

Jan. 15, 1952

J. L. DALKE

2,582,374

MAP MAKING APPARATUS

Filed Aug. 17, 1945

5 Sheets-Sheet 1

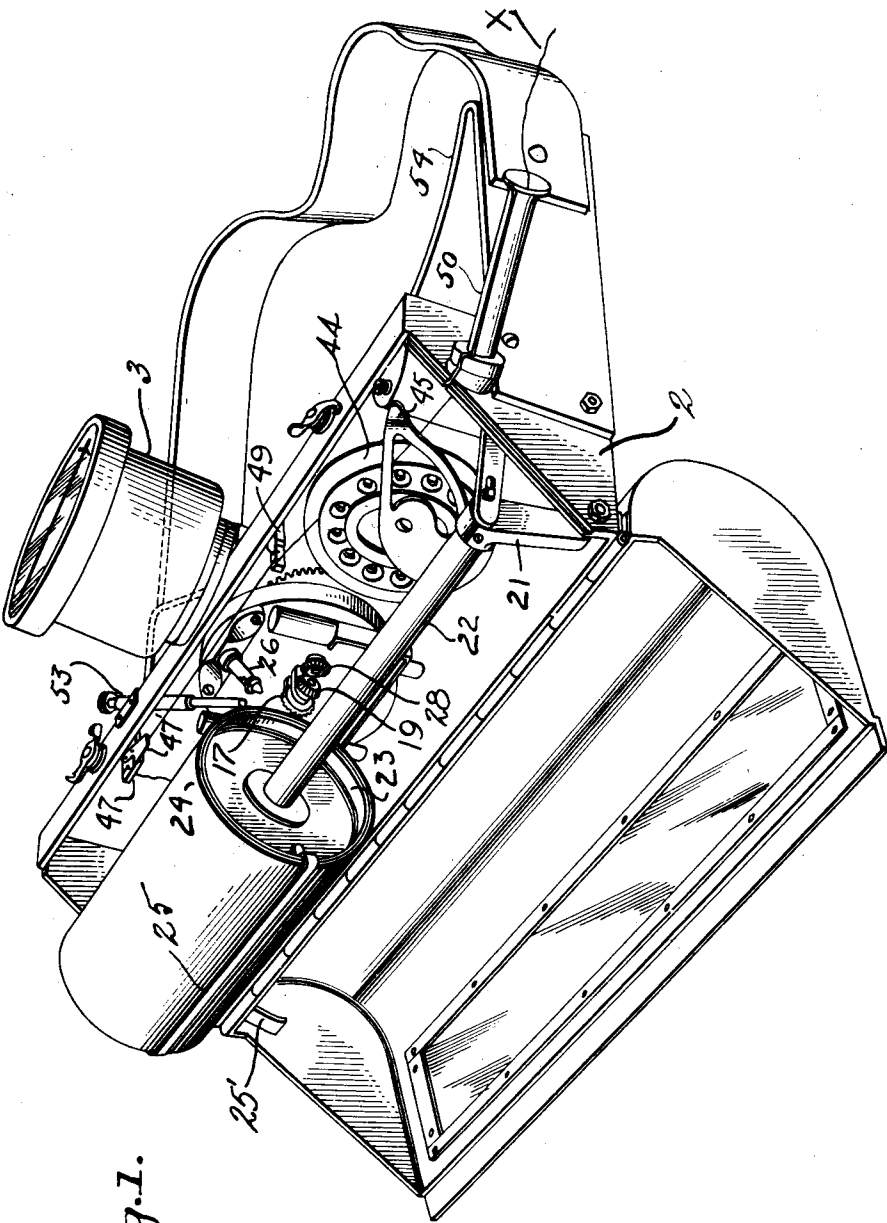


Fig. 1.

