

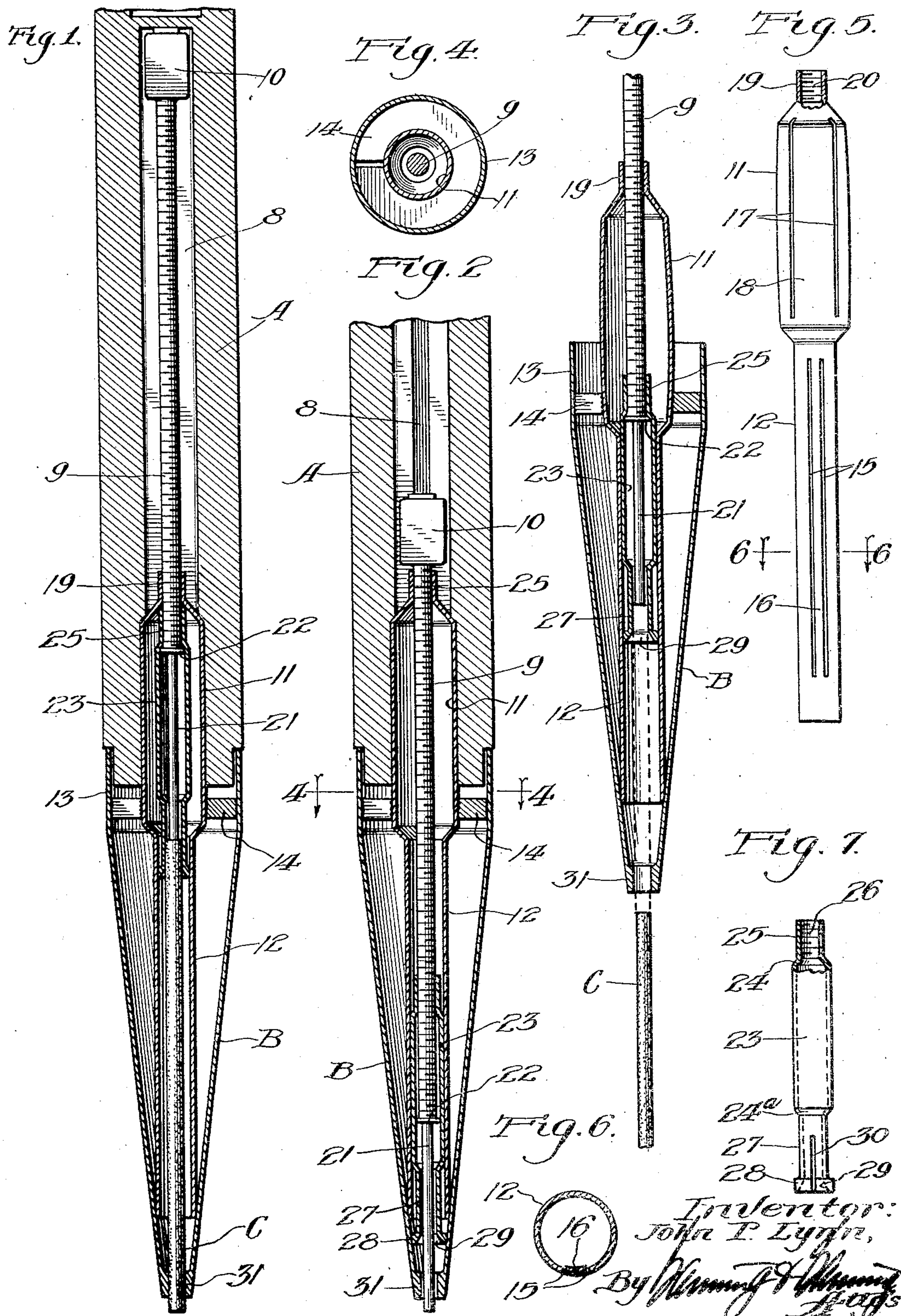
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PENCIL

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# UNITED STATES PATENT OFFICE

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## PENCIL

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This invention relates to a pencil having mechanical means for propelling, retracting, or expelling a lead through its tip portion. The mechanism employed is of the screw-operated type actuated by rotation of one part relative to another.

