(No Model.) 2 Sheets—Sheet 1.

O. KUSTEL.

SHIP'S LOG.

No. 382,816. Patented May 15, 1888.

Fig. 1

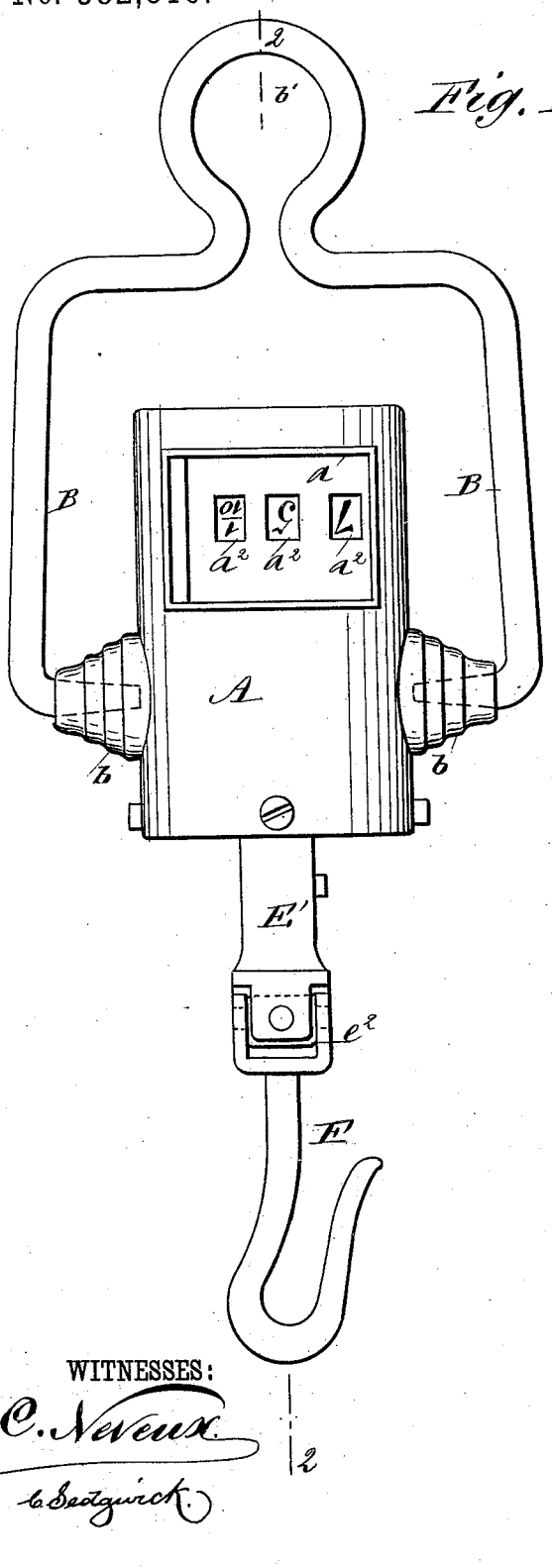
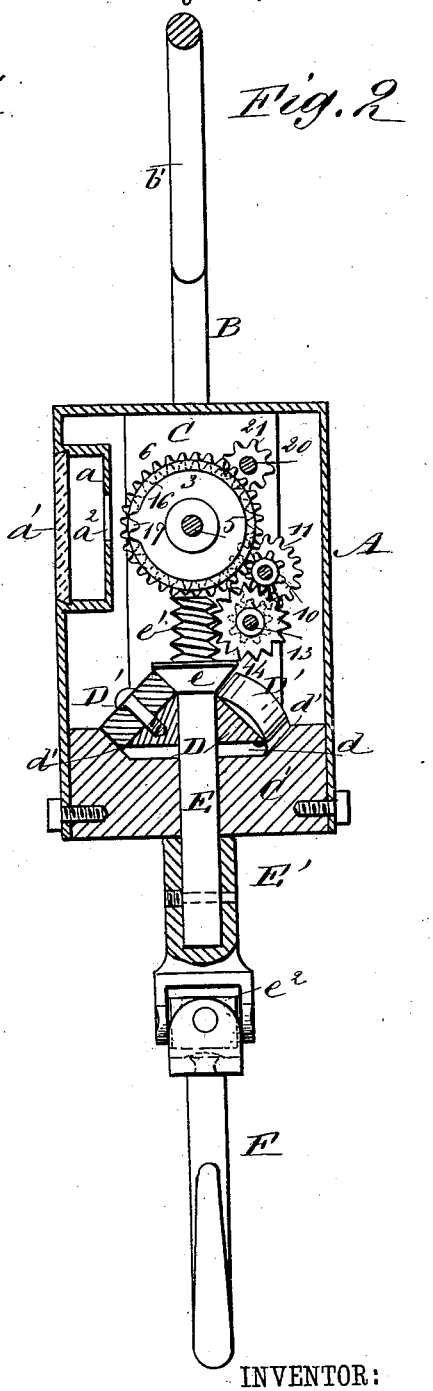