Inventor

John L. Dalke

By

Francis P. Vanderweiden and
Joseph F. Coover

Attorneys

Jan. 15, 1952

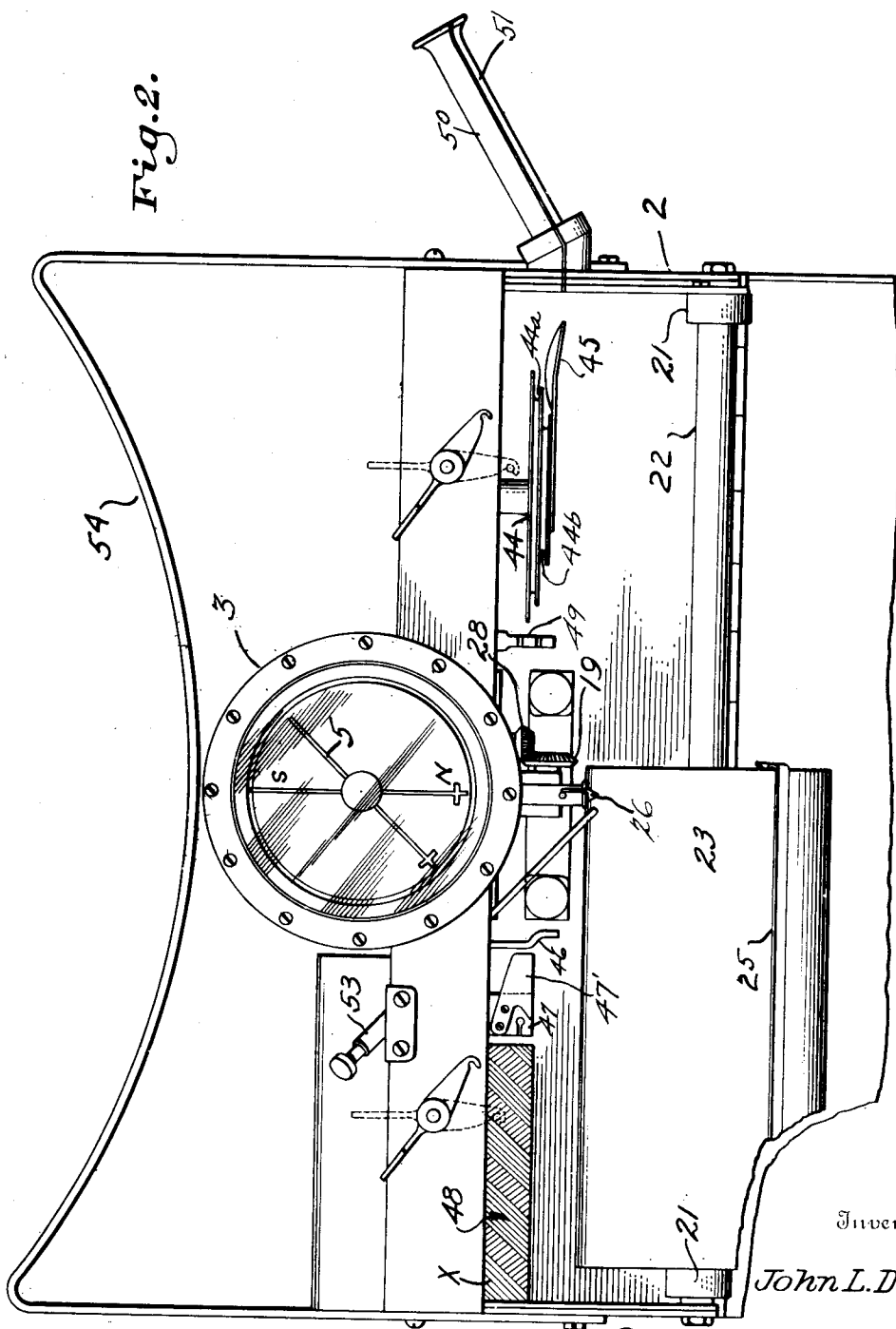
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Fig. 2.



