

No. 691,451.

Patented Jan. 21, 1902.

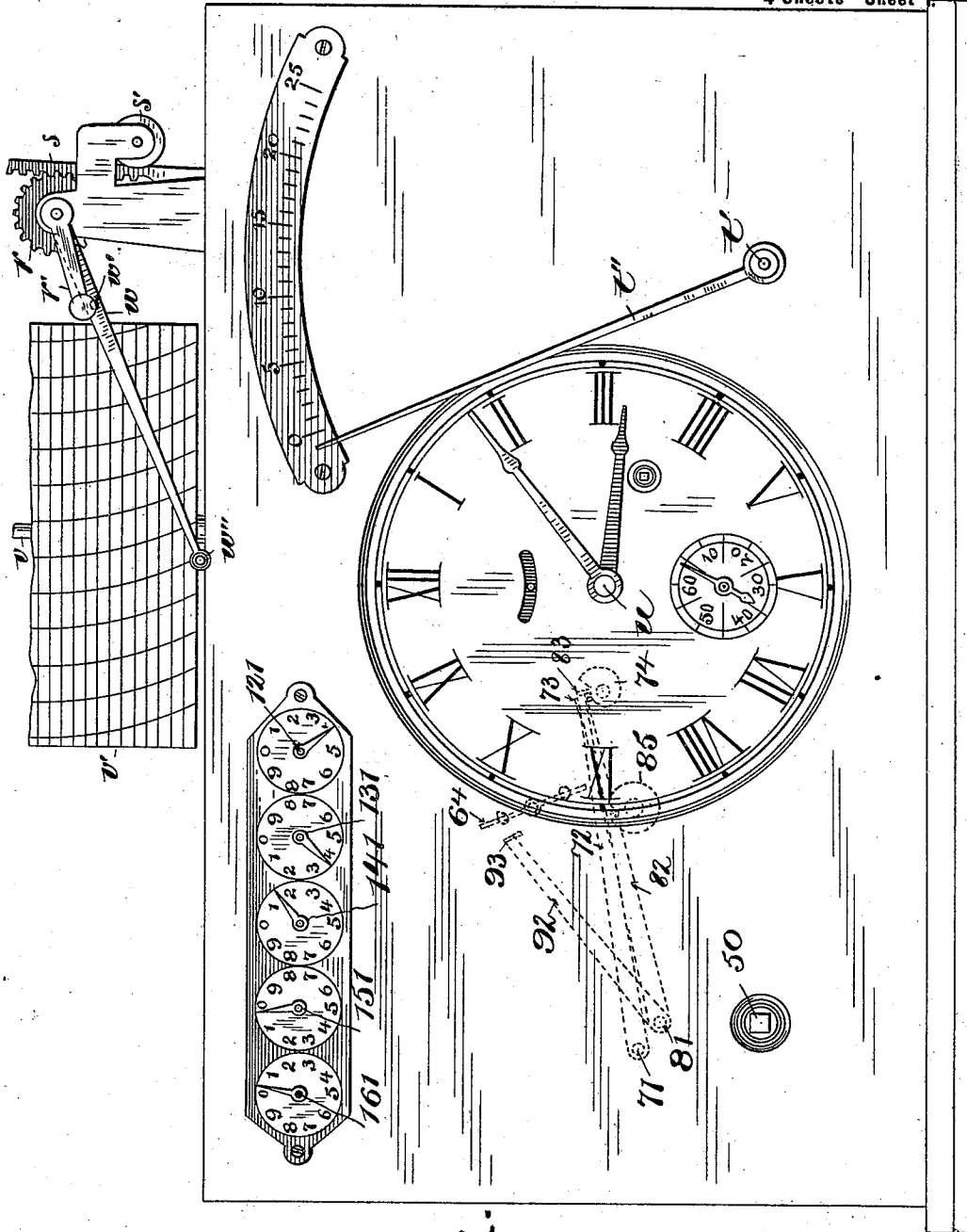
C. E. DELANOY.

APPARATUS FOR INDICATING, RECORDING, AND INTEGRATING THE SPEED
OF VESSELS.

(Application filed June 22, 1901.)

(No Model.)

