No. 699,272. Patented May 6, 1902.

B. T. WILLISTON.

REVOLUTION INDICATOR.

(Application filed Dec. 26, 1901.)

(No Model.) 2 Sheets—Sheet 1.

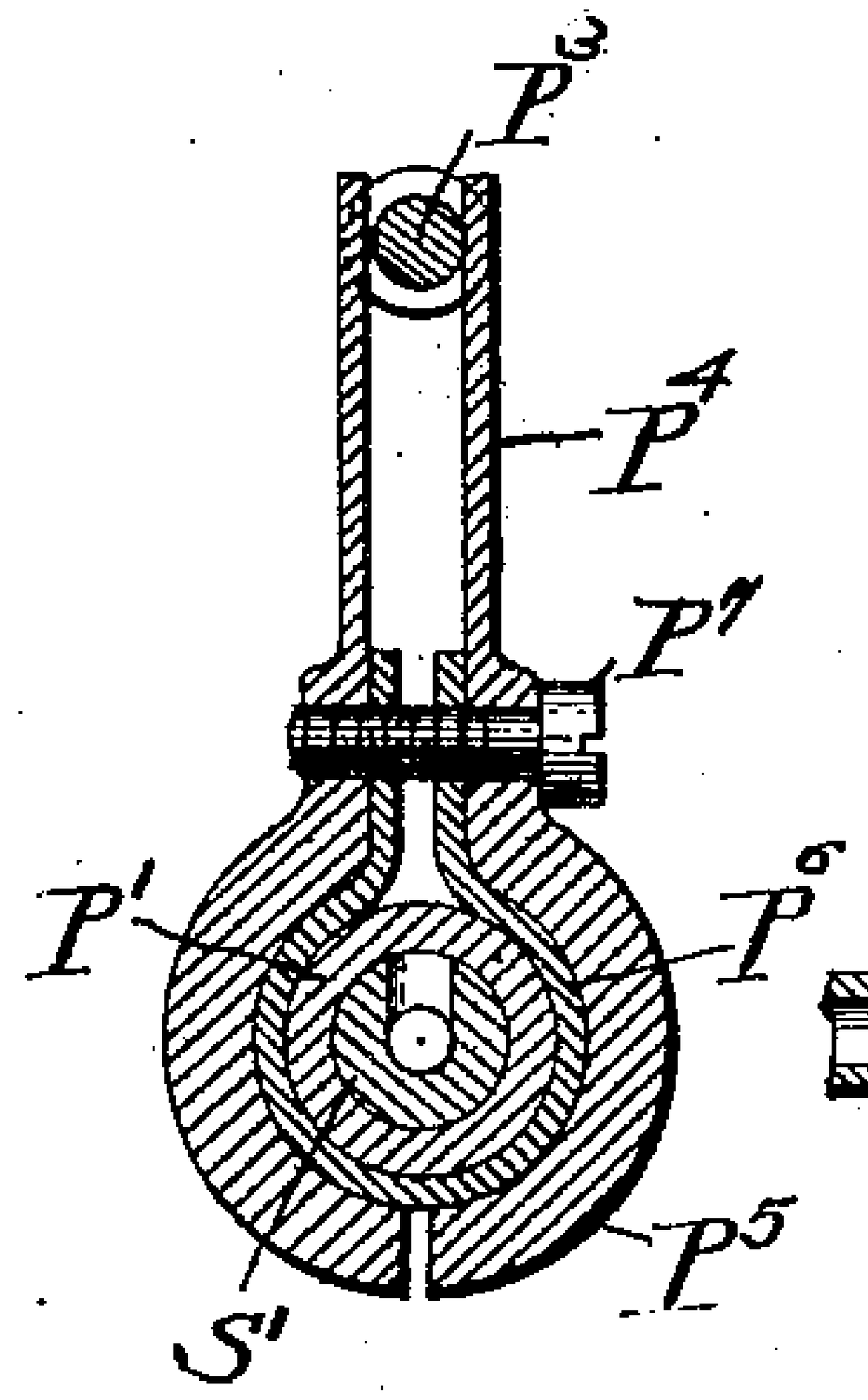

Fig. 2.