Inventor

John L. Dalke

By

Frederic C. Vandewalker and
Joseph H. Emery
Attorneys

Jan. 15, 1952

J. L. DALKE

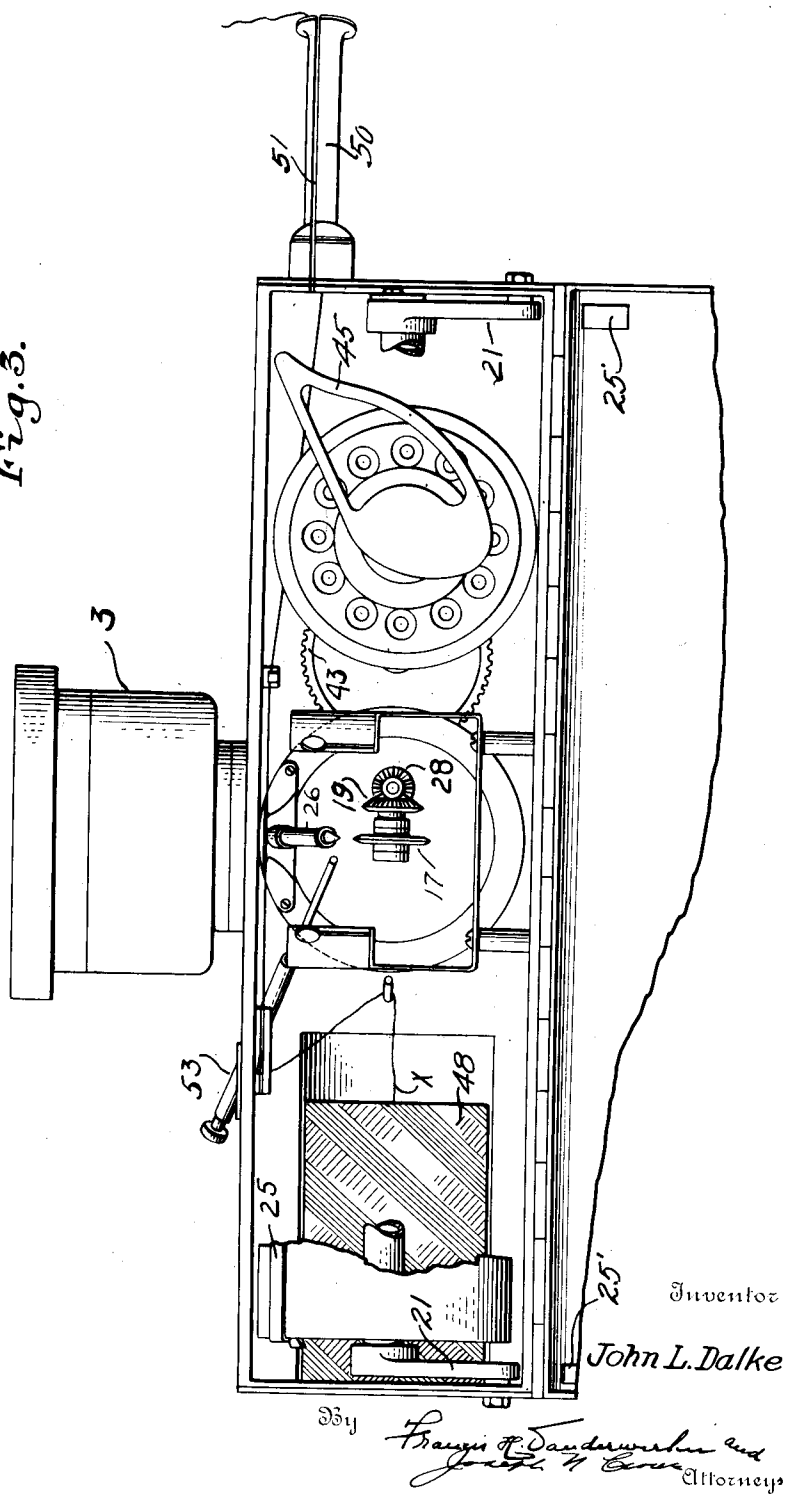
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Fig. 3.



