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COMPOUND MILL ENGINE.

We illustrate a very fine sample of a compound engine working the flax and jute mills of Mr. Etrich, at Taxomer, Bohemia. Our engraving is from *Engineering.* The editor states that this engine was designed by Dr. Proell, of Dresden, and is fitted with a new automatic valve gear, which positively controls the action of the double beat valves, and admits of a very extensive range of expansion. The engine was built by Messrs. Marky Bromovsky & Schulz, of Prague, and presents several features of interest.

The Rolling Contact of Bodies.

Professor Hele Shaw lately delivered a lecture at the Royal Institution upon "The Rolling Contact of Bodies." He commenced by putting forward the proposition that when a carriage wheel is rolled along, any particular point upon the tire of the wheel always reaches and leaves the ground in a perpendicular direction. In order to demonstrate this, attention was drawn to the fact that on revolving a wheel from which the tire had been removed, the central point at the extreme end of a spoke always reached the ground and remained there only while the spoke itself was in a perpendicular position. Further, in order to make the truth of this statement more apparent to his audience, the lecturer had recourse to a small solid wheel, to one side of which, near the edge, was attached a small brush, so that as the wheel rolled along a level surface, the brush accurately marked upon a suitably adjusted screen the direction of the course taken by that portion of the wheel upon which it was fixed. The diagram so obtained proved to be a representation of a series of cycloidal curves, the lowest points of which were reached in a perpendicular direction.

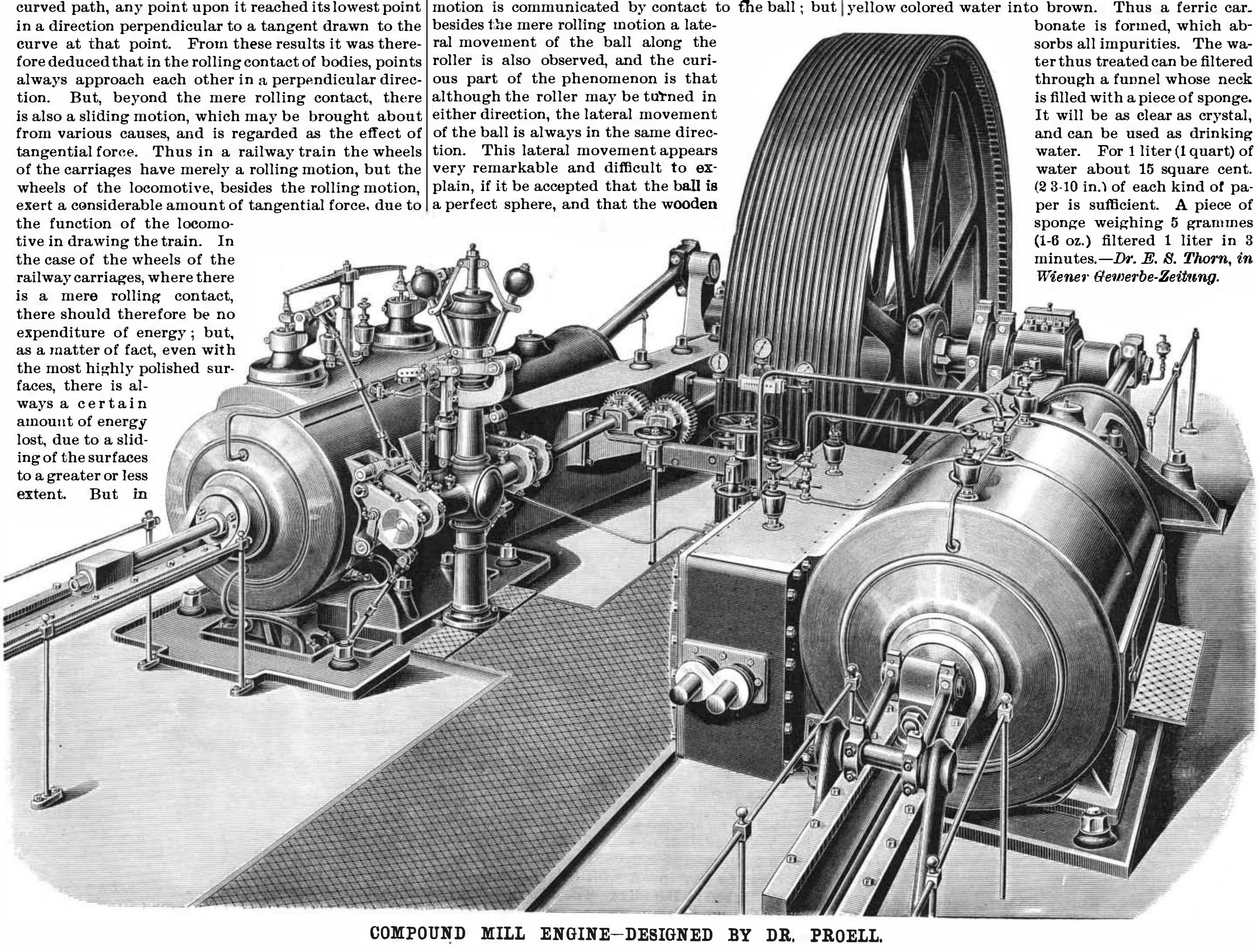
Similarly, by causing the solid wheel to travel in a curved path, any point upon it reached its lowest point in a direction perpendicular to a tangent drawn to the curve at that point. From these results it was therefore deduced that in the rolling contact of bodies, points always approach each other in a perpendicular direction. But, beyond the mere rolling contact, there is also a sliding motion, which may be brought about from various causes, and is regarded as the effect of tangential force. Thus in a railway train the wheels of the carriages have merely a rolling motion, but the wheels of the locomotive, besides the rolling motion, exert a considerable amount of tangential force, due to the function of the locomotive in drawing the train. In the case of the wheels of the railway carriages, where there is a mere rolling contact, there should therefore be no expenditure of energy; but, as a matter of fact, even with the most highly polished surfaces, there is always a certain amount of energy lost, due to a sliding of the surfaces to a greater or less extent. But in such a great measure is this loss of energy overcome, that Professor Shaw quoted a case in which, by means of a system of wheels rolling upon each other, a turntable weighing fourteen tons, when once set in motion, only requires a force of three and a half pounds to keep up its revolutions. The same principle is applied in a number of swing bridges, and in other cases where heavy weights are required to be moved with little power.

