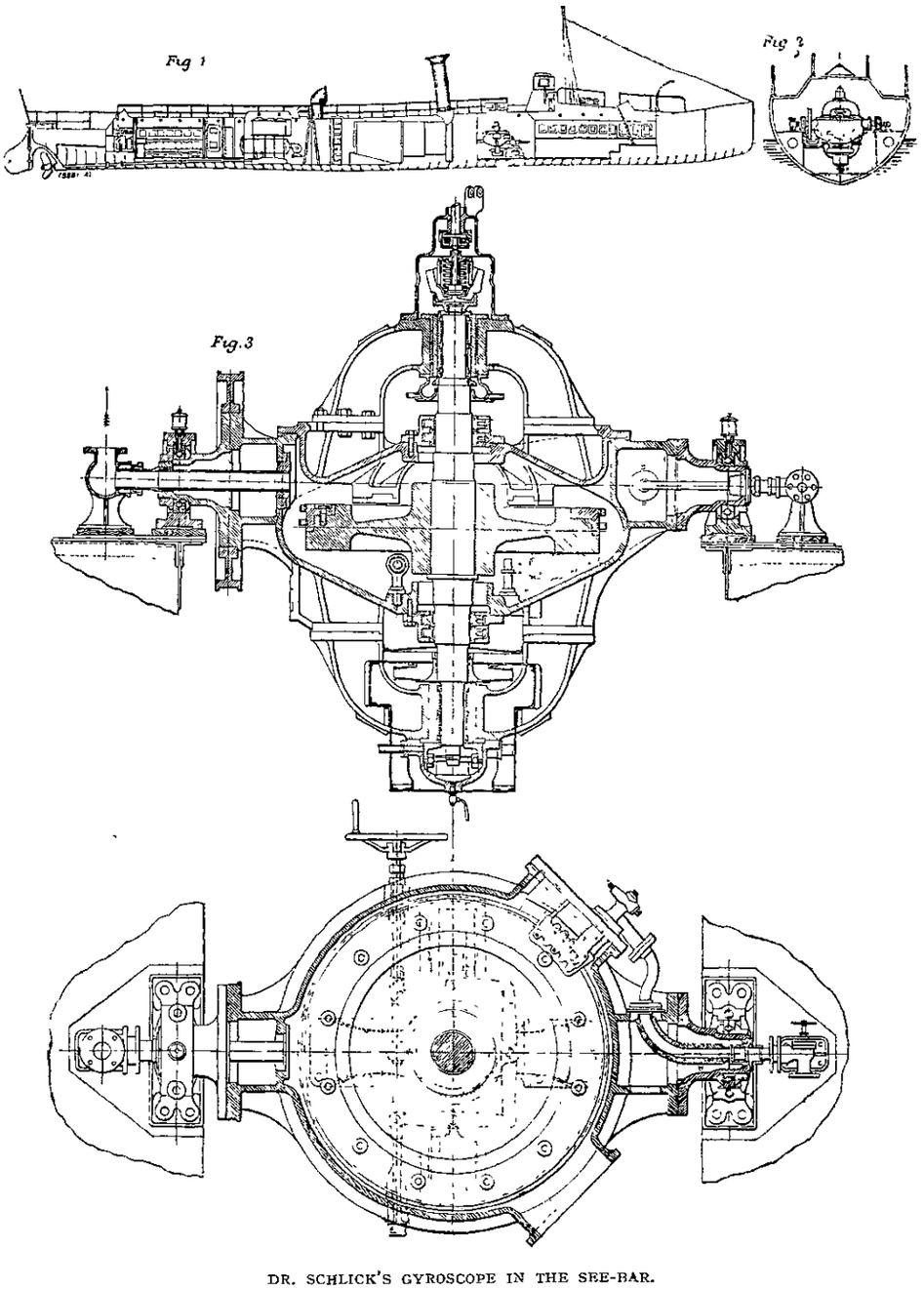
THE MARVELLOUS GYROSCOPE.

EXPLANATION: Fig. 1—The Gyroscope; 2—Car leaning over in crossing mono-rail bridge; 3—Car on curve; 4—Mr Brennan at home; 5—Car balanced after stopping; 6—Car balanced, at rest; 7—The stability apparatus; 8—A roomy car of the future; 9—The model, with all particulars; 10—A prophetic dream.

