

	Total Rain. Inches.
Combs Reservoir, 720 feet above sea	51.30
„ Ridge, 1,670 „ 35.85 in. + 20 in. for evaporation =	55.85

An occasional instance of less rain occurring on high land than on low land, like the one alluded to by Mr. Miller of Whitehaven, might, certainly, be met with; but the great weight of evidence was in favour of the conclusion, that up to a certain height within the region of the clouds, the rain was greater in proportion to the greater elevation of the ground. It was no less certain and curious, that in a direct line upwards, the greatest fall was upon the ground;—that there was less rain upon the top of a house than at the bottom, and still less upon the top of a church. This fact had misled many meteorologists into the belief, that the same rule applied to increased elevation of land.

If one of Mr. Homersham's funnel-gauges were placed in an exposed situation on Epping Forest, where the amount of rain was less than the evaporation from water, and visited at the end of a year, in the months of August, or September, Mr. Bateman had no doubt it would be found entirely empty.

MATHER'S ELASTIC METALLIC PISTON.

After the Meeting, Messrs. W. and C. Mather exhibited and described their Elastic Metallic Piston.

The main feature of this piston consisted in the combination of two helical coils, one placed within the other; the internal one giving the elastic power vertically and horizontally, the external case transmitting that power to the cylinder, and receiving the wear and tear against it. The essential elements of a good metallic piston, viz., horizontal and vertical elasticity, were thus secured in the formation of a perfect elastic metallic packing.

The great superiority of this improvement, was its simplicity; it only consisting of two pieces of metal, having vertical and horizontal elasticity in due and proper proportions, in simple combination, the horizontal elasticity keeping the packing steam-tight against the cylinder, and the vertical elasticity keeping it steam-tight between the top and bottom plates of the piston-block, thus allowing no space for the steam to escape in any direction. Another advantage was to be found in the mildness of the elastic pressure, which was generated by the circumference, and not by the diameter; thus creating but little friction, and consequently economising power and the wear and tear of the piston and cylinder. The internal helical

coil, if straightened out, would be equal to nine times the diameter of the cylinder.

It should also be observed, that the elasticity was perfectly circular in its action, always tending to wear the cylinder to a true circle, should it at first be otherwise. As the piston was self-adjusting, it accommodated itself to the inaccuracies of the cylinder, whether oval, or tapering, to a far greater degree than any other piston hitherto known. The small space occupied by the packing around the circumference, allowing a much larger water-way, rendered this piston superior to any other for air and cold water pump-buckets, for which purpose the external case was made of brass. The engine-man had no power of altering the elasticity of the packing, consequently, by keeping it clean, it would continue to work well until the casing was completely worn through. The steam, even if it got behind the packing, could not introduce itself into the body of the piston-block, the cover being accurately ground upon the outer rim of the block, and firmly screwed down by bolts near the external diameter, thereby preventing all ingress of steam into the interior of the piston, and consequently, the great strain upon the bolts, at each return of the stroke, in the common pistons.

It was constructed in the following manner: a cylinder of cast-iron of sufficient length was bolted to the face-plate of a lathe, and small holes were drilled at the starting and stopping places for the cutting tool. A cut was made in an oblique direction, by the ordinary traverse of a slide lathe, until nearly half way across the breadth, the cutting tool stopping at the hole drilled in that situation; a second cut was then made in a similar manner, but in a more oblique direction, by changing the speed of the traverse motion; and lastly, a similar cut was made from the middle to the outer edge; thus leaving the vertical elasticity in the part intended for the helical coil. Pieces were then cut off the ends of the coil to enable it to contract by a hoop, and thus to form the horizontal elasticity, the diameter of the hoop representing the cylinder in which the packing was required to work.

The external casing was simply a ring of cast-iron, or brass, with flanges on each edge projecting inwards. It was bolted against the face-plate of a lathe, and roughed over by the turning tool inside and outside: it was then cut with a small, or thin tool, once and three quarters round to the opposite edge, commencing and ending just within the flanges; the ends were next liberated by sawing through, then cramped together and made fast by the outside, and retained there until the edges and the inside were finished: the

stopping pieces were then fitted, and it was ground on the edges upon the block and cover in which it was to work. The case was now placed upon the block, and pieces of card-board, or thick paper were screwed between the block-case and cover, to hold it fast while the finishing cut was taken over the external circumference to the exact diameter of the cylinder. It was now ready to receive the internal coil, the flange of the casing, entering the part cut out of the internal coil, which was then screwed round until it came within the flanges of the casing, the joint opening considerably by its own inherent elastic power.

Before placing it in the cylinder, it must be coiled up by the hoop to the diameter of the cylinder, and when thus contracted, made fast, by screwing down the cover, upon pieces of card-board placed between the cover and the packing, nipping it sufficiently tight to prevent it from expanding when the hoop should be taken off. It could then be placed within the cylinder with perfect ease: the cover was unscrewed, and the card-board taken out; the cover was then screwed home upon the block, leaving the packing at full liberty to expand and come into contact with the cylinder with a mildness of elasticity peculiar to this form of metallic packing.

In all cases where segments were used, the cylinder was continually wearing into an irregular form, and required to be re-bored; for the segments, however small, could not be made to fit varying diameters; therefore causing a loss of steam, and consequently, of power. When two, or three annular rings, with one opening in each, were used, the elastic power was generally obtained by screws made to press against a V bit, the screws being acted upon by a plain spring of steel: the elastic power was very limited and stiff, and there was always a tendency towards an oval expansion, which caused the cylinder to wear irregularly. There was no vertical elasticity in either the segments, or the annular rings.

April 18, 1848.

JOSHUA FIELD, President, in the Chair.

IN accordance with the provisions of Section xi., Clause 4, of the Bye-Laws, the following proposition was brought before the Meeting, by the Council, and being duly moved and seconded, it was resolved:—"That the evening of Tuesday, the 30th of May, be devoted to the President's *Conversazione*, and that it be held in the rooms of the Institution."