The principal objects realized by this invention are simplicity in construction and operation; expulsion of the lead following the exhaustion of its serviceable portion; and protection to the operating parts against accident or tampering incident to usage. These and other objects of my invention will more clearly hereinafter appear in the specification and claims taken in conjunction with the accompanying drawing which illustrates a suggestive embodiment of the present pencil in the manner following:

Figure 1 is a longitudinal section taken centrally through the lower portion of a pencil showing in its entirety the operating mechanism which is in one extreme position;

Fig. 2 is a similar view with the propeller advanced to its opposite limit so as to expel a lead from the pencil;

Fig. 3 is a similar view of the pencil tip detached from the pencil body;

Fig. 4 is a transverse section taken on line 4—4 of Fig. 2;

Fig. 5 is a view in elevation of the axial tube detached from the tip with which it normally occupies a fixed relation;

Fig. 6 is an enlarged transverse section, taken on line 6—6 of Fig. 5; and

Fig. 7 is a view in elevation, and partly in section, of the lead carrier detached from the propeller with which it is inseparably associated.

In the present pencil I combine with a body A a relatively rotatable part, such as the tip B. The body is provided with a slotted axial bore 8 through which may slide non-rotatably a screw-threaded propeller 9 having a head 10 at one end thereof. This bore in the body extends upwardly from its lower end for a distance sufficient to accommodate the propeller, as suggested in Fig. 1. In its lower region the bore may be slightly widened to receive an enlarged end or head 11 of a tube 12 which extends down within the

tip close to its lower end. The walls of the tip are preferably tapered, as shown, except at the upper end 13 where they are straightened up to loosely surround the adjacent end of the body. The tube 12 is supported fixedly within the tip as by having its lower end engaged with the tapering walls thereof and having a connection between its head 11 and the cylindrical tip walls 13 in the form of a split ring 14 which is frictionally fitted in place.

The walls of the tube are longitudinally slitted at 15 or in two or more places to provide spring sections 16 which normally bow inwardly (see Figs. 5 and 6). In like manner the tube head 11 is slitted at 17 to provide spring sections 18 which are normally bowed outwardly, as shown in Fig. 5. The tip in which this tube is secured may then be connected frictionally with the pencil body and held in place by the spring force which is outwardly exerted by the sections 18 against the walls of the bore in which the same is received. At the upper extremity of the tube I provide a constricted neck 19 having internal threads 20 with which the screw threads of the propeller may co-operate. At its lower end the propeller is of reduced diameter to provide a pin 21. At the juncture of the pin with the propeller I provide a lateral projection 22 which is disposed within a lead carrier in the form of a sleeve 23 having its opposite end portions of slightly reduced diameter. Adjacent these reduced end portions the sleeve walls are configured to provide upper and lower shoulders 24 and 24<sup>a</sup>, respectively. The constricted upper sleeve end 25 is provided with internal threads 26 adapted to co-operate with the screw threads of the propeller. The lower sleeve end 27 terminates by preference in a head 28 having a beveled throat 29 upon the interior thereof. Also in the reduced lower sleeve end, I provide one or more slits 30 which define spring sections adapted to grip between them one end of a lead C which is insertable through the tip for connection with the carrier. At its lower extremity the walls of the tip are thickened as at 31 to provide a cylindrical guideway which aligns



a lead co-axially with the pencil when inserted for connection with the carrier. The securement of the lead in place is further facilitated by the beveled throat 29 which is provided at the lower extremity of the carrier.

In operation the pencil mechanism performs as follows: A rotation of the pencil body relative to its tip will produce a longitudinal travel of the propeller which also is rotated with the body by reason of the sliding non-rotative engagement of its head 10 within the slotted bore 8. The end of the propeller pin 21 is normally abutting the lead C which is held in the carrier so that the latter is required also to turn with the propeller. Near the lower limit of its movement the carrier will abut the tapered walls of the tip whereupon its advance will be arrested. The propeller, however, may continue to advance with the result that its pin end 21 will expel the lead C from the carrier, and eject the same from the pencil tip. In this position the parts are related as in Fig. 2.

To reload the pencil a new lead is inserted through the tip. Preliminary to this operation the propeller should first be retracted, and this may be done by a reversal of the turning movements just described. By detaching the tip from the pencil body and applying a turning force to the propeller head 10 which is then exposed for manipulation, this screwing back operation may be expedited. During the return movement of the propeller the carrier will initially remain stationary, due to the light friction applied thereto by the spring sections 16 until the projection 22 on the propeller has backed up to the upper shoulder 24 of the carrier. Further retraction of the propeller will thereupon cause a corresponding travel of the carrier until the parts are backed up to their limit, as shown in Fig. 1. At any desired point in this propeller retraction, a new lead C may be inserted through the tip and receive guidance from the wall 31 thereof so as to enter the throated end of the carrier by which it is then gripped with a spring action.

