(Model.)

D. CARROLL.

SHIP'S LOG.

No. 303,115. Patented Aug. 5, 1884.

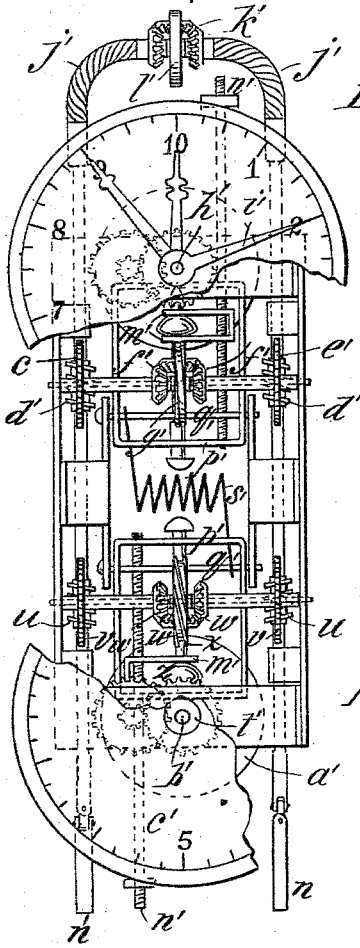


Fig. 1.

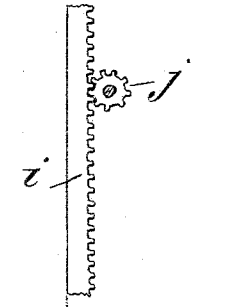


Fig. 3.

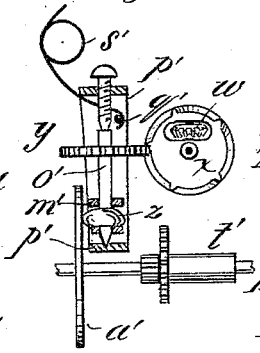


Fig. 4.

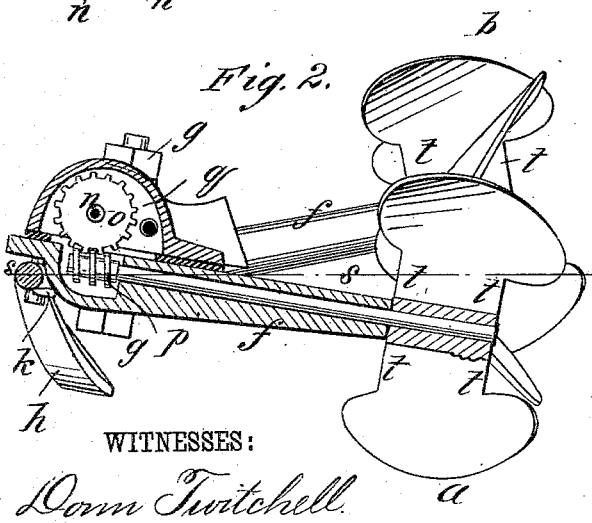
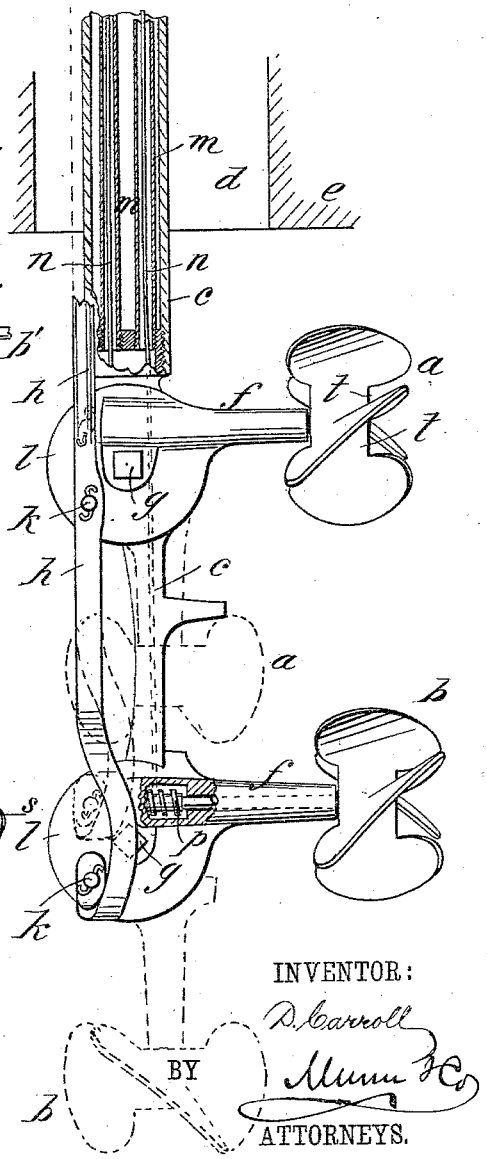


Fig. 2.