4 Sheets—Sheet 1



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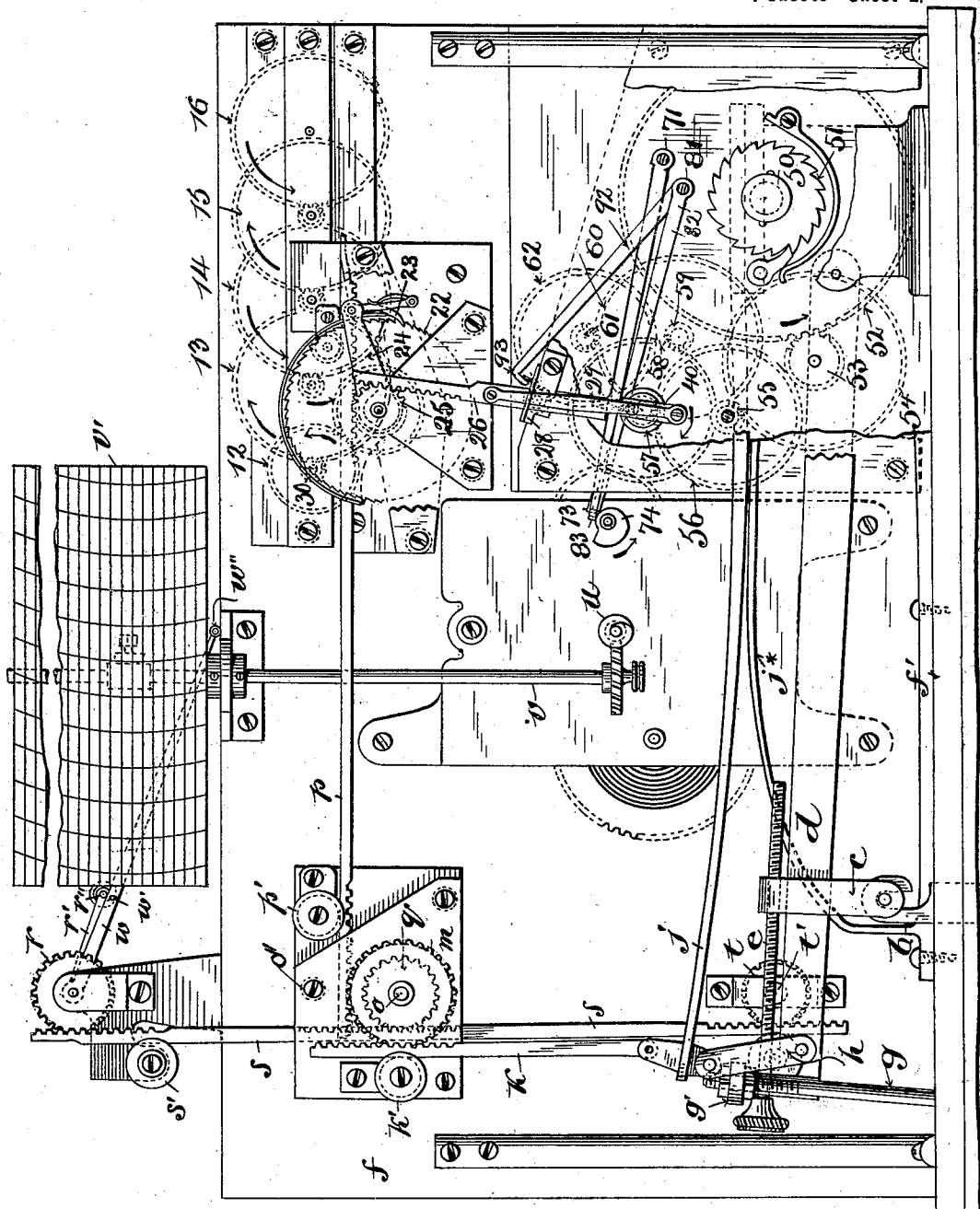
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Witnesses;
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Fig. 2.

