AN ELECTRICALLY-OPERATED GYROSCOPE.

A NEWLY-DISCOVERED MOTION.

BY EDWARD DURANT.

This specially-constructed gyroscope for use in the College of the City of New York, made by Charles Dressler, from suggestions by Prof. Alfred Compton, is quite new, in that it produces its own motion through the medium of electricity. Within the stationary ring mounted on the stand are carried the conducting wires, which convey the current from the binding posts to mercury cups located at the gimbal pivots of the two movable rings, and thence to the magnetic field ring and the armature brushes. One movable ring is pivoted to rotate in a vertical plane. The magnetic wire-wound field ring is gimbaled to rotate in a horizontal plane, while the armature, composed of a large disk encasing within the armature wires, is pivoted vertically in the field ring, and is in line with the vertical axis of the outer movable ring. In the illustration the brushes will be seen above the armature disk. Below is a special swinging weight, made to move to and from the armature disk by a crank-pin wheel operated by a worm screw on the armature shaft meshing with teeth on the crank wheel. The shaft of the motor is in the nature of a pendulum having the movable weight at the bottom. When set in motion electrically it has the function of a gyroscope, and if it is placed by hand in a position at right angles to the normal, or, in other words, in a horizontal position, while spinning, it will describe an orbital circuit like a planet or satellite, and revolve in a plane parallel with, or tangential to, the earth's surface.

The armature shaft supporting the pendulum weight then becomes a rotating radius vector, and the pendulum weight or armature disk becomes a miniature spinning, planetary mass, revolving in orbit with mutual affection between itself, the earth, and other planets.

The gyroscope has a constant angular velocity, and a constant orbital time. The separate nutation device attached, consisting of a relatively light weight, oscillated radially by means of the worm gear on the radial shaft, through a small space above the theoretic supporting pivot, brings about the most marvelous mechanical movement yet discovered. The pendulum begins to rise to a horizontal position, as before, but by Nature's influence only; and after it reaches the horizontal position or planetary plane it performs the astronomical nutation phenomenon by gradually stopping and slowly starting again.

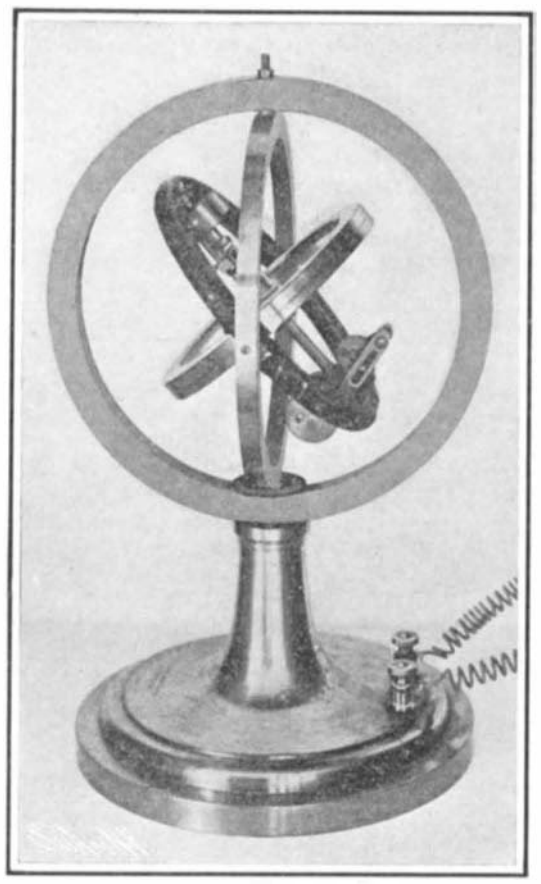
What we conceive of as weight or gravitational influence, passes out of the spinning mass to the imaginary supporting point or center of orbit.

When both the supporting rings or gimbals are in the same vertical plane, and the gyroscope wheel is rotating on axis at maximum speed, it will be observed that the gimbals cannot be moved freely by hand, except in the direction of rotation, and a very appreciable resistance is offered when an attempt is made to move the gimbals by hand in the reverse direction.