WITNESSES:

Donn Twitchell

L. Sedgwick

INVENTOR:

D. Carroll

BY Munn & Co

ATTORNEYS.

UNITED STATES PATENT OFFICE.

DAVID CARROLL, OF UNION CITY, PENNSYLVANIA.

SHIP'S LOG.

SPECIFICATION forming part of Letters Patent No. 303,115, dated August 5, 1884.

Application filed December 21, 1883. (Model.)

To all whom it may concern:

Be it known that I, DAVID CARROLL, of Union City, in the county of Erie and State of Pennsylvania, have invented certain new and useful Improvements in Ships' Logs, of which the following is a full, clear, and exact description.

My invention relates to an improved nautical log for indicating the forward and leeway motions of the ship by means of pointers and dials, the pointers being worked by means of screws or wheels let down into the water through a well in the ship.

The essential features of the invention consist of a contrivance for setting the wheels in the line of the well, for passing them through a well of small size, and afterward swinging them up horizontally and into position in advance of the supporting-rod, to enable the water to act on them in advance of any disturbing effect of the supporting-rod; also, of a contrivance of two wheels placed at an angle to the ship's keel in such a manner that both run alike when the ship advances without drifting, and indicate the advance by the sum of their revolutions, but vary when the ship drifts and indicate the same by the difference of their revolutions; and the invention also consists of certain details of apparatus, all as hereinafter fully described.

Reference is to be had to the accompanying drawings, forming part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a front elevation of the indicator mechanism, with the front of the inclosing-case and part of the dials removed to show the said mechanism clearly. Fig. 2 is a horizontal section of one of the wheels and top view of the other, as when adjusted for use, also a section of the stock by which the wheels are suspended, and of the gear connecting them with the indicator mechanism. Fig. 3 is a side elevation of the wheels, as adjusted below the ship's bottom for use, and a sectional elevation of the suspending-stock; and Fig. 4 is a detail of the leeway-indicator.

In this improvement I arrange two wheels, *a* and *b*, one above another, on a vertical support, *c*, extending down through the well *d* in the ship's bottom *e*, said wheels being mounted on hollow arms *f*, attached to support *c* by pivots *g*, and also attached to a vertical adjusting-rod, *h*, extending up through the well and having a toothed section, *i*, gearing with a pinion, *j*, for shifting the wheel-arms up into the horizontal position represented in full lines, Figs. 2 and 3, and down into the position represented in dotted lines Fig. 3, and also for raising the wheels up into the well when not to be used, and lowering them when they are to be used. The rod *h* is pivoted at *k* to the bearing-disks *l* of the wheel-arms, eccentrically to the pivots *g* of said arms, so that when the pinion *j* is turned with a crank or other means, the first effect is to swing the wheels down into the vertical position indicated by dotted lines, so that said wheels will rise in a well of no larger diameter than that of the wheels, and the next result is the raising of the wheels in the well. When the pinion is turned in the other direction for lowering the wheels the weight of the supporting stock and wheels will carry all down together until a cap on the upper end of the stock, or any other means for stopping the descent of the same, comes to rest on any suitable stop device, then the further operation of the pinion will cause the wheel-arms to swing up into horizontal position for use. Above the upper wheel-arm the stock *c* consists of a tube, up which two small tubes, *m*, extend, for inclosing the wires *n*, which gear with the wheels *a b*, respectively, by the wheels *o* and arms *p*, for transmitting the motion of the wheels to the indicators. These tubes *m* are tapped into the upper end of the lower part of the stock *c*, which is bored therefrom to the chambers *q*, where the wires connect with their respective wheels *o*. The object of the tubes *m* is to conduct oil down to the chambers *q* for lubricating the wheel shafts and gears, the oil being poured into the tubes at the upper end, which tubes are sufficiently extended above the water-level to contain oil-columns of sufficient length to force out the water and lubricate the working parts. When the wheels *a b* shift down to the vertical position for being raised up in the well, the worms *p* disconnect from the gears *o*, and they engage with said wheels again when raised