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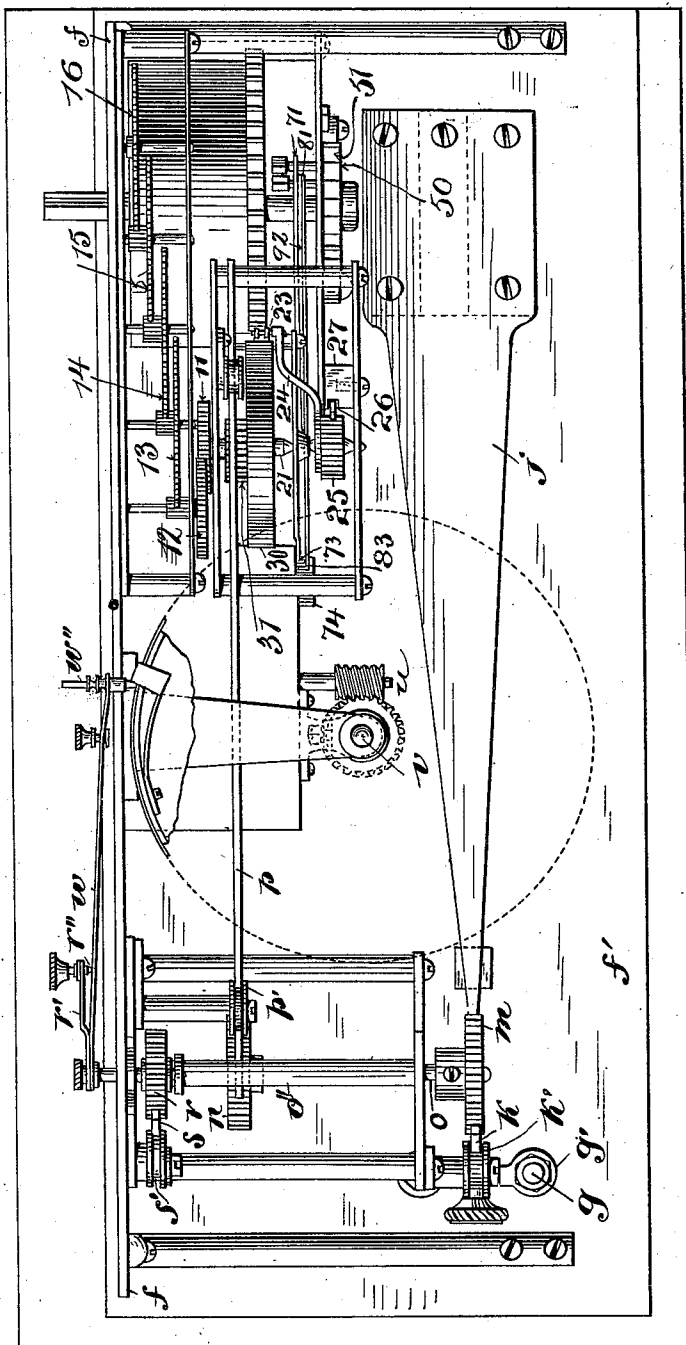


Fig. 3.