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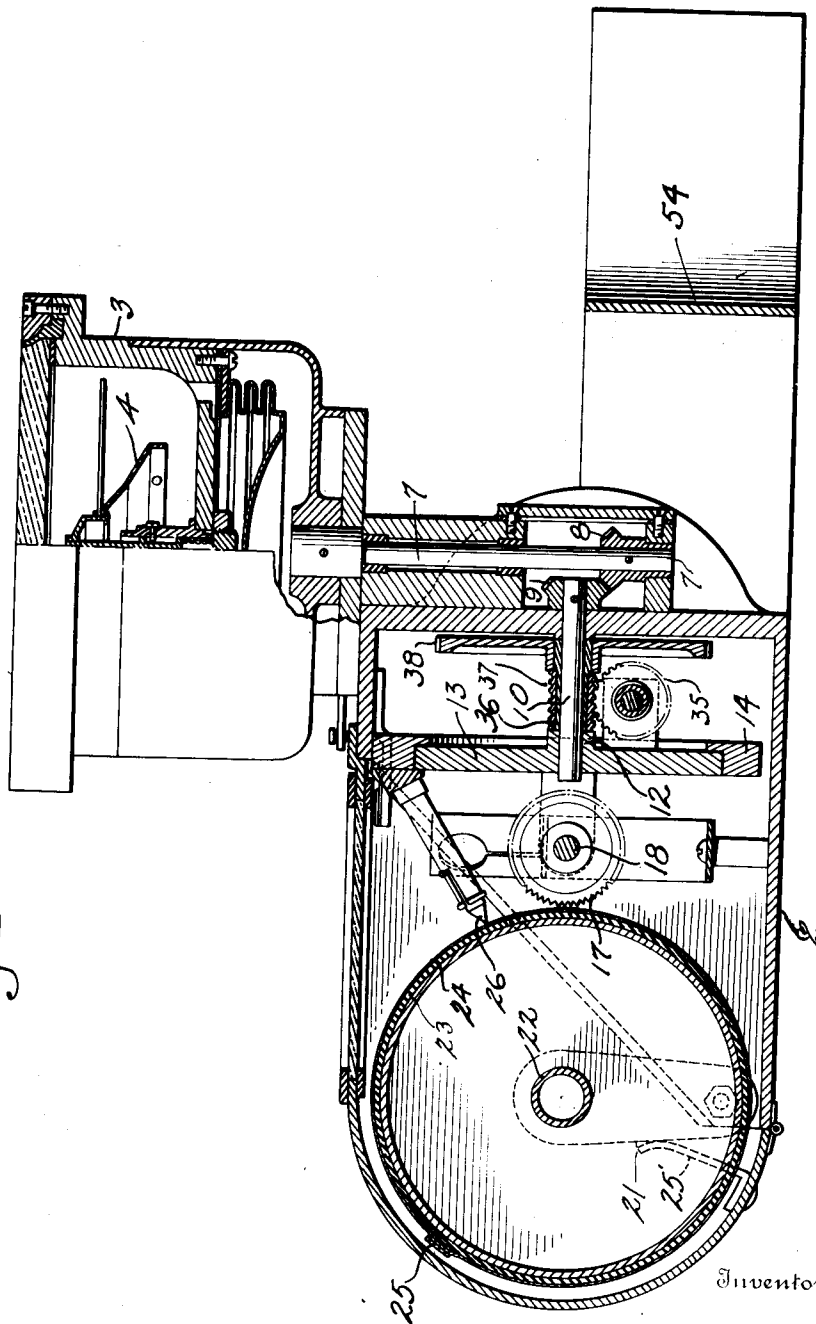
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Fig. 4.