up. The wheels *a b* are arranged obliquely to the line of the keel *s*, and on opposite sides of the same, the angles being alike for both, so that both will revolve at the same speed when the ship is advancing, without falling off either way; but if the ship falls off either way, one wheel will run slower than the other, the cause of which will be readily understood when it is considered that if one wheel were on the line of the keel and the other at a right angle to it, the latter would not revolve at all when the ship goes straight ahead, and should the ship fall off directly at right angles to the keel, the wheel set in that position would revolve and the other would not. The wheels are also constructed in the form of their arms at *t*, to enable them to run with as little obstructions as possible when receiving the water obliquely. The wheels *a b* thus arranged are geared to the leeway-indicator train, which is the lower indicator of the drawings, by the right and left worms, *u*, worm-wheels *v*, and the compound wheel consisting of the three bevel-wheels *w*, and the worm-disk *x*, said disk gearing with the wheel *y*, which turns the small friction-roller *z* that runs against the friction-disk *a'* on the post *b'* of the unit-hand which traverses the leeway-dial *c'*, so that it will be seen that the respective wheels drive in opposite directions. Consequently when they are both running at the same speed their effect on the pointers of the indicator will be neutralized by the middle bevel-pinion, *w*, of the compound wheel simply turning on its axis in disk *x*, without giving any rotation to the disk *x;* but when said wheels *a b* turn at different speeds, the disk *x* will be turned one way or the other, according as one wheel overruns the other, or to the extent of the difference between the motions of the two wheels *a b;* hence, when the ship falls to leeward the pointers of the leeway-dial will be turned forward or backward as she falls to port or starboard and indicate the same. The wheels *a b* are geared to the upper headway indicator-train, so that both drive on it in the same direction by the worms *d'*, both pitched alike, wheels *e'*, and the compound wheel consisting of the three bevel-pinions *f'* and worm-disk *g'*, said disk gearing with the indicator-train similar to that of the leeway-indicator, and consisting of a wheel, *y*, friction-pinion *z*, and friction-disk *a'*, said disk being on the post *h'* of the unit-hand *i'* of the indicator for the headway movement of the vessel, from which it will be seen that when both wheels *a b* run at like speed the upper indicator will indicate the maximum speed of said wheels; but should one wheel run slower the indicator will fall short of the maximum speed to the extent of the difference of the speeds of the two wheels, which will be the amount of the leeway drift indicated on the lower dial. In this statement of the case it is assumed that the leeway is in direct proportion as the difference of the speed of the two wheels, but practically it is five times the difference, and therefore the disk *x* of the leeway-indicator is constructed with five threads to the turn to speed up the leeway-indicator to that extent faster than the other indicator whose worm-disk *g'* is constructed with but one thread to the turn.

To ascertain the ship's position, we measure on the chart from the starting-point in the line the ship is held on by the compass, the distance indicated by the headway-indicator. From the point thus reached we measure to leeward the distance indicated by the leeway-indicator, and thus arrive at the ship's position. Should the wind change and cause the ship to fall to leeward in the reverse direction, the pointer of the leeway-dial will run back to zero when the ship returns to the headway-line on which she started. The wires *n* extend above the upper indicator, where they connect with each other by the flexible sections *j'*, and the compound wheel consisting of the bevel-pinions *k'* and the disk *l'*, the object of which is to provide a ready means of testing the accuracy with which the wheels are adjusted with reference to their inclination to the keel when the instrument is put in the vessel, which may be done as follows: Put the vessel on a straight line with the wind, so she will not fall off or make leeway, by a steam-tug if a sailing-vessel. Then watch the middle bevel-wheel, *k'*, of the compound wheel, which should stand at rest if wheels *a b* are set rightly; but should said wheel *k'* turn slightly, the support *c* of the wheels *a b* must be turned to right or left to shift said wheels, until said middle wheel, *k'*, ceases to turn on its own axis, when the wheels *a b* will be right. The said support *c* will have any suitable cap-lever or other device at the upper end for so shifting it, and also for holding said support when adjusted. The friction-rollers *z* of the indicator-trains are fitted to their shafts, so as to slide along them toward and from the center of the disks *a'*, for adjusting the speed of the clock-trains, and they are arranged between the prongs *m'* of a yoke fitted on an adjusting-screw, *n'*, for shifting them. The shafts *o'* of said rollers are mounted in frames *p'*, suspended on rods *q'*, and fitted with a spring, *s'*, that presses the rollers against the disks to produce the requsite friction for driving the indicator-trains. The leeway indicator-train comprises only the means for working two posts, *b'* and *t'*, for two hands to count one hundred, above which the record must be kept by tally; but the train for the upper indicator turns three hands for counting up to one thousand. It is to be understood that the wheels *a b* and their support *c* are so arranged that the wheels swing up to their working position in the forward direction, so as to get the best effects of the water in advance of the disturbing influence of the support *c*, the wheel-supporting arms, and the adjusting-rod *h*. The arrangement of the two wheels so that both shall be constantly in motion is better than an arrangement in which the leeway-wheel is so placed that it does not

