

cylinder of carding engines; and this we claim whether said feed rollers deliver the material directly on to the main cylinder, or to lickers-in, when said lickers-in are so arranged as to work in connexion with each other, and with the main cylinder. Also, the reversing of the relative velocities of the peripheries of the main working cylinder and stripper at intervals, by an automatic movement, for the purpose of cleaning and preventing the clogging of the main cylinder."

7. For an *Improvement in Watches*; George P. Reed, Waltham, Massachusetts; patented April 14, 1857; re-issued Nov. 24, 1857.

*Claim.*—"The arrangement of the barrel in respect to the pillar plate, so that it shall extend through the plate, and be fastened to the dial side of it. Also, arranging the main gear wheel with the retaining power and barrel arbor, so that the said wheel shall serve the purpose of a barrel head, or cover to the barrel. Also, the application of the retaining power directly to the fixed barrel."

8. For an *Improvement in Grain and Grass Harvesters*; Wm. H. Seymour, Assignor to self and Dayton S. Morgan, Brockport, New York; patented December 14, 1852; ante-dated October 25, 1852; re-issued Nov. 24, 1857.

*Claim.*—"The combination of the platform, the driving gear, the space between the platform and driving gear for the discharge of the gavel, the draft pole, and the stand or rest on the platform for the forker."

9. For an *Improvement in Grain and Grass Harvesters*; Wm. H. Seymour, Assignor to self and Dayton S. Morgan, Brockport, New York; patented December 14, 1852; ante-dated October 25, 1852; re-issued Nov. 24, 1857.

*Claim.*—"The combination with the stand or rest upon the rear side of the platform, for the person who rakes off the grain, and with the platform, of a strong rail firmly secured to the outer side of the main frame, and extending thence along the rear side of the platform to support it and the stand for the forker."

10. For an *Improvement in Grain and Grass Harvesters*; Wm. H. Seymour, Assignor to self and Dayton S. Morgan, Brockport, New York; patented December 14, 1852; ante-dated October 25, 1852; re-issued Nov. 24, 1857.

*Claim.*—"The method of protecting the gearing from being injured by the working and twisting of the main frame, by mounting the said gearing in an auxiliary metallic frame firmly attached to the main frame."

#### DESIGNS.

1. For *Stoves*; Wm. T. Coggeshall, Fall River, Massachusetts; dated Nov. 3, 1857.

2. For *Barometer Cases*; Theodore R. Tinby, Medina, New York; dated Nov. 10, 1857.

3. For *Match Boxes*; Elisha Waters, Troy, New York; dated Nov. 17, 1857.

The claims on the above, are for the several shapes, forms, ornaments, and configurations.

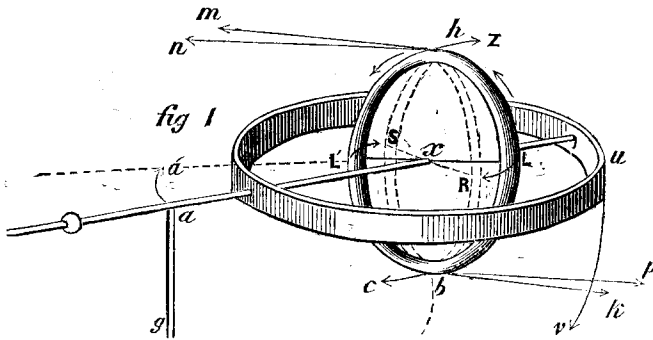
## MECHANICS, PHYSICS, AND CHEMISTRY.

For the Journal of the Franklin Institute.

*The Gyroscope.* By R. STEWART.

The gyroscope, fig. 1, when not balanced, instead of falling, revolves about its support *a g*, in the same direction as the bottom of the revolving wheel moves; but if balanced it will remain stationary. If it is overbalanced, it will revolve as the top of the wheel moves. The revolutions around the support *a g*, are more rapid the more it is overbalanced, and

the longer it revolves. When greatly overbalanced it will at first revolve around  $a g$  in undulations which gradually cease. The following is intended as an explanation, which the writer does not know to have been hitherto published.