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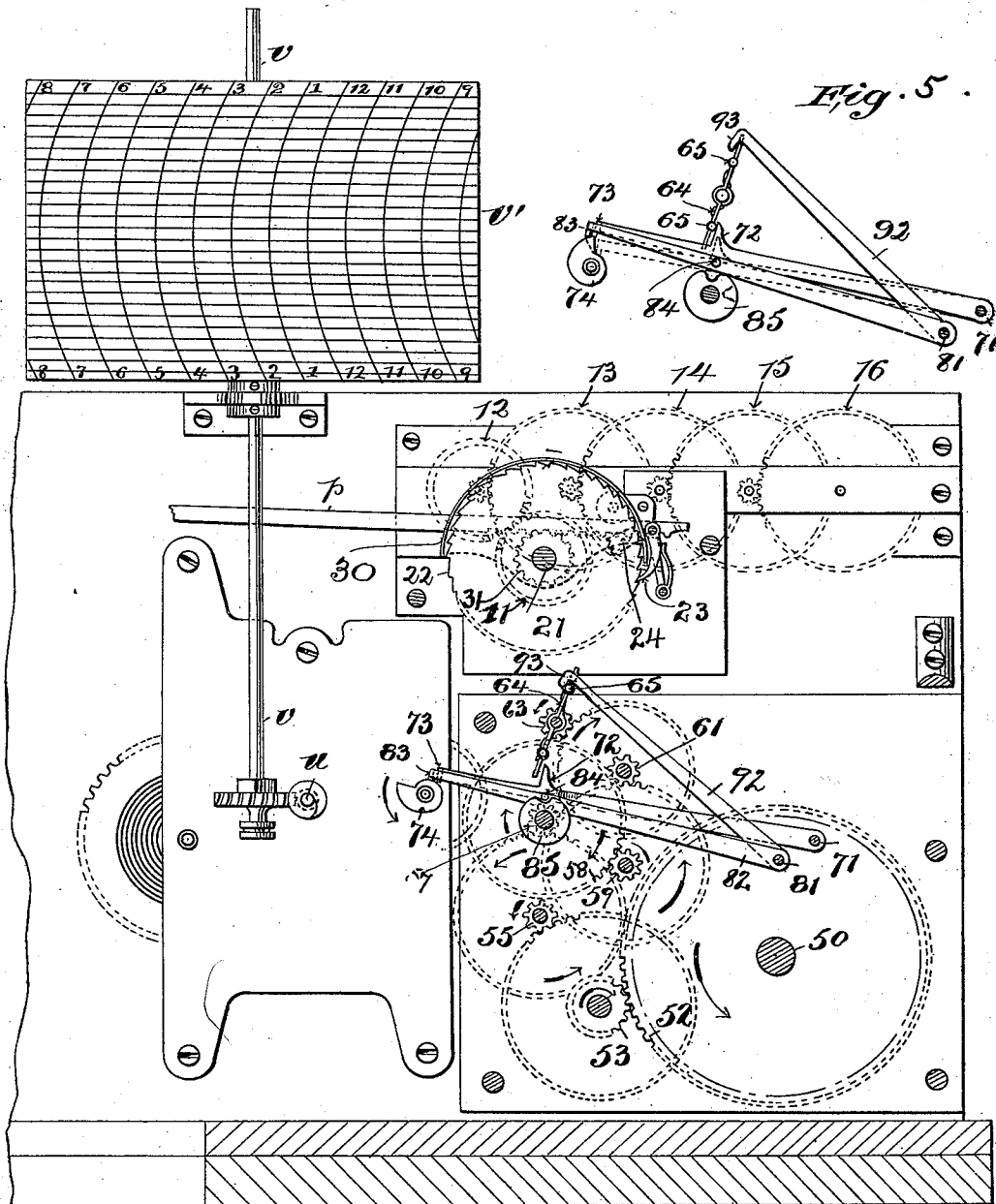


Fig. 4.

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UNITED STATES PATENT OFFICE.

CHARLES E. DELANOY, OF NEW YORK, N. Y., ASSIGNOR TO DELANOY
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APPARATUS FOR INDICATING, RECORDING, AND INTEGRATING THE SPEED OF VESSELS.

SPECIFICATION forming part of Letters Patent No. 691,451, dated January 21, 1902.

Application filed June 22, 1901. Serial No. 65,643. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. DELANOY, of the borough of Manhattan, in the city and State of New York, have invented certain new and useful Improvements in Apparatus for Indicating, Recording, and Integrating the Speed of Vessels, of which the following is a description, which, with the accompanying drawings, forms a part of this specification.

10 This invention relates in part to an apparatus which is connected by means of a cable with a drag or log which trails in the water behind the ship and which directly indicates the rate of speed in knots per hour or kilometers per hour or in any desired unit of speed.

The second part of the invention relates to recording mechanism by which the speed is continuously recorded.

20 The third part of the invention relates to integrating apparatus which indicates the total travel of the vessel by integrating the product of the speed by short intervals of time—as, for example, each minute—and thereby enables the observer to determine the distance traversed by the vessel between any two readings of the instrument. Preferably also the apparatus includes a timepiece or clock.

30 The object of the invention is to devise simple, accurate, and durable apparatus of a design that shall be comparatively economical in cost of manufacture. The indicating, recording, and integrating mechanisms may conveniently be mounted in a single frame or box, and the drag or log proper may be connected with the adjustable parts thereof by a suitable length of line or cable, so that when thrown overboard it may trail at a considerable distance in the rear of the vessel.

