

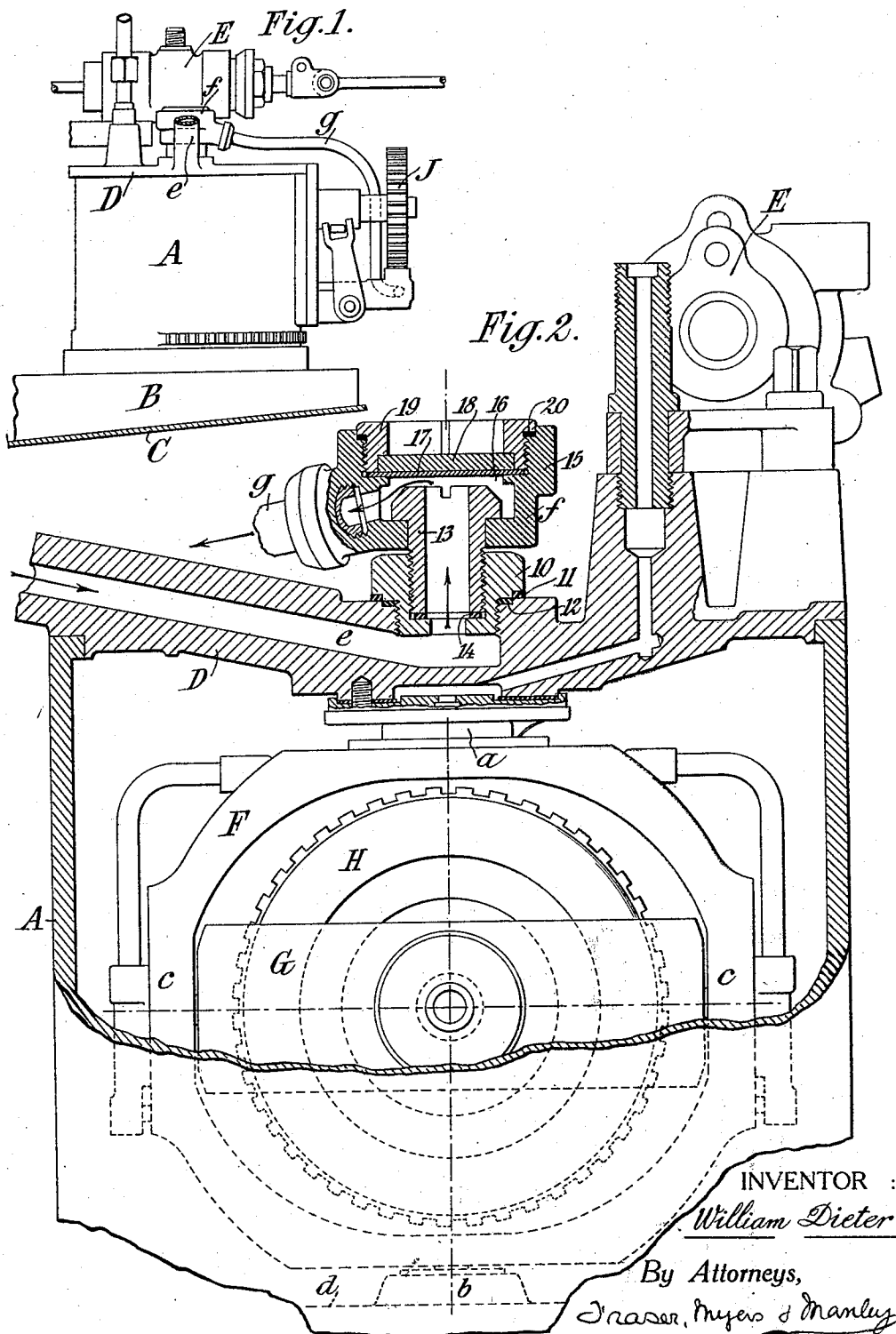
June 16, 1931.

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1,810,646

GYROSCOPIC STEERING MECHANISM

Original Filed April 16, 1926



UNITED STATES PATENT OFFICE

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GYROSCOPIC STEERING MECHANISM

Original application filed April 16, 1926, Serial No. 102,429. Divided and this application filed February 1, 1928. Serial No. 251,138.

The present application is a division of my application filed April 16, 1926, Serial No. 102,429.

This invention relates to gyroscopes for controlling steering mechanisms such as are used for steering automobile torpedoes. In such mechanisms the gyroscope is commonly spun up by the action of compressed air upon a turbine. Within recent years provision has also been made for continuing the spin of the gyroscope to keep it at suitably high speed, by applying jets of air impinging upon the serrated periphery of the fly-wheel.

The spinning-up by means of high-pressure may be performed as in the Bliss-Leavitt torpedo, the mechanism being shown in my Patent No. 1,153,678, dated September 14, 1915, and the patent of F. M. Leavitt, No. 1,185,210, dated May 30, 1916. The present invention has reference to the swivel construction by which for angle-fire the gyro casing may be turned to the desired angle.