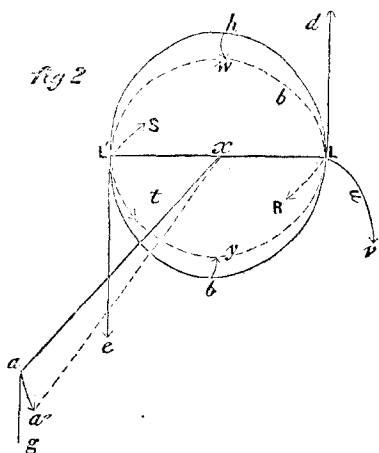


Let  $h l' b l$  be the wheel,  $h$  the top,  $b$  the bottom,  $a x$  the axis,  $a g$  the upright on which the axis is placed at  $a$ . By gravity the wheel will fall towards  $g$ , revolving about  $a$  as a centre. But  $h a$  the distance of the top, equals  $b a$  the distance of the bottom of the wheel from  $a$ , and both are greater than  $x a$ , the distance of the centre of the wheel from  $a$ . Therefore  $h$  and  $b$  being a greater distance than  $x$  from the centre of revolution, must go faster than  $x$ . Here, then, are two points, equidistant from an intermediate point  $x$ , going equally faster than  $x$ . Therefore, as this is a solid,  $h$  and  $b$  will revolve about  $x$  as a centre,  $h$  towards  $z$ , and  $b$  towards  $c$ , or the wheel, by gravity, will revolve on its diameter  $l x l'$ . Let the wheel be now made to revolve on its axis  $a x$ , in the direction  $h l' b l$  (shown by arrows); the top of the wheel, or  $h$ , would go in the direction  $h n$ , and  $b$ , as  $b p$ ; in both cases being perpendicular to the direction taken by gravity. Therefore, the wheel will take such a position as shall permit  $h$  and  $b$  to go in the direction of the resultants of these forces, or  $h$  towards  $m$ ,  $b$  towards  $k$ . This would be done by the wheel revolving on its diameter  $h b$ , as an axis,  $l$  going forward to  $r$ , as shown by the arrow, and  $l'$  backward to  $s$ , the axis  $x a$  at the same time moving to  $a'$ . But the upright cannot move thus, therefore the wheel moves in the opposite direction  $u v$ . Or there will thus be a force acting upon the wheel, causing it to move in a horizontal direction around  $a g$ , in the direction of the bottom of the wheel.

If by any force the wheel be made to go upwards, this horizontal force, and motion also, if nothing prevents, will be in an opposite direction ( $c$ ), or the wheel and axis will revolve around  $a g$  as the top of the revolving wheel would go as might be shown by similar reasoning. In what follows, the force causing the wheel to go as  $u v$ , will be called horizontal force, that which would make it go in an opposite direction, will be called *opposite* horizontal force.

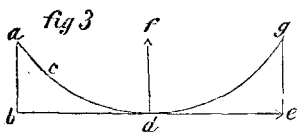
The axis by gravity continues to fall, but by this horizontal force it is turned in a horizontal direction. But by this horizontal motion is developed an upward force which checks its farther descent.

For fig. 2, the wheel revolving around  $ag$  as  $uv$ ,  $x$  goes slower than  $L L'$ , therefore,  $L$  will go as  $L R$ , and  $L'$  as  $L' S$ , in opposite directions.



But by axial rotation,  $L$  goes as  $Ld$ , and  $L'$  as  $L'e$ . The wheel must now take such a position as that  $L$  may go as  $Lf$ , and  $L'$  as  $L't$ —the resultants—or  $h$ , the top, would move forward as arrow  $yw$ , and  $b$  backward, as arrow  $by$ , and the axis  $xa$  would fall to  $a'$ . But this cannot thus move, therefore the wheel will ascend, or the force is now upward. This upward force increasing with the horizontal velocity, finally stops the descent of the axis and wheel, when under their combined influence the wheel ascends till it reaches its former height. In this ascent an