Last month we dealt with the Gyroscope generally, making demonstration clearer with the aid of illustration. To-day we deal with the two particular applications of the principle now before the public. These are the application of Dr. Otto Schlick to marine constructions, and the application of Mr. Brennan (of torpedo fame) to the steadying of railway traffic carried on a single rail. The two applications seem, so far as the evidence which has reached this country enables us to judge, to have been thought out by their respective inventors on separate lines quite independently of one another. The announcement of the first mentioned to the world preceded the announcement of the second, it is true. But the second was in preparation long before anything was known of its predecessor in publicity. Mr. Brennan's main patent was taken out in 1903.

Dr. Schlick's, which was described by Sir W. H. White, late constructor to the Navy in a paper read before the Institution of Naval Architects last March—"On the Gyroscopic Effect of Fly-wheels on Board Ships,"—consists of a wheel revolving horizontally in an air tight case of iron, as shown in the illustration on this page. Figure 1 shows a longitudinal section of the See-bar, an ex-torpedo boat of the German Navy, with the "Gyroscopic steadying apparatus" mounted and in position: Figure 2 is a cross section of the same: Figure 3 is a vertical section of the Gryoscope or fly-wheel and attachments inside the case: and Figure 4 is a horizontal section of the same. The outside diameter of the wheel is 1 metre: weight 1106lb, peripheral velocity per second 274.8ft: number of revolutions p.m. 1600. The fly-wheel is of forged steel in one piece, and the cast iron casing containing the wheel is carried on two horizontal trunnions. When the vessel is at rest in an upright position the spindle of the fly-wheel will be vertical. When the vessel is set rolling, the spindle of the fly-wheel is free to become inclined to the vertical in the fore and aft direction. As rolling proceeds the gyroscopic effect of the fly-wheel produces longitudinal oscillations of the apparatus. "The observer may be standing" remarks Sir W. White, "upon the deck that maintains a practically horizontal position as the vessel performs vertical heaving oscillations, but the gyroscope meantime may be oscillating violently to and fro in the longitudinal sense and the observer watching it may have the impression that the vessel herself is moving." At sea, during the experiments the fly-wheel was set in motion while the casting was kept fast. Under that condition the gyroscope had no effect, and the observer measured the rolling of the ship in the trough of the sea. That done, the casting was set free and the gyroscopic action come into play at once. In the words of the inventor, "The waves seemed to disappear under the ship, and as was to be expected, she rose with a gentle motion vertically upwards and sank again just as gently into the trough of the sea, without even spray coming on board to any extent worth mentioning." This Sir W. White confirmed by stating as the result of his observation on board that the angle of rolling of 30 degrees was reduced to one, almost



DR. SCHLICK'S GYROSCOPE IN THE SEE-BAR.

immediately after the casting of the spinning wheel had been set free. His verdict was that for vessels of the class of the See-bar the use of the gyroscope is a proved success, that with all Channel passenger boats exposed to high seas it will be most useful, that with large ocean liners, gyroscopic effect, now but little wanted owing to their steadiness can in all probability be very simply applied, and that for the more modern warships in which the design involves short periods of oscillation and frequent rolling, the securing of a stable firing platform will require "the installation of large and powerful gyroscopes to secure adequate extinction."

In the experiment on the See-bar it was proved that reduction of the speed from 1600 revolutions, which was the normal speed maintained, lessened the effect on the rolling; and it was concluded by the experts present that with wheels of smaller diameter driven at higher speeds much economy in construction and driving power could be secured. As a matter of fact all agreed that the one metre of diameter installed was too much. Finally, it is Sir W. White's opinion that there must be a great deal of careful experiment before the application to large ships of the gyroscope.

The Brennan Mono-rail.

Mr. Brennan employs two gyroscopes, or to use Lord Kelvin's word gyrostats. These are in every respect similar except that they rotate in opposite directions. They are supported on carriers which are pivoted on parallel axes. The carriers are connected by means of links or gearing, so that the rotation of the one carrier in one direction insures a corresponding rotation of the other carrier in the opposite direction. The axes of the gyrostats are horizontal, and are at right angles to the longitudinal axis of the vehicle.

"The essence of the invention" we quote from the report of a writer fresh from an interview with Mr. Brennan, after a trial of the model car in Mr. Brennan's grounds, "is the introduction of means by which any disturbance of equilibrium, or change of direction of the vehicle, automatically controls the precession of the gyrostats, together with an automatic means of accelerating or retaining such precession. Thus the vehicle is rapidly brought back to a middle or normal position of maximum stability, and the action is so controlled that there is no tendency of any gyroscopic effect to persist and thereby to produce oscillations of increasing amplitude. One of each pair of gyrostats is