pencil, the combination
 of a casing having a point for the projec-
 tion of leads, a magazine for leads carried
 by the casing and spaced from the point 130

thereof, means for guiding the leads from the magazine to the point, reciprocating members engaging successive leads for feeding the same along the guiding means from the magazine toward the pencil point, each of
 5 said members having their engaging portions so formed as to feed the leads during forward movements only, spring means for retaining the feeding members in engagement
 10 with the leads, said spring means being so arranged as to thrust the feeding members with increasing force against the leads as their forward movements progress and with decreasing force as their return movements
 15 progress, and means for actuating said feeding members.

10. In a mechanical pencil, the combination of a casing having a point for the projection of leads, a magazine for leads carried by the casing and spaced from the point
 20 thereof, means for guiding the leads from the magazine to the pencil point, a plurality of jaw members provided in the casing for feeding successive leads along the guiding means from the magazine toward the pencil
 25 point, means for retaining the jaw members in resilient engagement with the lead, and actuating means for said jaw members, said actuating means being arranged to move said
 30 jaw members in series relationship, whereby as one jaw member is moving forward from the magazine toward the pencil point another jaw member is returning preparatory to again moving forward so that a continuous
 35 feeding action is exerted.

11. In a mechanical pencil, the combination of a casing having a point for the projection of leads, a magazine for leads carried by the casing and spaced from the point
 40 thereof, means for guiding the leads from the magazine to the point, mechanism movable back and forth within the casing for feeding successive leads along the guiding means from the magazine toward the pencil point,
 45 and means including a rotatably mounted cam member for actuating said feeding mechanism in both directions during revolution in one direction.

12. In a mechanical pencil, the combination of a casing having a point for the projection of leads, a magazine for leads carried by the casing and spaced from the point
 50 thereof, means for guiding the leads from the magazine to the point, mechanism disposed within the casing for feeding successive leads along the guiding means from the magazine toward the pencil point, a rotatably mounted cam member for actuating said
 55 feeding mechanism, and means for angularly adjusting said cam member, said adjusting means having a portion disposed exteriorly of the casing for grasping.

13. In a mechanical pencil, the combination of a casing having a point for the projection of leads, a magazine for leads carried

by the casing and spaced from the point thereof, means for guiding the leads from the magazine to the point, a plurality of jaw members having serrated portions for engaging the leads, a rotatably mounted cam
 70 member for reciprocating said jaw members alternately, the serrated portions of the respective jaw members being formed to feed the leads toward the pencil point when moving in a direction toward the pencil point and
 75 ineffective to move the leads when moving in the opposite direction, and means for angularly adjusting the cam member.

14. In a mechanical pencil, the combination of a casing having a point for the projection of leads, a rotatably-mounted magazine for leads carried by the casing and spaced from the point thereof, a detachable
 80 closure for the magazine, said closure being disposed exteriorly of the casing for grasping, means for guiding the leads from the magazine to the pencil point, and means connected to the magazine and responsive to any
 85 angular movement thereof for feeding successive leads along the guiding means from the magazine toward the pencil point.

15. In a mechanical pencil, the combination of a casing having a point for the projection of leads, a magazine for leads carried by the casing and spaced from the point
 90 thereof, said magazine being rotatably mounted in the casing, means for conveying the leads from the magazine to the pencil point, a bearing member for retaining both the magazine and the conveying tube in axial
 95 alignment within the casing, said bearing member being provided with a flexible portion for fixedly engaging the bore of the casing, and means including mechanism rotatably movable with the magazine for feeding
 100 leads through the conveying means from the magazine toward the pencil point upon angular adjustment of the magazine.

16. In a mechanical pencil, the combination of a casing having a point for the projection of leads, a magazine for leads carried by the casing and spaced from the point
 110 thereof, said magazine being rotatably mounted in the casing, a tube for conveying the leads from the magazine to the pencil point, said tube having openings in the sides thereof, a bearing member for retaining both
 115 the magazine as well as an end portion of the tube in axial alignment within the casing, a second bearing member for retaining the other end of the conveying tube in axial alignment within the casing, both said first
 120 and second bearing members having flexible portions for fixedly engaging the bore of the casing, and feeding mechanism projecting
 125 into the openings in the conveying tube and responsive to angular adjustments of the magazine for feeding the leads through the conveying tube from the magazine toward
 130 the pencil point.