Inventor

John L. Dalke

By

Francis F. Davidson and
Joseph F. Brown

Attorneys

Jan. 15, 1952

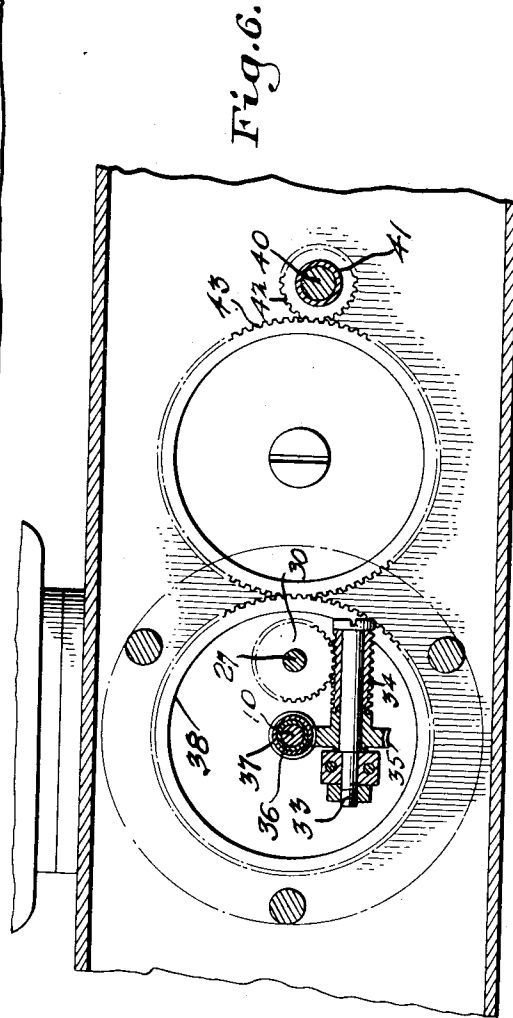
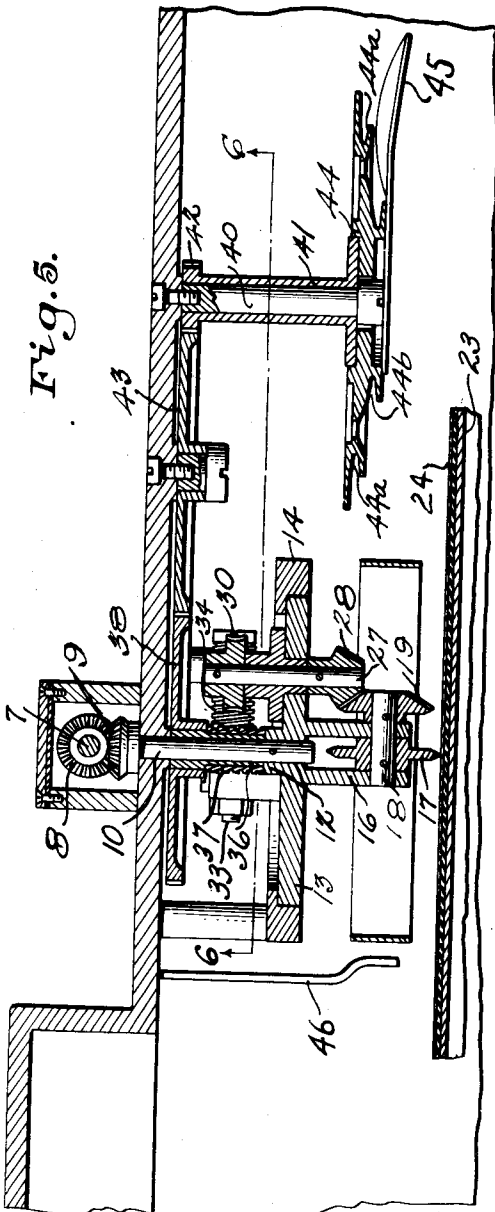
J. L. DALKE

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MAP MAKING APPARATUS

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Inventor

John L. Dalke

 ω_{ij}

Francis P. Vanderwerker and
Joseph H. Brown

Attorneys

UNITED STATES PATENT OFFICE

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MAP MAKING APPARATUS

John L. Dalke, Enid, Okla., assignor to the United States of America as represented by the Secretary of War

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2 Claims. (Cl. 33—1)

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This invention relates to an improvement in mapping devices of light construction which are easily transportable and adaptable for use on any terrain. More particularly, the invention relates to a device embodying a directional recording means utilizing a magnetic compass and a range recording means including a flexible cable payout mechanism. The invention is operable respectively and independently of the mode of transporting over the terrain or conditions of the terrain or visibility, and the device of the invention will operate satisfactorily when utilized by troops in forward areas under blackout conditions in total darkness.

Numerous mechanical devices for attainment of similar results have been developed, but so far as is known, all of the devices of the prior art are lacking in some respects. Some of the mechanisms of the prior art are too heavy and cumbersome to be easily transportable; others are too complicated in design and operation to possess the required degree of flexibility of use to make them operable under all conditions or satisfactory for all uses desired.

The primary object of this invention is to provide a device overcoming the aforementioned difficulties and in addition possessing the required degree of lightness, flexibility of use and ease and simplicity of operation as to be suitable for use on any terrain and under adverse conditions of weather and visibility.

A further object of the invention is to provide a portable mapping unit of the above indicated character which includes recording means, operating mechanism arranged to impart mapping data to the recording device, which operating mechanism includes a ball of twine, or a supply of flexible cable of any suitable character which engages a sheave or pulley wheel which is driven by movement of the twine or cable as this is played out during mapping operations, the sheave in turn driving a gear train in which all of the elements are positively connected to each other, thereby preventing any tendency of slipping between the elements with attendant inaccuracy in the mapping data, together with means which are controlled by the gear train for recording mapping data on the recording device.

