and, in twelve or fourteen hours, they lost eight pounds per cubic foot, in Scotch sleepers, which then absorbed an equal weight of creosote. An average of $11\frac{1}{2}$ lbs. of creosote per cubic foot was now put into all the Memel timber at Leith harbor works; and it was forced in with a pressure of 180 lbs. per inch. One piece of creosoted timber had been observed at Lowestoft, which had been half cut through for a mortise, but not filled up again, and a teredo had penetrated a little way into it at that part, and then attempted to turn to the right, and then to the left, and had ultimately quitted the timber without proceeding any farther. Young wood was the most porous round the exterior, and consequently absorbed most creosote, which formed a shield to keep off the worm. The creosoted sleepers were better, after eight or ten years, than when new, because the creosote got consolidated in them, and rendered them harder. He had taken the idea originally from the Egyptian mummy; it was exactly the same process; any animal put into a creosote tank assumed the appearance and became in like condition to a mummy. Timber creosoted was now chiefly used in railways; but he believed that, if it was introduced into coal pits, it would be found that no timber so used in those places would rot.

The Chairman inquired whether, in the process of creosoting, the quantity of sap was calculated, and how the exact quantity of creosote that was put into the timber was ascertained.

Mr. Bethell replied, that every piece of timber was weighed before it was put into the creosote tank, and again when taken out; and each piece was required to be increased in weight, by the process, 10 lbs. per cubic foot. The quantity of oil used always rather exceeded the weight gained in the timber, on account of the loss of weight from the moisture extracted by the exhaustion of the air pump. He also remarked, in answer to another question from the Chairman, that oak only absorbed half as much creosote as Memel timber. Common fir creosoted would last double the time of hard wood creosoted, because it took more creosote. Beech made the best wood, being full of very minute pores; and they could force a greater quantity of creosote into beech than into any other wood; consequently it took a more uniform color throughout from the process. Long pieces of timber were found to require more time to saturate them in proportion to their length. The creosote appeared to enter at the two ends, and be forced up through the whole length of the pores; and the progress was known by the quantity of creosote forced into the tank after it was filled, according to the number of cubic feet of timber contained in the tank.

*An Investigation of the Strains upon the Diagonals of Lattice-beams, with the resulting Formule. By W. T. DOYNE, Assoc. Inst. C. E., and PROF. W. B. BLOOD.**

The experiments detailed in the paper were made on a model 12 feet in length, so constructed that the diagonals in compression (which were strips of mahogany, let into the top and bottom, but not fastened to them, and the ties, which were of hoop iron chains,) must of necessity take their

* From the London Journal of Arts and Sciences, December, 1861.

respective bearing and strain; and by the substitution of a dynamometer for any one of the ties, the strain on it could be accurately measured.

The results of the investigation (which were given in a table, showing a remarkable coincidence between the strains as measured and calculated) were, that for a parallel beam of one span, supported at each end and loaded at the centre, the strains throughout the diagonals were uniform, and the horizontal strains were greatest at the centre, decreasing uniformly at the points of support. For a similar beam, uniformly loaded over its entire length, the strains on the diagonals commenced at the centre, increasing uniformly to the points of support; while the horizontal strains decreased from the centre to the ends, in the ratio of the ordinates of a parabola. These results were arrived at by different methods of reasoning, and the formulæ derived from them were stated to be applicable to the more complex form of a closely intersected lattice, taking into consideration the increased number of triangulations.—*Proc. Inst. Civ. Eng.*

On the Discharge of Water over Weirs and Overfalls. By THOMAS EVANS
BLACKWELL, *M. Inst. C. E.**

[Paper read at the Institution of Civil Engineers, May 6, 1851.]

The establishment of certain natural laws in hydraulics has occupied the attention of philosophers from the days of Galileo to the present time, and although the great principles which now form the groundwork of modern hydraulic science are indisputably settled, yet much remains to be done by practical men, towards applying the necessary corrections for special circumstances; this is only to be accomplished by a faithful record of facts, and in engineering there is perhaps scarcely a branch where there is a greater want of them than in that of hydrodynamics.

This deficiency was particularly felt by the author of this paper, in the case of weirs or overfalls, established, by order of Parliament, for regulating and measuring the flow of water into a canal; and, as frequent doubts and disputes had arisen, the following experiments were undertaken for determining, by absolute trials, the discharge that might be expected from such orifices; and, as the opportunities for making such experiments are not of frequent occurrence, the results were carefully recorded, in order to submit them in detail for the consideration of the Institution.

The first set consists of a series of 243 experiments, made on overfalls of 3 feet, 6 feet, and 10 feet in width, with heads from 1 inch to 14 inches, and with the varying circumstances of having, for the overfall bar,—1st, a thin plate; 2d, a plank 2 inches thick; and, 3d, a crest 3 feet in breadth. These were all made on the Kennet and Avon Canal, in July, 1850.

The second set was made in conjunction with Mr. Simpson (V. P. Inst. C. E.), who has kindly permitted the results to be placed on record. The series consists of about 70 experiments, made on an overfall of about 10 feet in width. These were made at Chew Magna, Somerset, also in the summer of 1850. Although in some respects, as being made over a

* From the *London Architect* for January, 1852.