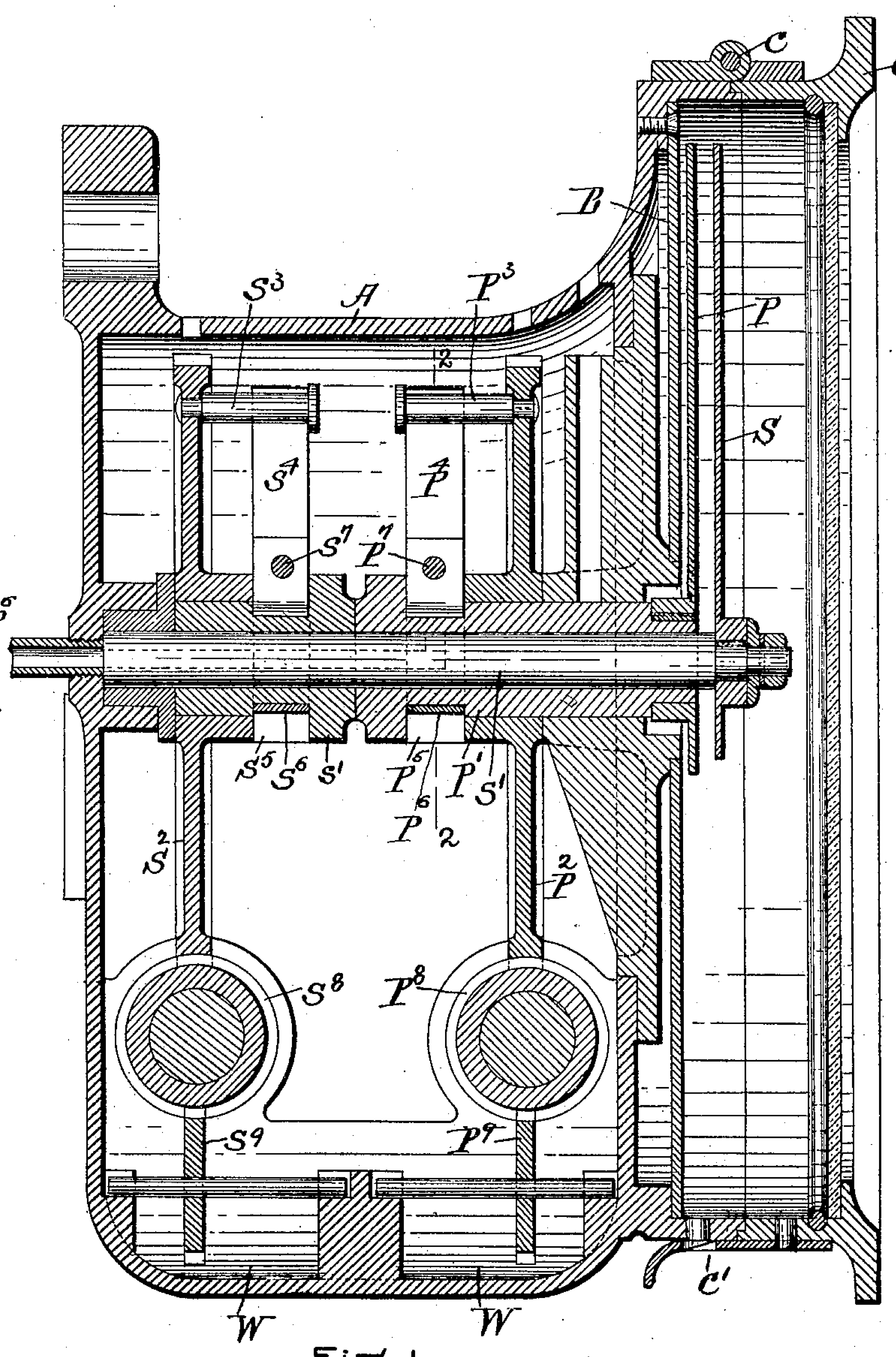

Fig. 1.

