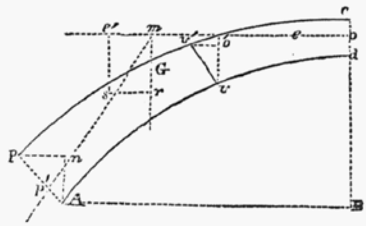
effect, the load upon the different parts of the arch and the curve of its intrados must bear such a relation to each other, that the line of pressure will never fall outside the limits of any joint, but will approach as nearly to the centre of the joint as possible.

To find the relative length of the joints at different points of an arch, and the line of direction of the pressure.

FIG. 75.



Let $c\,d$ represent the depth of the joint at the crown necessary to resist the horizontal thrust, as determined from assumed dimensions, and let this force be represented by a line $o\,e$, equal to $c\,d$, applied at the centre of pressure (o). Let G represent the centre of gravity of the arch $A\,d$, and $m\,r =$ length of line that represents the weight. Transfer the force at o to the point m, and make $m\,e' = o\,e$. Construct the parallelogram of forces $m\,s$. As $m\,e'$ represents the length of joint necessary to resist the horizontal force, $m\,r$ would be the length sufficient to sustain the weight, and the resultant $m\,s$ would represent the length of a joint, to resist the combined pressure of the two forces. Draw $A\,p$ perpendicular to $m\,s$, produce and equal in length to $m\,s$. $A\,p$ will represent both the length of the joint at the point A, and its proper direction, since it is perpendicular to the line of pressure $m\,s$.

By drawing $p\,n$ parallel, and $A\,n$ perpendicular to $A\,B$, we find that the triangles $A\,p\,n$ and $m\,s\,r$ will be equal, hence, $A\,n = s\,r = c\,d$, and as the same is true at any other point it follows, that *the difference of level of the extremities of any joint of the arch should be equal to the depth at the crown.* Also as $p\,n = m\,r =$ weight of portion of arch $A\,D$,