Fig. 2



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ATTORNEYS.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 5

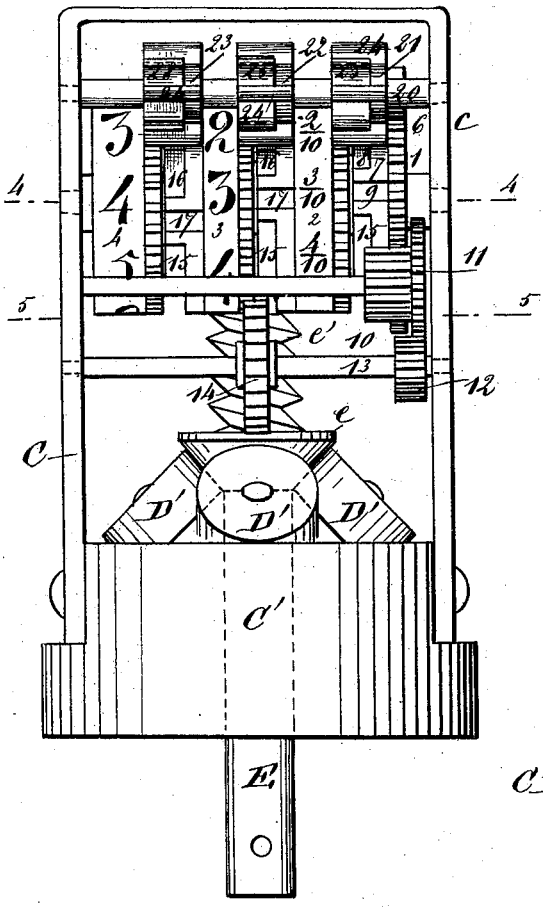


Fig. 4

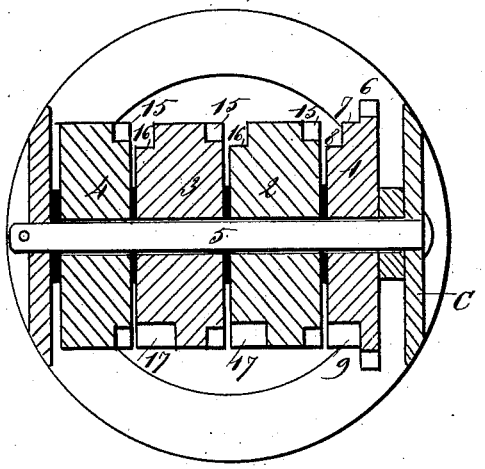


Fig. 5

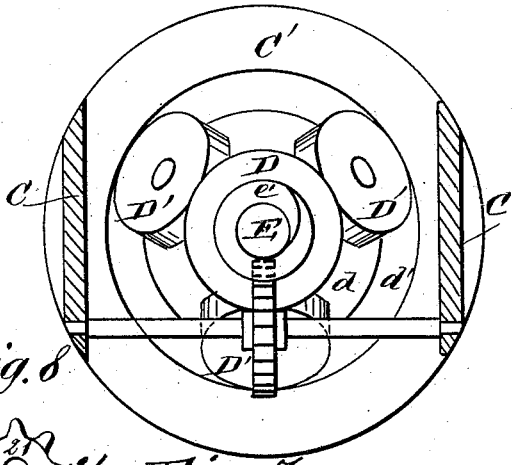
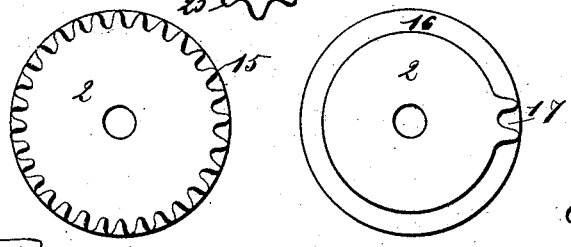


Fig. 6.

Fig. 7.



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UNITED STATES PATENT OFFICE.

OSCAR KUSTEL, OF SAN FRANCISCO, CALIFORNIA.

SHIP'S LOG.

SPECIFICATION forming part of Letters Patent No. 382,816, dated May 15, 1888.

Application filed August 15, 1887. Serial No. 246,975. (No model.)