40 In the drawings, Figure 1 is a face view of the apparatus, with the exception of the log and its cable. Fig. 2 is an interior rear view of the same with portions of the inclosing casing removed and some of the details omitted and some of the parts broken away to show other parts that are farther away. Fig. 3 is a plan view with the top of the box removed and some of the parts omitted or broken away for the sake of clearness. Fig. 4 is a partial view of some of the details of the recording

and the integrating mechanisms viewed from the rear, as in Fig. 2, and partly in section. Fig. 5 is a detail view of part of the releasing or stopping mechanism of the integrating apparatus as seen in its position at the instant just before release.

Throughout the drawings similar reference characters indicate the same or similar parts of the mechanism.

60 Before describing the details of the apparatus shown in the drawings it will facilitate a comprehension of the invention to have it understood in advance that the log or drag produces a tension in its cord or cable. The inboard end of the line, which may terminate in a hook *b*, is secured to a lever and acts against a spring, so as to operate a series of racks and pinions. The racks and pinions are adjusted thereby to an extent nearly proportional to the square of the speed of the vessel. By these racks, therefore, the indicating-needle is directly adjusted, the scale being calibrated or subdivided, so that the speed may be directly read upon it. Some of these racks and pinions are also utilized to adjust an arm that carries a pencil, and the pencil rests upon a rotary drum which is turned by clockwork, and therefore receives upon the surface of the paper or other material carried by it for the purpose a line or mark made by the said pencil, which thus continuously records the speed of the vessel. The integrating apparatus, which records the distance of travel by the vessel, has a series of indicating-needles, which may be very like those of a revolution-counter for steam-engines, pumps, &c., and at regular intervals of time—for example, once in each minute—the needles are moved forward a distance corresponding to the speed at which the vessel is running. To produce this last effect and cause the needles to be adjusted each time to an extent accurately corresponding to the speed, a pawl and ratchet-wheel or friction-pawl and friction-wheel may be utilized in combination with an adjustable sector, which screens the ratchet-wheel or friction-wheel from the action of the pawl entirely when there is no tension upon the cord or cable of the log or drag and exposes it to the action of the pawl to an extent that accurately cor-

responds to the speed of the vessel when there is a tension exerted upon the cord or cable of the log or drag. The pawl is carried by a movable arm and is actuated by clockwork at uniform intervals—as, for example, once each minute. Consequently once in each minute it adjusts the integrating needles or counters to an extent proportional to the distance that the vessel has traveled during such intervals. It is only necessary, therefore, to properly proportion the scale on which the needles indicate in correspondence with the adjustment of the screening-sector in order to read directly upon the scales beneath the needles the distance that the vessel has traveled. A description more in detail follows.

Any suitable form of log or drag can be used in connection with the integrating and indicating mechanism described. The form which I prefer to use in connection with this apparatus is shown in United States Letters Patent No. 611,100, granted to me November 6, 1900.

The end of the cable is attached by the hook *b* to a sliding stirrup *c*. The stirrup *c* is adjustably secured to the lever *d*. This lever is pivoted, as shown, within the casing of the apparatus and connected at its free end by a link *h* to the free end of the stiff spring *j*. The spring *j* bends against and is supported by a rigid support *j**, which is accurately proportioned to cause the deflection of the spring to vary approximately as the square root of the applied pull—that is to say, the deflection and the movements of the lever are to correspond to the speed of the vessel, and the speed, theoretically, is proportional to the square root of the tension of the log; but the tension is sometimes shown to vary more than the exact square of the speed and as more nearly the two-and-a-half power of the speed. By the expression “approximately as the square root” I mean that the action is regulated so that the movement is proportional to the speed, although the tension is proportional to some power or function of the speed and not proportional to the speed. The curvature of this support *j** is empirically laid out for the particular form of spring employed; but the form shown is approximately correct for the tapering spring illustrated. The stirrup *c* is delicately adjustable upon the lever-arm *d* by a screw *e*, which is free to be turned, but is fixed against endwise movement upon the lever-arm *d*. By this adjustment of the stirrup *c* the leverage exerted upon the lever-arm *d* is increased or decreased at will to adjust it accurately to any variations in the resiliency or stiffness of the spring *j*. The spring *j*, and therefore also the lever *d*, is connected to a rack *k*, provided with a guide-wheel *k'* and meshing with the gear *m* upon the main shaft *o* of the apparatus. The main shaft *o* is provided with a pinion *q*, fixed upon it. (See Fig. 2, as this pinion lies directly beneath the pinion *r* and is hidden by it in