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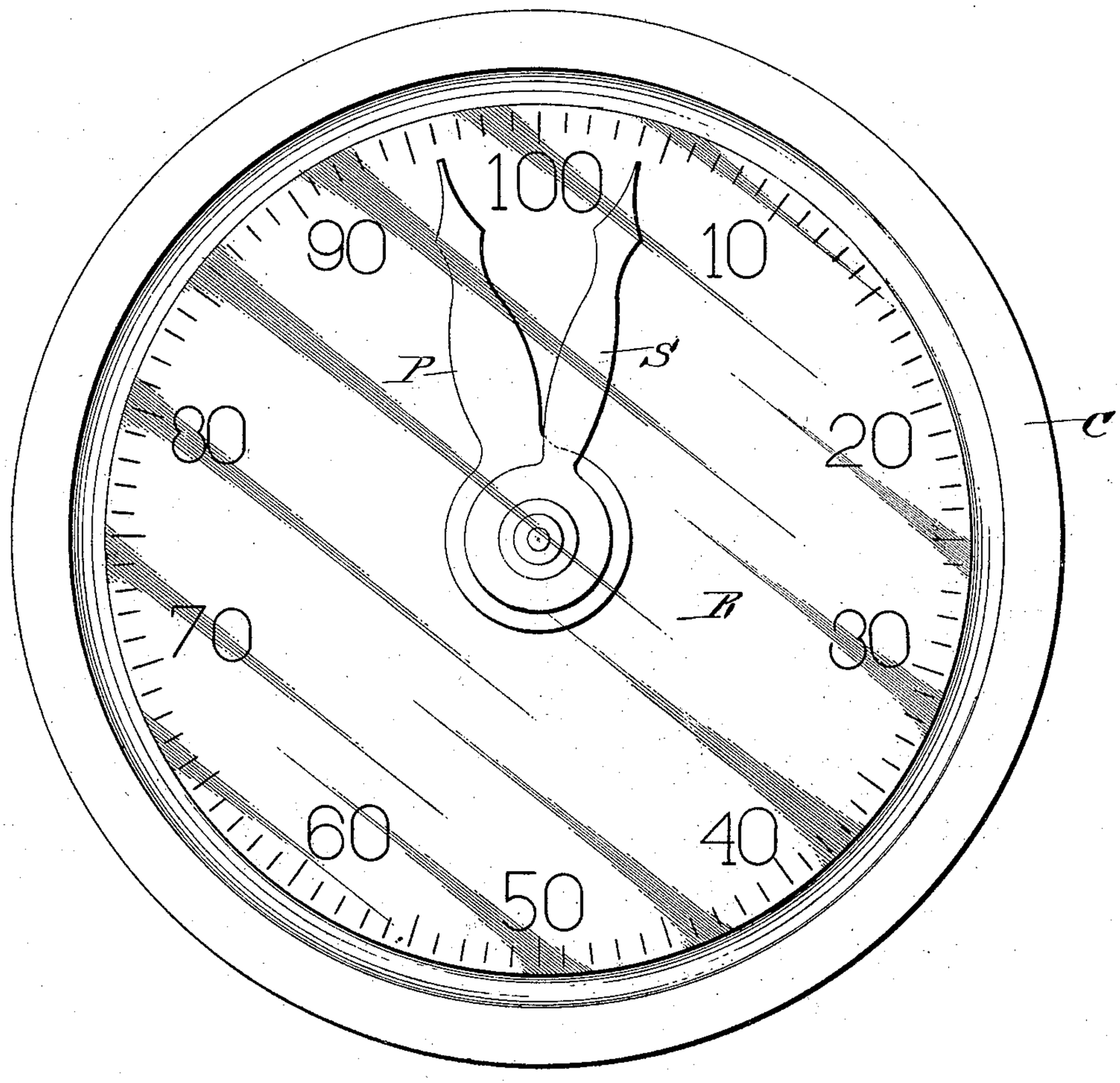

Fig. 3.