To all whom it may concern:

Be it known that I, OSCAR KUSTEL, of San Francisco, in the county of San Francisco and State of California, have invented a new and Improved Ship's Log, of which the following is a full, clear, and exact description.

My invention relates to an improvement in ships' logs, and has for its object to provide a log wherein the distance sailed or steamed by a vessel in a given time will be recorded in knots, which record will be open to inspection at all times, and wherein the mechanism for registering the distance will be simple, accurate, and durable in construction.

The invention consists in the construction and combination of the several parts, as will be hereinafter fully set forth and pointed out in the claims.

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

Figure 1 is a side elevation of the log, and Fig. 2 is a vertical central section on line 2 2 of Fig. 1. Fig. 3 is a plan view with the casing removed. Fig. 4 is a horizontal section on line 4 4 of Fig. 3, and Fig. 5 is a similar section on line 5 5 of Fig. 3. Fig. 6 is a side view of one face of a recording-disk. Fig. 7 is a similar view of the opposite face of the same disk, and Fig. 8 is a side elevation of a pinion adapted to engage the disks.

In carrying out the invention, A represents a cylindrical casing closed at the upper end, near which end a rabbet is produced in one side covered by a glass pane, a', and provided with a series of rectangular recesses, a^2. The opposite end of the casing is open, and near said open end, at each side of the casing, aligning tubular projections b are formed, in which the ends of a bail, B, are received, the said bail being provided with a central eye, b', above the closed end of the casing, as shown in Fig. 1.

Within the casing a substantially U-shaped frame, C, is entered, having its members united by a centrally-apertured disk, C′, and upon the inner face of the disk, surrounding the aperture therein, a circular recess, d, is formed having an outwardly and upwardly inclined side wall, d'. An apertured conical wheel, D, is made to revolve upon the face wall of the recess d, provided at intervals upon its inclined sides with three or more friction-rollers, D′, adapted to travel upon the inclined side wall, d', which wall constitutes a track for the aforesaid rollers.

Through the aperture in the conical carrying-wheel D, and also through the aperture in the disk C′, a shaft, E, is projected, provided above the conical wheel with an annular projection, e, having a beveled under surface adapted to engage the friction-rollers D′, and above the said projection with a worm, e'.

The friction-rollers D′ are of even diameter throughout and their axes are parallel with the inclined faces of the side wall, d', and disk or projection e, so that when strain is exerted on shaft E the disk or projection e will bear on the friction-wheels and force them against the inclined wall d' in a straight line or at right angles to their axes. By this construction there will be no strain on the pivots or axes of the rollers D′ and there will be no friction or wear on the heads of said pivots, as the rollers will not be forced outward. If the axes were at right angles to the shaft E and were provided with beveled friction-rollers, the strain of the beveled faces of projection or disk e and surface d' on said rollers would tend to press them outward, causing sliding friction and force them off of their pivots or axes. Then, again, in another well-known construction, where the projection or disk e and the surface d' are both flat and the friction-rollers are of even diameter throughout and have their axes at right angles to the shaft E, sliding friction must exist between said rollers and said surfaces. These difficulties are all avoided by my improvements, as there is but a very slight amount of sliding friction, and hence there is little, if any, tendency of the rollers to fly or be forced outward against the heads of their axes.

The shaft E extends below the disk C′ to a connection with a sleeve, E′, having a bifurcated lower end, and between the members of the bifurcated end a block, e^2, is pivoted, the shank of a hook, F, being pivoted to the ends of said block, as shown in Figs. 1 and 2, whereby a substantially universal joint is established between the hook and sleeve.

It will be observed that the shaft and conical wheel turn independently of one another,

and also that the shaft may revolve freely in the disk C'.

Having described the actuating mechanism of the log, I will now give the construction of the recording mechanism acting in combination therewith.

Within the U-shaped frame C a series of four or more wheels, 1, 2, 3, and 4, are held to turn independently upon a transverse shaft held in said frame, the position of the wheels being such as that when the frame is placed in the casing the wheels 2, 3, and 4 will register, respectively, with one recess, a^2, in the glass-covered rabbet a, as shown in Figs. 1 and 2. The wheel 1 is provided with a stepped periphery, the highest step being the outer one, which consists in a series of teeth, 6, the lower and inner steps, 7 and 8, being plain surfaces which extend entirely around the wheel. At a given point, however, in the second step, 7, a recess, 9, is formed of a depth corresponding with the face of the third step, upon which step at this point two teeth are produced—one at each side of the recess 9—whereby said recess is continued out to the inner face of the wheel, as shown in Fig. 4.