Fig. 3.) The pinion *q* actuates the vertical rack-bar *s*, which is provided with a guide-wheel *s'* near its upper end and a similar guide-wheel near its lower end and which meshes in its lower end with a pinion *t*, fixed to a shaft *t'*, which extends through the casing *f* of the box at the front and carries a speed-indicating needle *t''*, Fig. 1, which moves over a scale, which is calibrated or graduated to show the speed in knots, kilometers, or any desired units per hour. The rack-bar *s* also meshes with and actuates a pinion *r*, which is rigidly connected with and which therefore turns a short arm *r'*. The arm *r'* is provided with a pin *r''*, which fits into a corresponding recess or hole *w'* in the recording-arm *w*. This recording-arm *w* is loosely pivoted concentric with the pinion *r* and arm *r'*, so that when the pin *r''* is in the hole *w'* the arm *w* turns with the pinion *r* and adjusts its pencil-point or marker *w''* to record upon the drum *v'* the speed of the vessel. When, however, the pin *r''* is withdrawn from the hole *w'*, the arm *w* will be out of use. The drum *v'* is mounted to turn with its shaft *v* and is actuated by a worm *u* and worm-wheel, as shown, so as to make a complete revolution once in twenty-four hours or at any other interval desired. The drum *v'* should have paper recording-sheets wrapped upon its surface, as is common in such recording apparatus, and provided with indicating-lines and cross-lines, as will be well understood.

The details of the clockwork mechanism by which the worm *u*, and consequently the drum *v'*, is turned is not an essential of the invention, though preferably the same clockwork will be utilized to turn the hands of a clock, and the worm-shaft *u* may carry the minute-hand of the clock and make one complete revolution per hour, in which case the worm will turn the shaft *v* once for every twenty-four of its turns.

The integrating mechanism for indicating the distance traveled by the vessel will be best explained by analyzing or dividing it into three factors—to wit, first, the mechanism that screens the ratchet-wheel from the action of the pawl to a greater or less degree, corresponding to the speed of the vessel; secondly, the time-controlled mechanism which actuates the pawl at regular intervals; thirdly, the needles for counting units, tens, hundreds, thousands, &c., of knots or kilometers traversed. This ratchet-wheel 22 may be a single wheel with a great many small teeth, or, better still, may be a number of similar ratchet-wheels secured together side by side, with the teeth of each wheel set a little in advance of the teeth of the next wheel, so as in effect to multiply the number of teeth upon which the pawl may act; but, as will be well understood by skilled mechanics, a similar effect may be produced by using a single ratchet-wheel and several spring-pressed pawls of slightly-different

lengths—as, for example, three pawls differing in length by just one-third of the space between adjacent ratchet-teeth, so that the pawls will act successively. Assuming that one or more such pawls 23 are vibrated at regular intervals through an arc corresponding, for example, to a maximum speed of thirty knots per hour, (if that is the maximum for which the instrument is intended,) it consequently follows that the ratchet-wheel 22 will be adjusted to an amount corresponding to thirty knots at each movement of the pawl if the ratchet-wheel is not screened from the action of the pawl, whereas if it is entirely screened it will not be actuated at all, and if it is screened for one-half of the arc through which the pawl vibrates it will be actuated at each movement of the pawl to an amount corresponding to a speed of fifteen knots. This screening effect is produced by an arc-shaped screen or shield 30 of thin metal fitting over the ratchet-wheel 22 and mounted concentrically with it. This sector screen or shield 30 is provided with a pinion 11, rigidly fixed to it, which meshes with and is therefore adjusted by the rock-bar *p*, which in turn is actuated by the pinion *n*, fixed to it and turning on the main shaft *o*. In consequence of this connection the tension or pull in the cable *b'* of the log or drag will adjust the sector screen or shield 30 to expose more or less of the surface of the ratchet-wheel 22 to the action of the pawl 23.