The lecturer then went on to explain the application of rolling contact in the employment of machines for measuring distances, and in other instruments, such as Sir W. Thomson's harmonic analyzer for computing the state of the tide at any place for any time. But in all these instruments Professor Shaw pointed out certain corrections had to be made to allow for the tendency of the wheels to slip over each other. In order to illustrate this tendency, the lecturer referred to an experiment in which he had made two wheels revolve round each other ten thousand times, and found then that they had slipped one thirty-second of an inch from their original position, or about one inch in three hundred thousand revolutions. Though this tendency may no doubt be reduced with more perfect instruments, yet to a slight degree it always remains. At the same time Professor Shaw remarked that a minute force exerting itself in a lateral direction would soon have an appreciable effect upon a revolving wheel, although it might be quite imperceptible in its action when the wheel was stationary. This point the lecturer also well illustrated by means of experiment.

He then drew attention to a phenomenon which is observed during the rotation of a ball by means of a revolving cylinder. If a polished wooden ball be placed upon two polished wooden rollers, one of which is kept stationary while the other is made to revolve, a rolling motion is communicated by contact to the ball; but besides the mere rolling motion a lateral movement of the ball along the roller is also observed, and the curious part of the phenomenon is that although the roller may be turned in either direction, the lateral movement of the ball is always in the same direction. This lateral movement appears very remarkable and difficult to explain, if it be accepted that the ball is a perfect sphere, and that the wooden cylinders are mathematically correct and placed in a perfectly horizontal position. If the wooden ball be replaced by one of harder material, or a ball of iron, the lateral motion is perceptibly increased; but the greatest effect is obtained when the wooden rollers are either substituted by rollers of India rubber, or else covered with a sheet of that material. This phenomenon has never been satisfactorily explained, but Professor Shaw now thinks that he has been able to do so, although he only arrived at the solution of the problem which he put forward as recently as the previous afternoon. Of course, when a ball is placed upon a body, its weight causes a certain amount of distortion in the surface of that body, and causes forces to be exerted, acting on the ball from all sides. But when a ball is in motion, the direction of these forces is considerably altered. The direction of the force in the surface of the body in front of the ball during its passage is maintained, and its power is intensified; but the direction of the force in the surface behind the ball is reversed, owing to the release of pressure from the weight of the ball in that spot. To these changes in the direction of the forces Professor Shaw ascribes the cause of the phenomenon.

Method of Clarifying Muddy Water.

Filter paper is dipped into a solution of 43 per cent ferric chloride in 57 per cent of water, and after thorough saturation is dried between filter paper. In the same way a second piece of filter paper is treated in a saturated solution of bicarbonate of soda. Now, if a piece of the yellow paper that has been treated with ferric chloride is first placed in muddy turbid water, the fluid is colored yellow by the iron salt. Next, into the same water, a piece of the same size of the bicarbonate of soda paper is dropped, turning the yellow colored water into brown. Thus a ferric carbonate is formed, which absorbs all impurities. The water thus treated can be filtered through a funnel whose neck is filled with a piece of sponge. It will be as clear as crystal, and can be used as drinking water. For 1 liter (1 quart) of water about 15 square cent. (2 3-10 in.) of each kind of paper is sufficient. A piece of sponge weighing 5 grammes (1-6 oz.) filtered 1 liter in 3 minutes.—*Dr. E. S. Thorn, in Wiener Gewerbe-Zeitung.*



COMPOUND MILL ENGINE—DESIGNED BY DR. PROELL.