Further objects of the invention will become apparent as the description proceeds and the features of novelty will be pointed out in particularity in the appended claims.

The invention, then, comprises the features hereinafter fully described, and as particularly pointed out in the claims, the following description and the annexed drawings setting forth in detail certain illustrative embodiments of the invention, this being indicative of but one of several ways in which the principle of the invention may be employed.

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In the drawings:

Figure 1 is a perspective of the map making apparatus of the invention, with the cover of the housing opened to show the various operating instrumentalities;

Figure 2 is a plan of the showing of the apparatus of Figure 1;

Figure 3 is a side elevation of the showing of Figures 1 and 2;

Figure 4 is a view taken approximately midway of the length of the apparatus and illustrating some of the parts thereof in section;

Figure 5 is a view similar to the showing of Figure 4 but at substantial right angles thereto; and

Figure 6 is a sectional view on the line 6—6 on Figure 5.

Referring more particularly to the drawings, the numeral 2 designates the main housing for the apparatus of the invention. Mounted atop this main housing 2, and adapted for rotative movement with respect thereto, is a compass housing 3, the latter containing a liquid-filled magnetic compass 4 (Figure 4). For purposes which will later appear, the compass housing 3 is provided with a reference marker 5 for coincidence with the north-south line of the magnetic compass 4 when the said compass housing is rotated to the proper relative position.

The rotatably-mounted housing 3 is secured to a vertical rotatable shaft 7 to which there is attached a bevel gear 8. This bevel gear 8 meshes with a similar bevel gear 9 which is secured to one end of a horizontal rotatable shaft 10, the latter carrying on its opposite end an attached sleeve 12 having an intermediately disposed and integrally formed enlarged disk 13 which is journaled in a ring-type bearing 14, the said ring-type bearing 14 being suitably supported in the main housing 2. The sleeve 12 projects beyond the proximate end of the rotatable shaft 10 and is provided with an enlarged and split portion providing a forked bearing member 16 which receives a plotting wheel 17 which may be provided with a rubber tread or peripheral teeth (as shown). A transverse shaft 18 is journaled in the side walls of the sleeve 12 and carries in attached relationship the plotting wheel 17. It also projects beyond the enlarged and split portion 16 of the sleeve 12 to receive an attached bevel gear 19, the purpose of which will later appear.

The main housing 2 carries a pair of spaced parallel pivoted links 21 which support an elongate shaft 22, the latter extending in right-angular relationship across the split end of the sleeve 12. Slidably mounted on this shaft 22 is a cylindrical drum or platen 23 which carries the mapping paper, or other record, 24. The mapping paper may be attached to the platen by any suitable means, as for example, the spring clip 25 which is most clearly shown in Figure 1.

The course traveled by the apparatus is traced upon the mapping paper 24 by a stationary pencil 26 or other stylus which is suitably mounted on the main housing 2.

The peripherally toothed plotting wheel 17 projects from the split end of the sleeve 12 and engages the platen 23. A strip spring 25' or other suitable device may be positioned in contact with either or both of the pivoted links 21 to effect a resilient relationship of the plotting wheel on the platen. This permits the easy and rapid withdrawal of the platen for purposes of observation and/or to change the mapping paper 24.

The length of the cylindrical platen is approximately one-half the length of the elongate shaft 22 on which it is carried; and the construction and arrangement of these elements is such that the platen may either rotate, slide, or rotate-and-slide, depending upon the angle at which it is engaged by the peripherally toothed plotting wheel 17.

A rotatable shaft 27 extends through (and projects from either side of) the disk 13 on the sleeve 12. On its end which is most adjacent the shaft 18 which carries the peripherally toothed plotting wheel 17, the shaft 27 has secured thereto a bevel gear 28 which is meshed with the previously described bevel gear 19. Fixed to the other end of the rotatable shaft 27 is a worm gear 30. Disposed adjacent the worm gear 30 and in right-angular relationship with respect thereto is a shaft 33 rotatable on which is a worm 34 which meshes with the said worm gear 30. On this shaft 33 there is also a worm gear 35 which is secured to worm 34. Thus, the worm gear 35 is adjacent to the shaft 10 and in right-angular relationship with respect to it. A sleeve 36 is mounted for rotation on the shaft 10; and it has secured to it a worm 37 which meshes with the worm gear 35. The sleeve 36 also has secured to it a large spur gear 38.