The action of the parts is peculiar in particulars as follows: The propeller is movable both with and independently of the carrier. This results from the fact that between these parts there is a screw-threaded connection which permits the propeller to turn relative to the carrier only when the lead C is being or has been expelled from the latter. Normally the carrier engages the lead with sufficient friction to oppose any advance of the propeller relative to the carrier, but when progress of the carrier is positively arrested by its abutting the tapering walls of the tip, then further actuation of the parts can only result in the propeller continuing its forward movement with a consequent dislodgment of

the lead. Between the propeller and carrier there is accordingly a slip connection which is normally inoperative whenever a lead is positioned in the latter. The extent of possible slippage is determined by the spacing between the upper and lower shoulders 24. There is also this further characteristic, namely, that the lead, during its travel through the pencil, is advanced non-rotatably relative to the propeller. The lower tip end furnishes a loose guide or support for the lead and may be strongly fashioned so as to be durable in service. The actual retention of the lead is performed by the carrier which at all times is afforded complete protection within the axial tube.

I claim:

1. In combination, a pencil having a body in which is an axial bore, a tapered tip at the lower body end, a tube arranged axially within the tip and extending into the bore of the body for frictional connection therewith, means connecting the tube fixedly with the tip whereby the tube serves as a medium for securing the tip removably to the pencil body, a screw-threaded propeller adapted for longitudinal travel within the bore of the body and through the tube of the tip, threads formed at the upper tube end for co-operation with the screw threads of the propeller, means for preventing rotation of the propeller during longitudinal travel thereof within the bore, an extension of reduced diameter at the lower propeller end, means projecting laterally from the propeller at a point adjacent its juncture with the extension at the lower end thereof, a sleeve having screw threads for co-operation with the threads of the propeller and mounted at the lower end thereof to surround the reduced extension aforesaid, means at the lower sleeve end for gripping one end of a lead, means at the lower tip end for guiding a lead during its in and out movements through the tip, spring means for applying to the sleeve a light friction such that it tends to oppose rotation with the propeller, and means on the sleeve co-operating with the projection of the propeller for preventing separation of the sleeve from the propeller, substantially as described.

2. In combination, a pencil in which is comprised a body having an axial bore extending inward from the lower end thereof and having guide ways, a tip, an axial tube connected fast with the tip and receivable within the bore for establishing a frictional connection therewith, a screw threaded propeller having a head cooperating with the guide ways in the bore of the body for non-rotatable travel therethrough, screw threads on the tube for co-operating with those of the propeller for advancing the latter when the tip is rotated relative to the pencil body, and a lead carrier mounted for limited travel



with the propeller at the lower end thereof having means for engaging with a lead whereby to propel or retract the same, substantially as described.

5 3. In combination, a pencil in which is comprised a body having an axial slotted bore, a tip provided with an axial tube receivable in part within the bore of the body and adapted to engage frictionally therewith  
10 whereby to secure the tip removably to the pencil body, a screw threaded propeller having a guiding head longitudinally slidable through the slotted bore, screw means in the tube for co-operating with the threads  
15 of the propeller for advancing the same when the tip is rotated relative to the pencil body, and means having threaded engagement with the propeller adapted to grip a lead to advance or retract the same through  
20 the tip, substantially as described.

4. In combination with a pencil in which is comprised a body and a tip, frictionally secured together and one rotatable relative to the other, screw means operatively associated with the tip and body and movable  
25 through the body and tip in response to relative rotation therebetween, and a lead carrier having threaded engagement with the screw means for propelling or retracting a  
30 lead through the tip, substantially as described.

5. In combination with a pencil having a body and tip in relatively rotatable relation, means providing a removable connection between the tip and body, means at the lower  
35 tip end forming a guide through which a lead may be freely moved, a carrier having means to grip the inner end of a lead, and screw means threaded into said carrier and  
40 having operative connection with the body and tip whereby to advance the carrier through a predetermined distance and then continue a further movement relative to the carrier, substantially as described.

6. In combination with a pencil in which is comprised a body and a tip, frictionally secured together and one rotatable relative to the other, a lead carrier mounted in the  
45 tip, screw means co-operating with the carrier and the body adapted upon relative rotation between the two parts to advance the carrier in either direction, and means providing a screw threaded connection between the carrier and said screw means, substantially as described.  
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7. A pencil in which is comprised two separable relatively rotatable parts, a lead carrier having limited movement in one part,  
60 propelling means for the lead carrier co-operating with the other part, and means providing a screw threaded connection between the carrier and the propeller adapted on continued rotation of the parts to produce a  
65 lesser longitudinal movement of the former

in response to a greater endwise travel of the latter, substantially as described.

