ing to one side of the centre, say at \( \frac{1}{4} \) the length of the lever from one end. Then, in order that the lever be balanced, the weight at B must be \( \frac{1}{4} \) the sum of A and B, and that at A, \( \frac{3}{4} \) that sum; for always B multiplied by \( \frac{3}{4} \) S must equal A multiplied by \( \frac{1}{4} \) S, and the sustaining force P must, of course, equal the sum of A and B. For example, suppose P, or A plus B, is 12 tons, and the span S is 20 ft. For equilibrium, the proportion of the 12 tons at A is in excess of that at B, precisely in the proportion that the lever of B exceeds that of A—in this case, 3 times. A, then, must be 9 tons, and B 3 tons, and \( \frac{3}{4} \) S multiplied by 9 equals 45, being the same as \( \frac{3}{4} \) S multiplied by 3. Again, supposing that there is but one weight, and two points of support, as in the

![Figure 25](image)

figure, the condition is precisely the same as before, only reversed, and, according to the law of the lever, we find that for equilibrium a force must be applied to A equal to \( \frac{1}{4} \) of P, and at B equal to \( \frac{3}{4} \) P. This last example is precisely the same case as that of a beam or truss of any kind, only A and B are now called the reactions of the abutments, the sum of which must always be equal to the weight or weights causing them. In order then to know just how much of the weight at any point of a