From the foregoing it will be perceived that the rotation of the spur gear 38 will cause the rotation of the peripherally toothed plotting wheel 17; and in order to permit the stylus 26 to indicate on the mapping paper 24 the precise distance over which the apparatus is being moved, it is only necessary that the spur gear 38 be given a rotational function in accordance therewith. The gear train shown and described has been found to be very efficient. To a large extent this is due to the gear reduction assembly being attached to and forming part of the means for enabling the rotation of the wheel at right angles to its direction of rotation. This construction and arrangement makes negligible the advancement of the plotting wheel 17 upon the rotation of the compass housing 3 through a complete revolution; and thus limits to a minimum the degree of error which might otherwise be introduced through the gearing reduction assembly.

The necessary rotation of the spur gear 38 may be obtained in numerous ways, as by connection with the propeller shaft of a vehicle or vessel, the driving shaft of an odometer, or speedometer, etc. However, an acceptable embodiment, which has proven to be very satisfactory, and the one which is illustrated in the drawings, takes the form of a string or thread which is attached to a fixed point and payed out from the main housing 2 as the distance is being negotiated; together with means for translating the amount of string payed out into terms of rotation of the spur gear 38. According to this embodiment, there is fixedly secured to the main housing 2 a stationary shaft 40 on which

there is mounted a rotatable sleeve 41. To the inner end of this rotatable sleeve 41 there is affixed a small gear 42 which imparts rotation to the spur gear 38 through an intermediately disposed idler gear 43.

To the outer end of the rotatable sleeve 41 there is attached for conjoint rotation therewith, a pulley 44 having two string-receiving grooves of different diameters, the larger being indicated at 44a and the smaller at 44b. The string is assisted into the desired groove by means of a conveniently disposed guide 45. The supply of string X is maintained in the form of a ball or spool on a suitable spindle 43. As the string X is payed from the ball on the spindle, it is wrapped around a hook guide 46, which comprises a rod or wire suitably attached to the main housing 2 and having a bent or curved outer end to prevent the convolution of the string from slipping off. As the string X leaves the hook guide 46 it is passed under a block 47, through a vertical slot in the said block, and under a tension device 47' which comprises a resilient metallic strip of suitable wearing qualities, for example, Phosphor bronze. This tension device (i. e. resilient metallic strip) may be suitably supported by attachment to the top surface of the block 47 in the manner shown. After the string X leaves the under surface of the tension device 47' it is passed through one of a pair of horizontal slots of a double guide generally indicated at 49, and wrapped into one of the string-receiving grooves (i. e. 44a or 44b) of the pulley 44.

As it comes out of the selected string-receiving groove of the pulley 44, the string X is passed through a tubular external guide 50, after which it is free to be attached to a convenient object at the point from which the mapping process is to begin. The placing of the string X in the tubular external guide is facilitated by the provision of a slot 51, preferably in the forward-facing portion thereof.

When the peripherally toothed plotting wheel 17 is in engagement with the mapping paper 24, the length of the route marked by the stylus depends upon the diameter of the plotting wheel and the amount it rotates. By proper choice of the ratio of the diameter, of the string-receiving grooves of the pulley 44 with respect to the diameter of the peripherally toothed plotting wheel, and the ratio of reduction of the gear train, any mapping scale may be obtained.

A sharply pointed position marker 53 extends angularly through the main housing 2, to a point adjacent the point of contact of the stylus 26 with the mapping paper 24 and permits the operator to manually depress it and puncture the mapping paper to mark points en route without opening or removing the cover for the main housing.

The apparatus may be attached to the operator by straps (not shown) and a body rest 54 enables the main housing to be comfortably carried in front of the operator at waist level. The compass reference lines are phosphorescent to permit operation of the apparatus under night time conditions; and if desired, lights may be provided for enabling the making of observations and adjustments under similar conditions.

It will be readily understood by those skilled in the art that the orientation of the compass housing 3 by the operator will determine the angularity of the peripherally toothed plotting wheel 17 with respect to the axis of the cylindrical platen 23; and that in this manner accept-

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ably accurate compensation is made for deviation from a true magnetic course.

