solid cylinder of 87 *radius*, has a resistance which is to the solid one only as 121 to 100.

3. That the hollow cylinder of 99 void, the resistance of which, compared to that of the solid one, which is 14 *radius*, would be, according to Galileo, $7\frac{1}{2}$ times greater, has one $8\frac{1}{2}\frac{2}{3}$ times greater according to the hypothesis of M. Parent, which is also that of M. Mariotte.—*Abridged from the Transactions of the Royal Academy of Paris for 1702.* [*Lond. Mech. Mag.*]

¶ *On the Effect of Impact on Beams.* By EATON HODGKINSON.

The author gave the results of some inquiries into the power of beams to resist impulsive forces. The experiments were made by means of a cast iron ball, forty-four pounds weight, suspended by a cord from the top of a room with a radius of sixteen feet. The ball, when hanging freely, just touched laterally an uniform bar of cast iron, sustained at its ends in a horizontal position, by supports under it and behind it, four feet asunder. The intention was to strike the bar, sometimes in the middle, and sometimes half way between the middle and one end, with impacts obtained by drawing the ball and letting it fall through given arcs, shifting the bar when the place of impact was to be changed, and obtaining the deflections of the bar at that place by measuring the depth which a long peg, touching the back of the bar, had been driven by the blow into a mass of clay placed there. The results were:—

1. The deflections were nearly as the cords of the arcs through which the weight was drawn, that is, as the velocities of impact.

2. The same impact was required to break the beam, whether it was struck in the middle, or half way between the middle and one end.

3. When the impacts in the middle, and half way between that and the end, were the same, the deflection at the latter place was to that at the former, nearly as three to four, which would be the case if the locus of ultimate curvature, from successive impacts in every part, was a parabola.

The preceding deductions the author had found to agree with theoretical conclusions, depending on the suppositions, (1) that the form of a beam bent by small impacts was the same as if it had been bent by pressure through equal spaces; and (2) that the ball and beam when struck, proceeded together after impact as one mass. These suppositions likewise gave as below:—

4. The power of a heavy beam to resist impact, is to the power of a very light one, as the sum of the inertias of the striking body and of the beam is to the inertia of the striking body.

5. The time required to produce a deflection, and, consequently, the time of an impact, between the same bodies, is always the same, whether the impact be great or small. The time, moreover, is inversely as the square root of the stiffness of the beam.

6. The results of calculations, comparing pressure with impact,

gave deflections agreeing with the observed ones, within an error of about one-eighth or one-ninth of the results.

[Report of 3d Meeting of Brit. Assoc. for Advanc. of Science.

On the Direct Tensible Strength of Cast Iron. By E. HODGKINSON.

The absolute strength of this metal, notwithstanding the extensive use made of it in the arts, is still a matter of doubt. If we turn for information to authors, we find Mr. Tredgold and Dr. Robison making it three times as great as Mr. Rennie, or Captain Brown, and the advocate of the greater strength (Tredgold) attributing the less strength, as found by the others, to the straining force not having been kept in the centre of the prism. For, supposing the extensions and compressions to continue always equal from equal forces, (which they are under slight strains,) a small deviation from a central strain would make a great reduction in the strength; and if the force were applied along the side of a square piece, the strength would be reduced to one-fourth. (*Tredgold*, Art. 61, 62, 234.)

The above contrariety of opinion was the cause of the following experiments, in which the utmost care was taken to keep the straining force along the centre of the castings, which had their transverse sections of the form +, except in the last two experiments, in which the section of the castings was rectangular, and the force applied exactly *along the side*. The iron was of a strong kind, the same as in the author's experiments on beams, (*Manchester Memoirs*, vol. v.) and was broken by a machine on Captain Brown's principle for testing iron cables.

Force up the middle.

Experiments.	Area of section in parts of an inch.	Breaking weight in tons.	Strength per square inch in tons.
1	3.012	22.5	7.47
2	2.97	21.0	7.07
3	3.031	25.5	8.41
4	2.95	19.5	6.59
			Different quality of iron

Force along the side.

Experiments.	Area of section.	Breaking weight in tons.	Strength per inch.
5	4.85	11.5	2.38
6	4.815	13.75	2.855
			mean 2.62

Whence the strength of a rectangular piece of cast-iron, drawn along the side, is rather more than one-third of $7\frac{2}{3}$ tons, its strength, as above found, to bear a central strain (for $\frac{2.62}{7.65} > \frac{1}{3}$.) but from the