revolve when the ship advances without leeway, because in that case the wheel is not so sensitive and will not run with the leeway movement until the movement is of considerable extent, while in this arrangement the wheels are sensitive to the slightest change and indicate the same promptly.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a nautical log, two wheels, *a b*, arranged obliquely to and on opposite sides of the keel and geared reversely to the leeway-indicator and directly to the headway-indicator by combination or differential wheels, substantially as described.

2. In a nautical log, the combination of two continuously-revolving wheels arranged to run alike by the headway of the vessel and to vary in speed by the leeway of said vessel, a headway-indicator geared with said wheels differentially and indicating the sum of the speeds of the wheels if they run alike or vary in speed, and a leeway-indicator also geared differentially with said wheels, and indicating the difference of the speeds of said wheels, substantially as described.

3. The combination, in a nautical log, of two wheels, *a b*, arranged obliquely to and on opposite sides of the keel, and geared, by wires *n*, right and left worms *u*, wheels *v*, and compound wheel *w x*, with the leeway-indicator train, substantially as described.

4. The combination, in a nautical log, of two wheels, *a b*, arranged obliquely to and on opposite sides of the keel, and geared, by wires *n*, worms *d'*, of like pitch, wheels *e'*, and compound wheel *f' g'*, with the headway-indicator's train, substantially as described.

5. The combination, in a nautical log, of two wheels, *a b*, arranged obliquely to and on opposite sides of the keel, and geared by wires *n*, right and left worms, *u*, wheels *v*, and compound wheels *w x*, with the leeway-indicator also geared by said wires *n*, worms *d'*, of the like pitch, wheels *e'*, and compound wheels *f' g'*, with the headway-indicator train, substantially as described.

6. In a nautical log consisting of two wheels, *a b*, arranged obliquely to and on opposite sides of the keel, a headway-indicator and a leeway-indicator geared together by the wires *n*, and differential mechanism, as described, the said wires *n* coupled above the indicators by the flexible sections *j'*, and compound wheel *k' l'*, for an indicator to adjust the wheels *a b*, substantially as described.

7. A nautical log having wheels *a b*, arranged on a supporting-stock, *c*, fitted in a well, *d*, through the bottom of the ship, said wheels connected, by arm *f* and pivots *g*, with the stock, and provided with means for shifting them into the line of the stock for drawing them into the well, and also for shifting them into and maintaining them in the working position, substantially as described.

8. A nautical log having wheels *a b*, mounted on a stock, *c*, projecting from the ship into the water, said wheels arranged on said stock to project forward in advance of the same to receive the water in advance of and undisturbed by the influence of said stock on the water, substantially as described.

9. The combination of the shifting-rod *h*, with the wheel-supporting arms *f*, pivoted to the stock *c*, substantially as described.

10. The shifting-rod *h*, connected with the wheel-supporting arm *f*, pivoted to the stock *c*, extended up through the well, and geared by a toothed rack, *i*, with a pinion, *j*, for adjusting the wheels thereby, substantially as described.

11. The tubes *m*, in combination with the wires *n*, stock *c*, and the wheel-gears *o p*, for lubricating the same, substantially as described.

DAVID CARROLL.

Witnesses:
ELMER E. GREGORY,
CHAS. S. BROOKS.