If the outer gimbal is forced by hand to move in the direction of this phenomenal resistance, the inner gimbal immediately inverts before permitting the outer gimbal to move freely in this same direction it was at first forced.

When the model is at rest the heavy pendulum weight is by no means balanced by the very light oscillating weight.

Up to about 1860 the jet condenser was the one usually employed on board ship, which meant, of course, that the boilers were constantly fed with salt water; and this, in turn, meant the deposition of great quantities of sulphate of lime scale on the heating surface. With the low pressure then prevalent this did not greatly affect the economy of the boilers, except that, as "blowing off" to keep the density of the water down was a continuous practice, there was a certain loss of heat, and of course there was the necessity for frequent scaling of the heating surfaces. However, they were effectually protected against corrosion. About 1860 the use of surface con-



AN ELECTRICAL GYROSCOPE.

densation became general, and as this greatly reduced the amount of scale formed, it was practicable and safe to increase steam pressures, which accordingly resulted with a consequent reduction in the weight of machinery per unit of power.

THE "WHIRLPOOL" ILLUSION.

We illustrate herewith "The Great Whirlpool," the invention of Mr. Joseph A. Bruce, of Brooklyn, N. Y. This appears to be the latest thriller in the amusement line, and its novelty should appeal to the amusement-loving public.

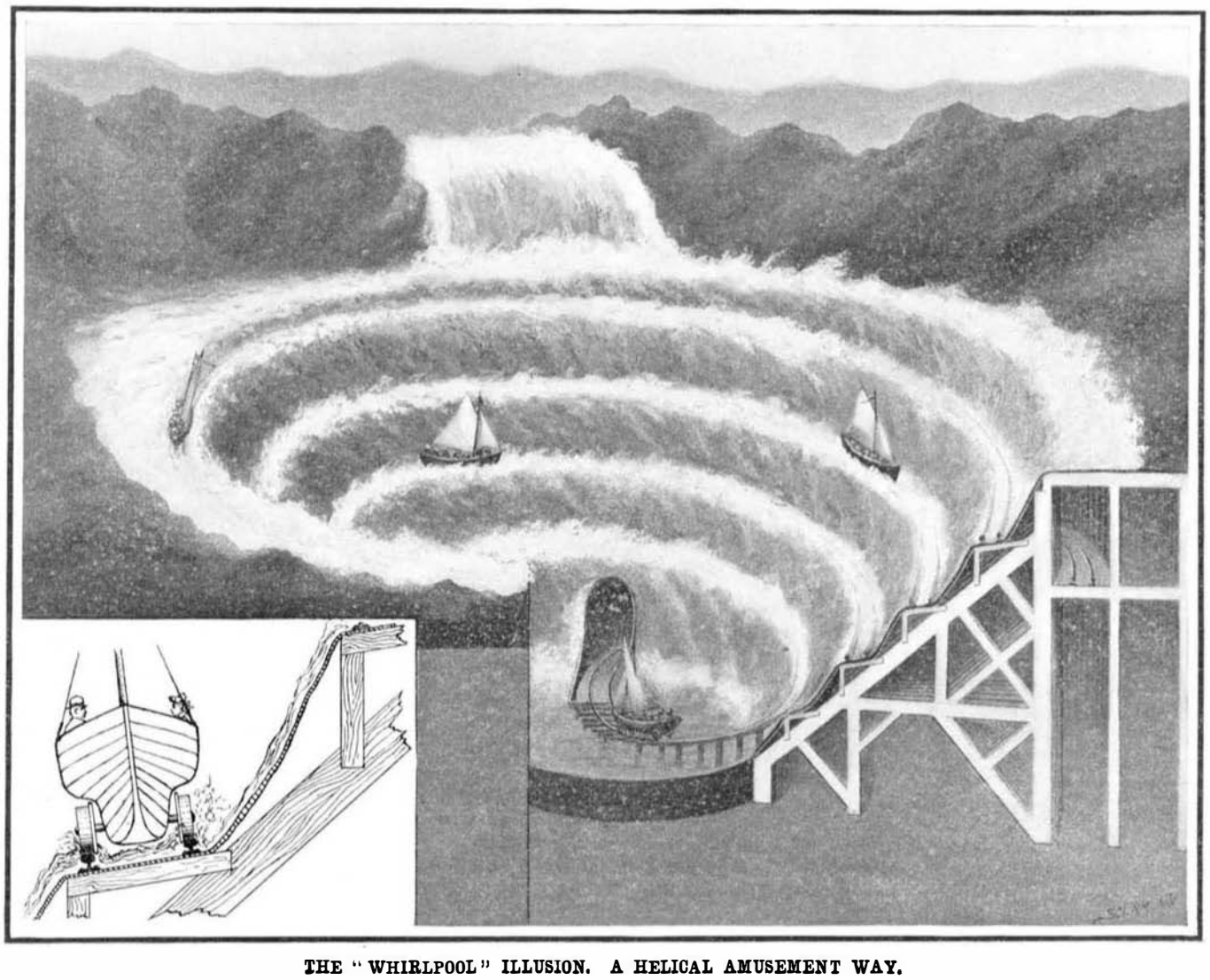
A building over fifty feet high and one hundred feet square is built inside to simulate a monster whirlpool. The passengers who are seeking the sensation ascend in boats by an endless chain from a lobby to the upper interior. As the boats come up, the passengers are confronted by a tremendous waterfall, the water falling from a great height, while the whirlpool proper is at their feet, ninety feet in diameter, the depth being fifty feet. By optical illusions the depth is made apparently much deeper, the waters dashing, jumping, and gyrating to the vortex below, from which the spray ascends. The roar of the mad waters is heard, and the boat starts down an inclined plane or spiral road, going by gravity on tracks at ever-increasing speed until through an opening it disappears at the bottom, apparently sucked into the insatiable depths below. Passing through dark tunnels over many bumps, the boat dashes into the foyer to sunlight and safety.