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UNITED STATES PATENT OFFICE.

BELVIN T. WILLISTON, OF SOMERVILLE, MASSACHUSETTS, ASSIGNOR TO HANCOCK INSPIRATOR COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

REVOLUTION-INDICATOR.

SPECIFICATION forming part of Letters Patent No. 699,272, dated May 6, 1902.

Application filed December 26, 1901. Serial No. 87,213. (No model.)

To all whom it may concern:

Be it known that I, BELVIN T. WILLISTON, a citizen of the United States, and a resident of Somerville, in the county of Middlesex and State of Massachusetts, have invented new and useful Improvements in Revolution-Indicators, of which the following is a specification.

My invention consists in sundry improvements in the construction of revolution-indicators such as are used on steam vessels to indicate the speed at which the engines are turning, and are especially adapted to twin or multiple screw vessels.

In the drawings hereto annexed, which illustrate my invention, Figure 1 is a vertical central section of an indicator, taken at right angles to its face. Fig. 2 is a sectional detail taken along the line 2 2 of Fig. 1, and Fig. 3 is an elevation of the dial.

In steam vessels having more than one propeller-shaft it is of importance to maintain equal conditions in the engines of the respective shafts, so that a proper balance may be conserved between the propelling forces on the two sides of the vessel. In steamships-of-war especially the engineers in charge observe the comparative performance of port and starboard engines with constant scrutiny and require the assistance of speed-indicators in so doing.

Revolution-indicators for single shafts have long been used, and while just comparisons of the speed of two engines may be made with two such indicators separately mounted and driven each from its own engine-shaft such comparison is more or less troublesome, according to the distance of one indicator from another or the pressure of duties upon the observers. With two such indicators accurate comparison can be made by no less than two persons, who count the revolutions of each engine separately and compare notes afterward. With the revolution-indicators herein shown and presently to be described the comparative speed of two engines may be quickly and readily observed at any moment by a single person.

A, Fig. 1, is the casing of the revolution-indicator, composed of brass or other suitable material and finished with proper apertures and bearings for the working parts. The casing A has a glass-faced cover C, hinged at *c* and latched at *c'*, which covers the dial B and pointers S and P. The pointers S and P are firmly secured to the ends of the shafts S' and P', whereof the shaft S' serves as a bearing for the tubular shaft P'. The shafts S' and P' are driven, respectively, by worm-wheels S^2 and P^2, which mesh with worms S^8 and P^8. The worm-wheel P^2 is loosely fitted over the tubular shaft P', and the worm-wheel S^2 is similarly placed upon the sleeve *s'*, which is keyed or otherwise firmly secured to the shaft S'. The shaft P' and sleeve *s'* are grooved circumferentially to receive the claws P^5 and S^5 of the friction-drivers P^4 and S^4. By making the shaft P' and sleeve *s'* of the same diameter and shape the several parts that are mounted thereon are respectively interchangeable. The worm-wheels are of equal size and pitch. The driver for the worm-wheel P^2 is shown in section in Fig. 2, and as the two drivers are exactly alike one description will suffice for both. Claws P^5 fit over the friction-strap P^6, which is wrapped around the shaft P' in the circumferential groove. A screw P^7, which passes through the claws P^5 and strap P^6, binds the two claws P^5 tightly on the friction-strap P^6. The arms P^4, which are resilient, bear against the pin P^3, which is secured to the worm-wheel P^2 near its circumference. By means of the screw P^7 the degree of closeness of contact between the claws P^5, strap P^6, and shaft P' may be determined, while the resiliency of the arms P^4 takes up any slight wear of the strap P^6 and obviates the necessity of readjustment. The strap P^6 is preferably to be of some tough flexible substance, as leather or leather-board, which is sufficiently compressible to form a good frictional connection between the driving and driven parts of the mechanism. While in its normal condition this mechanism is positive in all its connections for all practical purposes; but if it be desired to arrest one or both of the pointers S and P this may be done without injury or strain to any of the parts. The worms S^8 and P^8 and the wheels S^2 and P^2 may con-