8. A pencil in which is comprised a body having an axial bore extending to its lower end, a tube enlarged at one end for reception  
70 within the lower end of the body bore, a tip wherein the tube is extended having a fast connection therewith and adapted thereby to be separably secured to the pencil body, a carrier movable through the tube and into the  
75 enlarged upper end thereof, means for securing one end of a lead to the carrier, guiding means at the tip extremity through which the lead may be freely moved, a pin within the carrier in abutting relation to the proximate end of the lead, a screw-threaded propeller from one end of which the pin is extended, screw means on both the tube and carrier adapted to co-operate with the threads of the propeller, and means in the  
80 tube for retarding rotation of the carrier therewithin, substantially as described.

9. A pencil in which is comprised a tip having an axial tube, a guide at the lower tip end through which the lead may move, a  
90 sleeve movable through the tube having means for gripping the inner end of a lead, the entrance to the sleeve being throated whereby to facilitate positioning of the lead therewithin, screw means co-operating with the sleeve and abutting the end of the lead therein for advancing the sleeve through the tube, and a pencil body with which the tip is separably connected having means co-operating with the screw means whereby upon rotation of the tip relative to the body the screw means is operated to move the sleeve in either of two directions, substantially as described.  
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10. A pencil in which is comprised two relatively rotatable parts in end to end relation,  
105 a tube connected fast with one of said parts, a tubular lead carrier slidable within the tube, and means operable by the other of said parts and slidable relative thereto, adapted to engage a lead in the carrier, said means having a screw-threaded connection with the tube and the carrier to propel the carrier therewithin, substantially as described.

11. A pencil in which is comprised two relatively rotatable parts, means slidable  
115 axially of one part and operable thereby having a screw-threaded connection with the other part, and a tubular lead carrier having a threaded connection with said means and adapted to abut the lead of the carrier whereby to advance the carrier a distance less than the travel limit of said slidable means, substantially as described.  
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12. A pencil in which is comprised two relatively rotatable parts, a tubular lead carrier movable axially of one part, and threaded means operable by the other part and slidable relatively thereto connected directly with the carrier and abutting the lead therein for  
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movement serially therewith and there-through, substantially as described.

13. A pencil in which is comprised two separably connected relatively rotatable parts, a tube connected fast with one part and extended partly into the second part, screw means operable by the second part and slidable relative thereto and into the tube, and a tubular lead carrier slidably confined within the tube and movable in response to actuation of said screw means, substantially as described.

14. A pencil in which is comprised two relatively rotatable parts, a tubular lead carrier movable axially through one part, spring means for applying friction to the carrier during movements thereof, screw means operable by the other part slidable relative thereto, and adapted to abut the lead therein to transmit motion to the carrier, substantially as described.

15. In combination, in a pencil, a movable lead carrier, propelling means operatively connected therewith for relative movement to advance a lead therethrough, and means for preventing relative movement therebetween in both directions, whereby said carrier is moved with said propelling means as a unit.

16. In combination, in a pencil, a movable lead carrier, propelling means threaded in said carrier and movable therein, and stops on said carrier and propelling means to limit said relative movement in both directions.

17. In combination, in a pencil, a movable lead carrier having contracted ends and an intermediate portion of larger diameter, a propeller threaded into said carrier and relatively adjustable therein, and a projection on said propeller adapted to contact with the contracted ends of said carrier to limit said relative movement in both directions.

18. In combination with a pencil having a body and tip in relatively rotatable relation, means providing a removable connection between the tip and body, means at the lower tip end forming a guide through which a lead may be freely moved, a carrier adapted to grip the inner end of a lead, and screw means actuated by relative rotation between the body and tip adapted to advance the carrier through a predetermined distance, said screw means being threaded to said carrier to permit a further movement relative to the carrier, substantially as described.

19. In combination with a pencil in which is comprised a body and a tip, frictionally secured together and one rotatable relative to the other, a lead carrier mounted in the tip, screw means co-operating with the carrier and the body adapted upon relative rotation between the two parts to advance the carrier in either direction, and means providing a threaded connection between the carrier and said screw means, substantially as described.

20. A pencil comprising two separable

relatively rotatable parts, a lead carrier carried by and movable through one part, means limiting movement of said carrier, propelling means for the lead carrier operatively associated with the other part and movable endwise through both parts, and means providing a threaded connection between the carrier and the propeller, whereby upon continued rotation of one part relative to the other a longitudinal movement of the carrier is produced in response to a portion only of the endwise travel of the latter, substantially as described.

21. A pencil in which is comprised two relatively rotatable parts, means slidable axially of one part and operable thereby having a screw-threaded connection with the other part, and a lead carrier mounted for limited movement with said means and having a threaded connection therewith whereby to be advanced a distance less than the travel limit of said slidable means, substantially as described.

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