The building is inclosed, and with the liberal use of electric effects an artistic, realistic, and ingenious exhibition is given.

Our sketch from model shows the interior as the passenger views it when he reaches the top in the boat car; the lower cut gives an idea of the mechanical construction. As shown in the illustration, the interior of the whirlpool, being built as an inverted cone, shelves down with considerable pitch from the top toward the lower center. The shelves contain tracks upon which the boat cars run. From the base of the waterfall there runs all around the building a trough, which carries the water from the falls, and overflowing, it runs down the whirlpool and around the roadway.

The interior is covered with canvas to represent water, and with the electrical effects the whirlpool seems indeed to be a live, mad body of water, restless, hungry, and pitiless. The water descends to a tank at the bottom of the whirlpool, over which is built a bridge upon which the boats pass to make their exit, and from this tank the water is pumped to the top of the building to feed the jumping, spurting, wild, and troubled waterfall. The boats having sails set on the rear side, the passengers are protected from the spray.

Each car is in charge of a man, and as the cars are equipped with safety brakes and are run on signal, all danger of accident is eliminated.



THE "WHIRLPOOL" ILLUSION. A HELICAL AMUSEMENT WAY.

IMPROVED METHODS IN HIGH-SPEED CHRONO-PHOTOGRAPHY.

BY DR. ALFRED GRADENWITZ.

Instantaneous photography, and especially the chronophotography of a moving object, have enabled us to recognize the true nature of some animal motions of which we have had but very hazy conceptions. The operation of the cinematographic camera consists essentially in moving a sensitized film behind a photographic objective, and stopping it for a moment at regular intervals while an exposure is made. For ordinary purposes a rate of ten to twenty views per second is quite sufficient to photograph the different phases of motion. On viewing in a similar intermittently working outfit the series of photographs taken, the impression of a continuous motion is produced. For more rapid movements, however, the rate mentioned proves insufficient, and the late Prof. Marey, of Paris, who paid especial attention to the phenomena of motion, designed some ingenious means of abridging the time of exposure, and thus increasing the number of photographs taken in a second. By intercepting the beam of light with an interlocking disk fitted with narrow slits and rotating at a high speed, he was able to obtain photographs of flying insects in 1-25,000 second. The same process was subsequently made use of by Lendenfeld, who succeeded in reducing the time of exposure to 1-42,000 sec. He was the first who succeeded in employing a continuously moving instead of an intermittently moving film for the disso-