In its operation the device may be attached to the operator by suitable straps, the body rest 54 engaging the forward portion of the operator at approximately waist level. The cord is attached to a stake, tree or other fixed object at the starting point of the course to be surveyed and the operator then faces in the direction of the first leg of the course and orients the compass by revolving its housing 3 until the reference marker 5 coincides with the north-south line of the compass 4. The device is then moved from the starting point to a second point on the course which point may be arbitrarily determined or may be the point at which a change in direction of the course occurs. As it moves over the first lap the cylinder 23 carrying the recording medium 24 moves past the marking pencil 26 and in contact therewith a distance proportional to the ground distance. Through the instrumentality of the cord, the sheave (44a or 44b), the gears 42, 43, 38, the worm 37, the worm 34, the pinion 30, the shaft 27 and the bevel gears 28 and 19, the toothed plotting wheel 17 rotates proportionately to the distance which the device moves. As a result of the setting of the compass, as previously referred to, the plotting wheel 17 is oriented with respect to the magnetic azimuth of the course. Such orientation is effected by the positioning of the compass housing 3, thus rotating the shaft 7, bevel gears 8 and 9, shaft 10, disc 13 and the supporting means 16 on which the shaft 18 carrying the plotting wheel 17 is rotatably mounted.

Upon reaching a point in the course at which a change of direction is necessary, the cord is attached to a fixed marker at such point and the compass re-oriented in the same manner as the instrument was set at the initial starting point.

From time to time it may be necessary to place a new sheet of paper on the cylinder after the cylinder has revolved approximately a complete revolution and the supply of cord 48 must likewise be maintained.

As a result of carrying out the above operations, it will be apparent that the paper 24 will have recorded thereon a line the orientation of any portion of which is directly indicated, the orientation of any leg of the course having been noted, and that the length of the various portions of the course will be such that distances may be scaled directly from the recording.

Other modes of applying the principles of the invention may be employed, changes being made as regards the details described, providing the features stated in any of the following claims, or the equivalent of such be employed.

Having thus described my invention, what I claim as new and wish to secure by Letters Patent is:

1. A map making apparatus adapted to be transported over a route to be mapped, comprising a main housing, a directional plotting means including a compass housing, a compass rotatably mounted within the compass housing, said compass housing being rotatably mounted upon said main housing, the said main housing enclosing a rotary disc bearing supporting means, perpendicular projections protruding from said disc bearing supporting means, a plotting wheel mounted on the said projections, a plotting drum actuated by the plotting wheel, a stationary

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stylus adjacent to the plotting drum in engagement with a marking surface carried thereon, said plotting drum being mounted for rotary and longitudinal movement, a distance plotting means consisting of a supply of flexible cable, a guide and tension mechanism for controlling paying out of the flexible cable, multiple sheaves adapted to receive selectively a turn of wrapping of the flexible cable, driving means interconnecting the sheaves and plotting wheel and driven by paying out movement of the flexible cable for rotating the sheave to impart rotary motion to said plotting wheel and the said plotting drum, and means for laterally shifting the plotting drum relative to the said stationary stylus responsively to rotation of the compass housing.

2. A map making apparatus adapted to be transported over a route to be mapped comprising a main housing, a directional plotting means including a compass housing, said compass housing being rotatably mounted upon said main housing, the said main housing enclosing a rotary disc bearing supporting means, perpendicular projections protruding from said disc bearing supporting means, a plotting wheel mounted on the said projections, a plotting drum actuated by the plotting wheel, a stationary stylus adjacent to the plotting drum in engagement with a marking surface carried thereon, said plotting drum being mounted for rotary and longitudinal movement, a distance plotting means consisting of a supply of flexible cable, a guide and tension mechanism for controlling paying out of the flexible cable, multiple sheave means adapted to receive selectively a turn of wrapping of the flexible cable, driving means interconnecting the sheave means and the plotting wheel and driven by rotation of the sheave means to impart rotary motion to said plotting wheel and the said plotting drum, and means for laterally shifting the plotting drum relative to the said stationary stylus responsively to rotation of the compass housing, the said lateral shifting means for the plotting drum including said rotary disc bearing supporting means and interconnected gears, one of which is actuated by rotation of the compass housing and another of which is operatively connected to the disc bearing supporting means.

JOHN L. DALKE.

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