tinue to turn, carrying the clutches P^4 and S^4, which turn upon the arrested shafts. At all times the frictional connection at P^5 P^6 and S^5 S^6 is sufficiently strong to drive the pointers P and S positively, but is not so strong but that a person may stop one or both of the pointers while the driving mechanism continues its movement without injury to the train of parts.

For the lubrication of the worms and worm-wheels I provide an oil-well W and oiler-wheels S^9 and P^9, which mesh with the worms S^8 and P^8 and dip into the well W. Thus when the mechanism is in motion the oiler-wheels carry enough oil into the worms to lubricate them.

In case more than two engines are to be speed-indicated the independently-driven indicator-pointers and their driving mechanisms may be correspondingly increased in number.

The operation of the above-described engine-revolution indicators is as follows: Left to itself the train of gears driven by the independent worm-shafts causes the several pointers to travel on the dial at speeds which differ precisely as the engine speeds differ. It is desired, for instance, to see what differential of speed exists between the starboard and port engines. The observer lifts the cover C, grasps both the pointers S and P, brings them immediately over each other—say at the zero-mark—and lets go of both together. The friction-drivers take hold instantly and the pointers travel forward. If the vessel is steaming straight ahead and the engines are working together perfectly, the pointers will travel around the dial as one; but if one engine is faster than the other—say by one revolution in a hundred—the differential will show when the pointers have traversed one hundred revolution-divisions on the dial. At any time the observer may seize simultaneously both pointers and stop them, so as to read the differential more at leisure, though this will hardly be necessary. Speed differentials during turns of the vessel, with helm to starboard or port, may be quickly and accurately read from my improved differential-revolution indicator. If the worm-wheels and dial have each one hundred divisions, the differentials are mechanically given to the observer in decimal percentages. I believe it to be preferable to have both the pointers frictionally driven from their respective gears. The observation of differential speeds may, however, be made readily when one only of a pair of pointers is frictionally driven. With such an indicator the observer who wishes to determine the differential of speed between the two independently-driven engines merely stops the frictionally-driven pointer until the positively-driven pointer comes around to it, when both pointers may be allowed to start together.

What I claim, and desire to secure by Letters Patent, is—

1. In a revolution-counter, the combination of a dial, a plurality of independently-driven pointers, one at least of the pointers being driven by a train of mechanism which includes a gear-wheel, a pointer-shaft, friction-claws clamped upon the said shaft on a friction-strap and provided with radially-extending resilient arms, and a pin secured to the gear-wheel engaged by said arms.

2. In a revolution-counter, the combination of a dial, a plurality of independently-driven pointers, one at least of the pointers being driven by a train of mechanism which includes a gear-wheel, a pointer-shaft, friction-claws clamped upon the said shaft and provided with radially-extending resilient arms, and a pin secured to the gear-wheel engaged by said arms.

3. In a revolution-counter, the combination of a dial, a pair of pointers, one secured to an inner shaft, the other to a sleeve-shaft journaled on the inner shaft, a sleeve, fixed to the inner shaft and having circumferential dimensions equal to those of the sleeve-shaft, interchangeable worm-wheels, and interchangeable friction-drivers mounted respectively on the sleeve-shaft and fixed sleeve, and driving-gears for the said worm-wheels, substantially as described.

Signed by me at Boston, Massachusetts, this 21st day of December, 1901.

BELVIN T. WILLISTON.

Witnesses:
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FRANK S. HARTNETT.