The wheel 1, which is the initial wheel of the recording-set, is actuated by a pinion, 10, fast upon a shaft extending transversely the frame parallel with the recording-wheels, the said shaft being revolved through the medium of a toothed wheel, 11, keyed thereon at one end, meshing with a pinion, 12, upon a similar parallel transverse shaft, 13, which shaft is rotated directly from the longitudinal shaft E by the engagement of a worm-wheel, 14, upon the shaft 13 with the worm e' upon the shaft E.

The recording-wheels 2 and 3 are similar in construction, the sides facing in the direction of the initial wheel, 1, being recessed to form a series of teeth, 15, flush with the periphery thereof, as shown in Fig. 6, and the reverse side of said wheels being provided with a single step, 16, having a plain face except at one point, where two teeth are provided to form a recess, 17, as shown in Fig. 7, which recess, as well as the recess 9 in the initial wheel, 1, is of a width corresponding to the space intervening the cogs or teeth upon the opposite sides.

The recording-wheel 4 is provided with an inner face similar to that of the wheels 2 and 3 and as shown in Fig. 4, the outer face thereof being plain.

The wheel 2 is divided and worked in fractions upon its periphery from $\frac{1}{10}$ to 0, the wheel 3 in units from 0 to 9, and the wheel 4 in tens from 0 to 9. Thus the greatest number of knots capable of being recorded with the number of wheels shown in the drawings is ninety-nine and nine-tenths, but the number of wheels may be added to, as desired.

To the rear of the recording-wheels and parallel therewith a shaft, 20, is journaled in the frame, carrying three pinions, 21, 22, and 23, provided with alternate wide and narrow teeth 24 and 25, the wide teeth 24 extending from side to side and the narrow teeth from one side to about the center, as shown in Figs. 3 and 8, the object of the pinions being to turn the various registering-wheels at the proper moment.

In operation the log is made fast with a line at b' to the taffrail of a vessel or extended from the side of the ship by a pole. From the hook F a line is extended into the water, having at the end any form of rotator, which rotating device will turn fast or slow, according to the speed of the vessel, and communicate the motion to the log by means of the line. The hook being revolved, the shaft E is turned, and likewise the initial wheel, 1, through the intermediate train of gearing aforesaid. When the initial wheel has made one revolution, the recess 9 will be beneath the pinion 21. The wide tooth 24 of said pinion will thereupon enter said recess and the registering-space between the teeth of the first registering-wheel, 1, turning said wheel one cog, when the short tooth will engage the cogs 15 and turn the wheel 2 another cog, whereupon the long tooth of the pinion slides on the plain surface of the step 7 until it again falls into the recess 9. Each action of pinion 21 upon wheel 2 turns the same to indicate a tenth of a knot. When a complete knot has been traveled, the pinion 22 will act upon the wheels 2 and 3 in like manner to the action of pinion 21 upon wheels 1 and 2 and turn wheel 3 to indicate a knot.

In the evolution of the log from the various forms of submerged log to the taffrail-log of the present day there has been but little departure from the old ideas, which has prevented them from being as efficient and as durable as is required. The best logs now in use have the friction-wheels running on a level track, and as the outer edge of the wheel has to travel over a longer track than the inner edge it soon wears a groove in the track and the log is worthless.

The shaft E has a beveled flange which also serves to reduce the friction, the friction-wheels D' coming in contact therewith exerting but little resistance to the revolution of the said shaft on account of their inclination toward it, which brings the bearing near the shaft.

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

1. In a ship's log, the combination, with the apertured head having a beveled face or track on its inner face, of the main shaft extending through the said aperture and having a disk or projection having its under face beveled parallel with the beveled face or track on the said head, and friction-rollers of even diameter between said beveled surfaces and having their axes parallel therewith, substantially as set forth.

2. In a ship's log, the combination, with the apertured head having a beveled surface or track on the inner face concentric with the aperture, of the shaft extending through said ap-

erture and having a disk or projection beveled parallel with the said beveled surface on the head, a loose wheel or disk upon the shaft, and rollers journaled thereon and of even diameter, the axes of the rollers being parallel with the two beveled surfaces, substantially as set forth.

3. In a ship's log, the combination, with the head C', having a central aperture and a recess having beveled side walls, *d'*, concentric with the aperture, of the shaft E, extending through the aperture and provided with the projection or disk *e*, having its lower surface beveled parallel with the surface *d'*, the loose beveled wheel D on the shaft within the recess, and the rollers D', of even diameter, journaled on the beveled face of the wheel between the two beveled surfaces between the shaft and the head, the axes of the wheels being parallel with the said beveled surfaces on the shaft and head, substantially as set forth.

OSCAR KUSTEL.

Witnesses:
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H. H. DOUGHERTY.