The pawl-arm 24, which carries the spring-pressed pawl 23, is actuated at regular intervals—for example, once in each minute—by the following time-controlled mechanism: The arm 24 is of course mounted coaxially or concentrically with the ratchet-wheel 22 and sector-shield 30 and is provided with a gear-wheel 25, Figs. 2 and 3, fixed to it. This pinion 25 is actuated by a rack 26, which is reciprocated in suitable guides by means of a pitman 29, Fig. 2, and crank-arm 40, which makes one complete revolution each minute. The crank-arm 40 might be turned at a uniform speed once in each minute; but preferably it is at rest most of the time and makes its revolution at the end of each minute. It is actuated by the following clockwork mechanism: Any suitably strong actuating spring-drum—such, for instance, as the form common in musical boxes—may be employed. The winding-shaft 50 of this may have a square end, as seen in Fig. 1, to fit a winding-key. Its ratchet 51 and spring-pressed pawl are shown in Figs. 2 and 3. This spring-drum by means of its gear-wheel 52 drives the pinion 53, which turns with the larger gear 54, and therefore multiplies the speed. Gear 54 drives pinion 55, turning with gear 56, and this last drives the pinion 57, which is mounted upon the same shaft with, and therefore actuates, the crank-arm 40; but this gear 57 also turns with gear 58, which meshes with pinion 59, that turns with gear 60. Gear 60 meshes with pinion 61, which turns with

gear 62, and this last gear meshes with and turns the small pinion 63, carrying the regulating fans or vanes 64. When the fan 64 is released and free to turn, it allows the pinion 57, and consequently the crank-arm 40, to make a complete revolution before the motion of the fan is stopped. The fan is stopped and released by means of three lever-arms pivoted, respectively, at 71 and 81 and controlled by the clock. One of the arbors or shafts of the clock that turns once in each minute has fixed to it a cam 74, as shown in the drawings. The cam 74 controls one lever-arm 82, which is pivoted to 81 and has rigid with it a second lever-arm 92. Lever-arm 92 terminates in a nose or detent 93, which in its lower position interferes with a pin 65 upon the rotary fan or vane and prevents the rotation, as seen in Fig. 4. In its raised position, however, as seen in Fig. 5, it does not interfere. The lever 72, which is pivoted at 71, also has a nose or detent, which in the raised position of the lever interferes with the pins 65 and stops the rotation of the fan, but in the lower position allows the fan to rotate freely. It consequently follows that the fan is free to rotate only when lever-arm 72 is down and lever-arm 92 is up, and this occurs only for an instant in each revolution of the cam 74. For this purpose the lever 72 is provided with a nose or point 73, which rests upon the cam 74, so as to be gradually raised by the spiral surface of the cam during its rotation and suddenly dropped when the abrupt radial surface of the cam passes under it. Similarly the lever-arm 82 has a nose or point 83, that rests on the cam; but this nose or point 83 lies slightly beyond the nose or point 73, so that the rotation of the cam 74 causes the lever-arm 72 to fall and release the fan or vane 64 just before the lever-arms 82 and 92 fall. Consequently, as seen in Fig. 5, when the lever-arm 72 drops from the position shown in full lines to that shown in dotted lines in Fig. 5 the rotation of the fan or vane 64 commences under the action of the spring-drum and the crank 40 begins to make its revolution, starting at the position shown in Fig. 2. In order to insure a complete revolution of the crank 40 before the lever-arm 92 can fall and to accomplish this without necessitating an accurate placing of the nose 83, a pin 84 is provided upon the lever-arm 81 in position to rest upon the circular portion of a notched disk 85, which is mounted rigid with and coaxial with the crank-arm 40 and pinion 57. When the pin 84 rests upon the circular portion of the notched disk 85, it supports a lever 82, and consequently also the lever 92, and prevents its stopping the rotation of the fan or vane 64 until the notch reaches the pin 84 and allows the pin to fall into it, whereupon the fan or vane 64 is instantly stopped. The notch is so placed that when the pin lies in the notch the crank 40 is in the position shown in Fig. 2, lying parallel with the pitman 29, and consequently holding

the rack 26 at its lowermost position. The operation of this portion of the apparatus is therefore as follows: Once in each minute the cam 74 allows the lever-arm 72 to drop.