opposite horizontal force is developed (c), which gradually destroys the first horizontal force (that forward), and gravity destroys the upward. Or fig. 3,  $a b$  is the perpendicular distance fallen by gravity,  $a c d$  the direc-



tion taken by the horizontal force, at  $d$  has maximum horizontal force  $d e$ , and upward  $d f$ , by which goes to  $g$ . The horizontal force acquired in falling through the height  $a b$ , by axial rotation, will be neutralized by the *opposite* horizontal force from the same axial

rotation in ascending to the *same* height. The upward force having acquired sufficient intensity to overcome gravity, and prevent the further descent below *b*, will in turn be overcome by gravity in ascending to the same height. The horizontal and upward forces being thus destroyed, gravity again causes the axis to begin to fall to pass through the same changes. In other words, as the pendulum oscillates, so does the axis, only that the oscillations of the axis and wheel are continually forward. Here also the extra weight, resistance of the air, and friction, will affect the motion, and in practice, will prevent the axis from ascending quite to the same height. It was just shown that the *opposite* horizontal force developed in ascending *exactly* to the same height, would just overcome the horizontal force acquired by its fall. If it does not rise to this height it will not be sufficient, and the axis will start on its next undulation with an initial horizontal force, which will prevent its descending to so great a distance before being checked; so that the motion becomes more and more in a horizontal line ( $\pi$ ). This, with the diminished axial rotation, will cause the wheel to revolve around its upright *ag*, as if following the thread of a screw or in a spiral.

As the axial rotation is great in comparison with that from gravity, the change the wheel must make will be slight, that is, the horizontal motion will be slow. For fig. 1,  $b p$ , represents the axial rotation,  $b c$  that

from gravity,  $b k$  will therefore be but little removed or make but a small angle with  $b p$ , or the wheel will turn but little to permit  $b$  to take the direction  $b k$ . Therefore, the swifter the axial revolutions, or the less the force of gravity, the slower will be the horizontal motion, until gravity is nothing, or axial infinitely great, when the axis will be stationary. On the contrary, if the axial is slower, or force of gravity greater, the horizontal will be faster; *i. e.*, the horizontal revolutions will be more rapid as the axial revolutions diminish, and the less will be the angle which the axis makes in falling with the perpendicular  $ab$ , fig. 3, until the axial ceases, when it is  $0^\circ$ , and the wheel oscillates as the pendulum. The undulations should thus be made more visible, which would be the case, if it were not for (H). This can be shown by starting the revolutions so that gravity may be comparatively great, *i. e.*, by greatly overbalancing the wheel, when the undulations become very plain, though they gradually cease, as explained above.

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*A Detailed Account of Experiments and Observations upon the Sorghum Saccharatum or Chinese Sugar Cane, made with the view of determining its value as a Sugar Producing Plant, from September 28, to December 20, 1857, at Oakhill, Philadelphia County, Pennsylvania. By JOSEPH S. LOVERING.*

The introduction of this plant into the United States, and the hope of producing sugar from it at the North, profitably, have excited such universal interest, that it has this year been planted in almost every State in the Union; and as the season has advanced, the opinions early expressed by many intelligent and scientific experimentalists, that it contains no crystallizable sugar, have apparently been confirmed by later trials. A few crystals, it is true, have been obtained in one or two instances, but all hope of producing sugar from it profitably seems to have been abandoned.

My object in making the following experiments has been to throw what light I could upon this important question, and, in the event of the result proving favorable, to give such a formula as would enable the uninitiated to proceed with confidence of success. They have been pursued without any attempt at extraordinary production, either in the cultivation of the cane or the development of its properties; on the contrary, the experiments were made upon small quantities, under many disadvantages that would not occur in large operations, and consequently with results less favorable.

The series being completed, perhaps the best method of communicating the results and imparting the knowledge obtained, to the public, will be by giving the following extracts from my notes, made as the work proceeded. They will show the progress of the development of the sugar in the stalk, and its decline, with many other interesting facts.

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*Extracts.*—On the 10th of May, I planted about half an acre, on upland of good quality, such as would yield in ordinary seasons, 50 to 60 bushels Indian corn to the acre. The rows 4 feet apart, and the plants