17. In a mechanical pencil, the combination of a casing having a point for the projection of leads, a magazine for leads carried by the casing and spaced from the point thereof, said magazine being rotatably mounted, a removable closure for the magazine disposed exteriorly of the casing for grasping, means freely communicating with the magazine for conveying leads to the pencil point, a cam member disposed within the casing and rotatable with the magazine, finger members disposed on opposite sides of the lead and having serrated portions for engaging the same, said finger members being so connected to the cam member as to be simultaneously reciprocated in opposite directions upon angular movement of the cam member, whereby with motion of the cam member, in either direction, one finger member is moving in a direction from the magazine toward the pencil point so as to feed the leads to the latter, and spring means for retaining the finger members in bearing engagement with the leads.
18. In a mechanical pencil, the combination of a casing having a point for the projection of leads, a magazine for leads carried by the casing and spaced from the point thereof, means for guiding the leads from the magazine to the point, a cam member rotatably mounted within the casing, a plurality of feeding members disposed within the casing and engaging, respectively, circumferentially spaced portions of the cam member, said feeding members being longitudinally movable in response to rotation of the cam member, and means to cause the feeding members to engage the leads.
19. In a mechanical pencil, the combination with a casing having a point for the projection of leads and means disposed within the casing for retaining a lead for projection through said point, of means for fixedly securing the retaining means within the casing and including a flexible diaphragm formed to exert radial spring tension between the casing and said retaining means.
20. In a mechanical pencil, the combination with a casing having a point for the projection of leads and means disposed within the casing for retaining a lead for projection through said point, of means for fixedly securing the retaining means within the casing and including a diaphragm secured to the retaining means, said diaphragm having an initial outside dimension slightly larger than the inside dimension of the casing and said diaphragm being composed of a flexible material so as to assume a concavo-convex position when forced into the casing, whereby said retaining means and said casing are secured in fixed relative position by the exertion of radial spring tension.
21. In a mechanical pencil, the combination with a casing having a point for the projection of leads and means disposed within the casing for retaining a lead for projection through said point, of means for fixedly securing the retaining means within the casing and including a flexible diaphragm formed to engage the retaining means by spring tension and the casing by spring tension.
22. In a mechanical pencil, the combination with a casing having a point for the projection of leads and means disposed within the casing for retaining a lead for projection through said point, of means for fixedly securing the retaining means within the casing and including a diaphragm, said diaphragm being composed of a flexible material and having an initial inside dimension slightly smaller than the outside dimension of the retaining means and an initial outside dimension slightly larger than the inside dimension of the casing, whereby, upon the retaining means being forced into the diaphragm and the diaphragm forced into the casing, the diaphragm is secured to both the retaining means and the casing by spring tension.
23. In a mechanical pencil, the combination with a casing having a point for the projection of leads and means disposed within the casing for retaining a lead for projection through said point, of means for supporting the retaining means within the casing and including a flexible diaphragm disposed in bearing engagement with the retaining means and formed to fixedly engage the casing by means of radial spring tension.
24. In a mechanical pencil, the combination with a casing having a point for the projection of leads and means disposed within the casing for retaining a lead for projection through said point, of means for supporting the retaining means within the casing and including a diaphragm disposed in bearing engagement with the retaining means, said diaphragm having an initial outside dimension slightly larger than the inside dimension of the casing and said diaphragm being composed of a flexible material so as to assume a concavo-convex position when forced into the casing, whereby said diaphragm and said casing are fixedly secured to each other by means of radial spring tension.
25. In a mechanical pencil, the combination of a casing having a point for the projection of leads, a magazine for leads carried by the casing and spaced from the point thereof, and feeding mechanism disposed within the casing and including lead-engaging feeding members each movable in a forward direction toward the pencil point and in a backward direction away from the pencil point, means angularly adjustable in either direction for effecting a forward movement of one of the feeding members, and means to cause said feeding members to engage the lead.
26. In a mechanical pencil, the combination with a casing having a point for the projection of leads and means disposed within the casing for retaining a lead for projection through said point, of means for fixedly securing the retaining means within the casing and including a flexible diaphragm formed to engage the retaining means by spring tension and the casing by spring tension.

tion of a casing having a point for the projection of leads, a magazine for leads carried by the casing and spaced from the point thereof, and feeding mechanism disposed
5 within the casing and including a plurality of lead-engaging feeding members each movable in a forward direction toward the pencil point and in a backward direction away from the pencil point, and a rotatably mounted
10 cam member angularly adjustable in either direction for effecting a forward movement of one of the feeding members, and means to cause said feeding members to engage the lead.

15 27. In a mechanical pencil, the combination of a casing having a point for the projection of leads, a magazine for leads carried by the casing and spaced from the point thereof, and feeding mechanism disposed
20 within the casing including lead-engaging feeding members each movable forward toward the pencil point and backward away from the pencil point and means angularly adjustable in either direction, for effecting
25 a backward movement of one of the feeding members.

28. In a mechanical pencil, the combination of a casing having a point for the projection of leads, a magazine for leads carried
30 by the casing and spaced from the point thereof, and feeding mechanism disposed within the casing including lead-engaging feeding members each movable forward toward the pencil point and backward away
35 from the pencil point, a rotatably mounted cam member, and means for angularly adjusting the cam member in either direction for effecting a backward movement of one of the feeding members.

40 29. In a mechanical pencil, the combination of a casing having a point for the projection of leads, a magazine for leads carried by the casing and spaced from the point thereof, means for guiding the leads from
45 the magazine to the point, reciprocating members operable one after the other for feeding successive leads through the guiding means from the magazine toward the pencil point, means to cause said members to grip
50 the lead upon forward movement, and means for actuating said feeding members, said actuating means including a portion disposed exteriorly of the casing for grasping.

In testimony whereof, I have hereunto subscribed my name this eighth day of May,
55 1928.

JOSEPH E. KUCHER.