5 Thereupon the fan or vane 64 is free to turn, and consequently the crank-arm 40 begins to turn and the notch in the notched disk 85 moves away from the pin 84 while the lever 82 is still resting upon the cam 74. Imme-
10 diately afterward the cam 74 allows the lever 82 to fall; but the pin 84 now rests upon the circular portion of the notched disk 85 and prevents the lever 82 from falling until by the complete revolution of the crank 40 and
15 the notched disk 85 the pin 84 and lever 82 can fall and instantly stop the revolution of the fan or vane 64.

It will now be seen that as the operation of the pawl-arm 24 and its spring-pressed pawl
20 is constant in amount and at regular intervals, and as the sector shield or screen 30 exposes the ratchet-wheel 22 to the action of the pawl to an extent corresponding to the speed of the vessel, therefore the ratchet-
25 wheel 22 is turned each minute to an extent corresponding to the distance the vessel has traveled in that minute, and for any hour or any other period of time it will have turned proportionately to the distance traveled by
30 the vessel in that period.

The needles or counters 121 131 141, &c., Fig. 1, are actuated by the ratchet-wheel 22 in the following manner: The needle 121 is mounted upon the same shaft with a gear-
35 wheel 12, which meshes with the gear 11, fixed to the same shaft and turning with the ratchet-wheel 22. Consequently it is only necessary to have the knots, kilometers, or fractional units, as the case may be, marked upon the
40 dial or scale of the needle 121 to cause the needle to indicate directly the distance traveled. Of course, as well understood, the movement of the wheel 122 and the size of the gears 11 and 12 should be so proportioned
45 that one complete revolution of the index-needle 121 will correspond to a simple multiple of the unit chosen. Preferably it may indicate tenths of a knot or tenths of a kilo-
50 meter, one revolution corresponding to one knot or one kilometer. The other needles 131 141, &c., are geared together successively by gears having a ratio of ten to one, as shown in the drawings, Figs. 2, 3, and 4. For example, the gear 13, which turns with the
55 needle 131, should make one revolution to ten revolutions of the gear 12.

Having now particularly described the nature of my said invention, I declare that what I claim is—

1. In an apparatus for ascertaining the speed of vessels by the tension produced by a log, the combination of a lever-arm, a spring against which it acts, a line or cable for applying the tension to said lever-arm, indicating mechanism connected to said lever-arm
65 to indicate the rate of speed, and a means for reducing the movement or displacement of the indicating mechanism to correspond substantially to the square root of the applied tension. 70

2. In an apparatus for ascertaining the speed of vessels by the tension of a log, the combination of a lever-arm, means consisting of a line or cable connected with said lever-arm for applying tension thereto, a marking
75 instrument connected to be adjusted by the said lever, means actuated by time mechanism for receiving the recording-mark made by the said marking instrument, and means reacting against the tension to regulate the
80 movement of the marking instrument to correspond to approximately the square root of the applied tension.

3. In an apparatus for ascertaining the speed of vessels by the tension of a log, a lever-arm acting against a spring, means for
85 applying tension to the said lever-arm, indicating needles or counters for showing the distance traveled by the vessel and provided with actuating connections that are regularly
90 operated by time-controlled mechanism, the said actuating connections being adjusted and controlled by mechanism connected and actuated by the said lever to actuate the said
95 needles or counters at a rate proportional to the rate of speed whereby said needles or counters integrate the product of the speed multiplied by the time and show the distance traveled, substantially as set forth.

4. As an improvement in tension-actuated
100 apparatus for logging vessels and in combination with tension-actuated logging mechanism having a spring against which the tension acts, a means for regulating the move-
105 ments of the mechanism to approximately the square root of the applied tension.

Signed this 21st day of June, 1901, at New York.

CHARLES E. DELANOY.

Witnesses:

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HENRY S. MORTON.