In the drawings,

Figure 1 is an elevation showing the general construction and arrangement of the gyro cup or casing and the depth engine, a portion of the torpedo shell beneath being shown in section.

Fig. 2 is a fragmentary sectional elevation on a larger scale.

Referring to the drawings, A is the usual gyro cup or casing, mounted as usual upon the base B which is fastened within the torpedo shell C; on the top plate or head D of the gyro casing are mounted in the usual manner the motors for vertical and horizontal steering, one of these steering engines being shown at E. Within the casing A is the gyroscope (commonly called gyro) comprising the usual outer gimbal ring F, inner gimbal ring G, and fly-wheel H. The outer gimbal ring is hung within the casing on a vertical axis on bearings *a* and *b*, and the inner ring is hung within the outer one in bearings *c*, *c*, all in substantially the usual manner. The upper bearing *a* has its fixed member fastened directly beneath the head D, while the lower bearing *b* is supported on a lower head or spider *d*, as usual. These four bear-

ings are best made as ball bearings, as is customary.

For the initial spinning up of the gyroscope, high-pressure air taken from the compressed air flask is introduced by a conduit *e* shown as formed in the head D, and which communicates through a swivel connection *f* with an outside pipe or air duct *g* leading (see Fig. 1) to the nozzle of the spinning-up turbine J. This spinning-up construction is that which is well-known in the Bliss-Leavitt torpedo, and is shown in my Patent No. 1,153,678, dated September 14, 1915, and the patent of F. M. Leavitt, No. 1,185,210, dated May 30, 1916. The present invention has no reference to this specific initial spinning means. The construction is such that for an angle-fire the gyro casing A may be turned by the usual means (which is well known) to the desired angle (the head D remaining stationary), and by the turning of the swivel *f* proper communication is maintained for the high pressure air from the inlet conduit *e* to the outlet pipe *g*, as is well understood.

The present invention introduces an improved construction of the swivel connection *f*. Difficulty has been experienced in maintaining proper packings for the high pressure air (its pressure approximating 3000 pounds per square inch) at this swivel joint. The construction provided by my present invention avoids the leakages heretofore encountered. Into the stationary head D is screwed a plug 10 sealed by packing gaskets at 11, 12, and into this plug 10 is screwed a tubular swivel spindle 13 packed by a gasket 14. A rotary shell 15 of the swivel *f* turns upon the swivel spindle 13, the head of the latter coming within a chamber 16 formed in this turning member. The top of this chamber is closed by an internal disk 17 backed by an outer strengthening disk 18, and this held in place by a screw ring 19 which is packed by a gasket 20. To withstand the high pressure, these packing gaskets 11, 12, 14 and 20 (and also advantageously the disk 17) should be of tinned copper, according to my Patent No. 1,478,108, dated December 18, 1923. By

means of the construction just described, the high pressure swivel joint can be opened by simply unscrewing the ring or plug 19 carrying with it the disk 18 and permitting the disk 17 to be taken out, thereby giving access to the chamber 16. To disconnect the swivel, the tubular spindle 13 may be unscrewed and lifted out. With the packing means described, the only possible leakage would be from the chamber 16 under the head of the swivel spindle 13 and around the neck of the latter. Any tendency to leakage here is practically overcome by the preponderant upward pressure of the compressed air on the swivel shell 15 which presents on the underside of the plug parts 19, 18, 17, a larger area than that of the annular projection of the head of 13, so that the upward pressure draws the casing 15 so tightly under the head that leakage is practically eliminated. Even if a slight leakage did occur, however, the waste would be negligible and the leakage could not affect the gyroscope, which is entirely housed within and protected by its casing A.

The present invention has no reference to the continued rotating drive of the fly-wheel by low-pressure air (at the usual working pressure of say 400 to 500 pounds per square inch), for which purpose such air is led through a duct (shown at the right in Fig. 2) passing through the head D to the upper bearing *a* and thence (by ducts not shown) to impinge against the fly-wheel to keep it spinning.

The present invention is susceptible of some degree of modification without departing from its essential features as set forth in the subjoined claim.

I claim as my invention:

In an automobile torpedo, a gyroscopic steering mechanism comprising a gyroscope enclosed in a frame having means for rotating it to permit of angle-fire adjustment, a head which is stationary with relation to the torpedo, a spinning-up turbine, a high-pressure air duct leading to the spinning-up turbine, a swivel connection in said duct, the portion of said duct leading to such swivel connection having immovable relation to said head, and the portion of said duct leading from said swivel connection to the spinning-up turbine adapted for angular displacement with said frame, said swivel connection having a removable closure permitting access to its interior and a removable swivel member which may be taken out through said closure.

In witness whereof, I have hereunto signed my name.

WILLIAM DIETER.