stance; and it is a familiar fact how very important a part is played in the steam-engine by the flywheel. Why should that be? Why should this flywheel be so important that it is only quite recently that mechanicians have learned to do without it? For this reason: if a mass of matter such as a flywheel is once made to revolve, it will retain that motion for a long time, resisting any tendency to an increase or decrease of its velocity. It is in consequence of this property which the revolving flywheel possesses that an engineer is able to get over the dead points in his engine, whilst

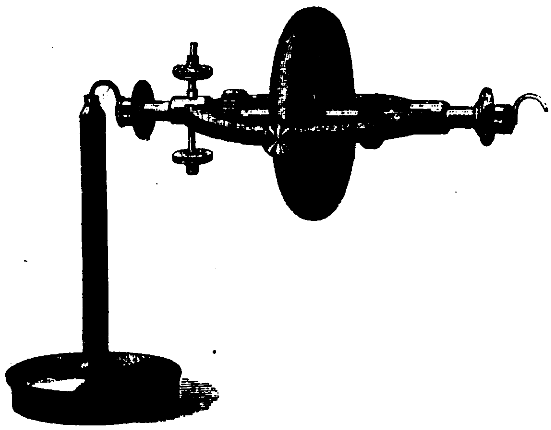

FIG. 27.—Rapidly rotating wheel supported at one end of its axis.

it also acts in preventing the engine making too sudden a start. In addition to this, when we have a mass of matter in the condition of the revolving flywheel it has some very peculiar qualities, only observed when such a mass of matter is in motion. If, then, we have a wheel so arranged that a very rapid rotation is being imparted to it, it does not behave as it would when at rest. These properties possessed by a rotating body can be well shown by an instrument known as the gyroscope, of which we shall speak more fully later on. It consists essentially of a

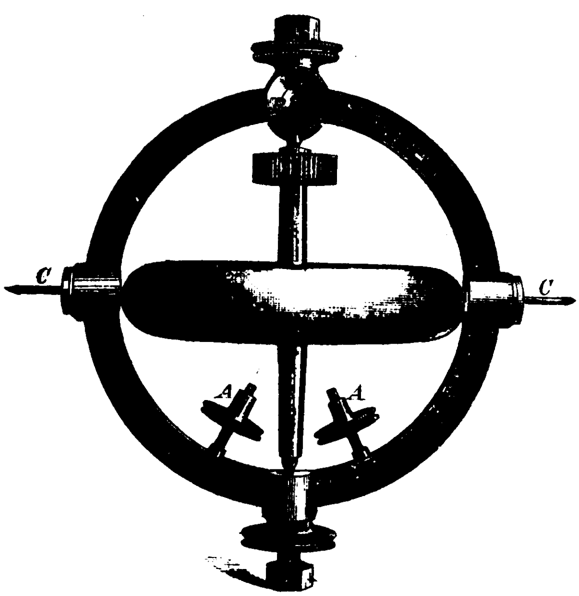

FIG. 28.—Rotating disk of gyroscope. C C, knife edges; A A, B B, adjusting weights.

disk to which a very rapid rotation can be imparted by a train of wheels or by other means. If the disk be set rotating, it is found to possess those curious qualities of which I have spoken. If whilst rotating at a high velocity it be placed in the position shown in Fig. 27, it will not fall, but will take on a movement of revolution round the stand.

From considerations suggested by this and other similar experiments, Foucault pointed out that it might be demonstrated whether the earth moved or whether she remained at rest. It struck him that the problem should be attacked somewhat in this manner:—

Suppose the earth to be at rest, and that either at the north or south pole a pendulum, suspended so that its point of support had as little connection with the earth as possible—so that it should, in fact, like the rotating flywheel, be independent of external influences, were set vibrating. Then an observer at the north or south pole would note that the swinging pendulum (the earth being considered as at rest) always had the same relation to the objects on his horizon. But, said Foucault, suppose that the earth does move. Then the swing of such a pendulum would not always be the same with regard to the places on the observer's horizon. Let the earth be represented by a globe. Suppose it to rotate from west to east. Place it with the north pole uppermost, and set the pendulum, whose point of support is disconnected from the rotating earth, vibrating. Then the pendulum will appear to travel from left to right as the earth rotates from right to left beneath it. Now suppose the pendulum to be suspended in the same way at the south pole, right and left now being changed. The earth of course rotates in the same direction as before, but the pendulum now appears to change the

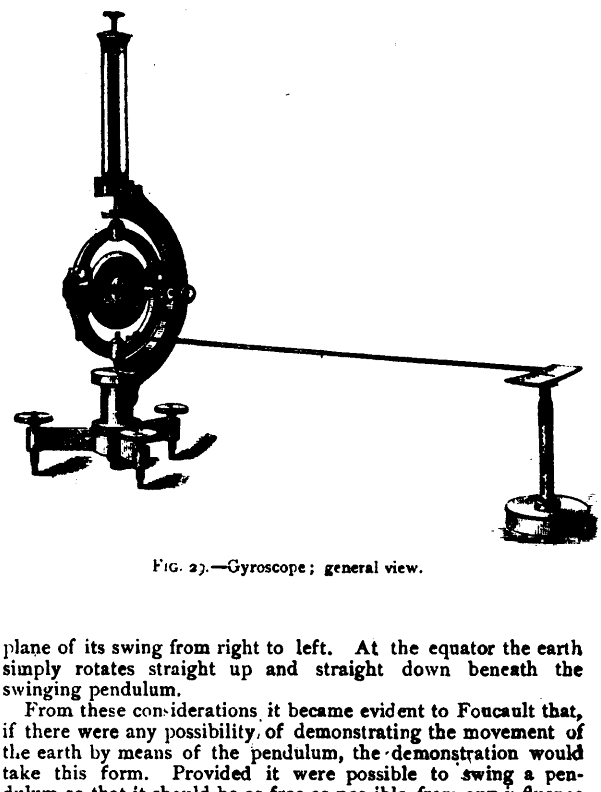

FIG. 29.—Gyroscope; general view.

plane of its swing from right to left. At the equator the earth simply rotates straight up and straight down beneath the swinging pendulum.

From these considerations it became evident to Foucault that, if there were any possibility of demonstrating the movement of the earth by means of the pendulum, the demonstration would take this form. Provided it were possible to swing a pendulum so that it should be as free as possible from any influence due to the rotation of the earth, and take that pendulum to the north pole, it would appear to make a complete swing round the earth in exactly the same time that it really takes the earth to make a complete rotation beneath it. At the south pole exactly the same thing would happen except that the surface of the earth would appear to move in the opposite direction to what it did at the north pole. Now it will be perfectly clear that if we thus get a pendulum appearing to swing one way on account of the true motion of the earth at the north pole and in the opposite direction on account of the true motion of the earth at the south pole; at the equator, as we found in dealing with our model earth and model pendulum, it will not change the plane of swing either way, that is to say, the time taken by a pendulum to make a complete swing will be the smallest possible at the poles, whilst at the equator it will be infinite.

At all places, therefore, between either pole and the equator