angle, also MN a chord in the circle $MPNQ$, is normal to PQ by construction, so that MN is bisected at A. Thus in the circle $MPNQ$, there are two chords PQ and MN intersecting at A, hence

$PA \cdot AQ = MA^2$

hence $PA\ (PQ - PA) = b'^2 - PA^2$

that is $PA \cdot PQ - PA^2 = b'^2 - PA^2$ from which $PA \cdot PQ = b'^2$

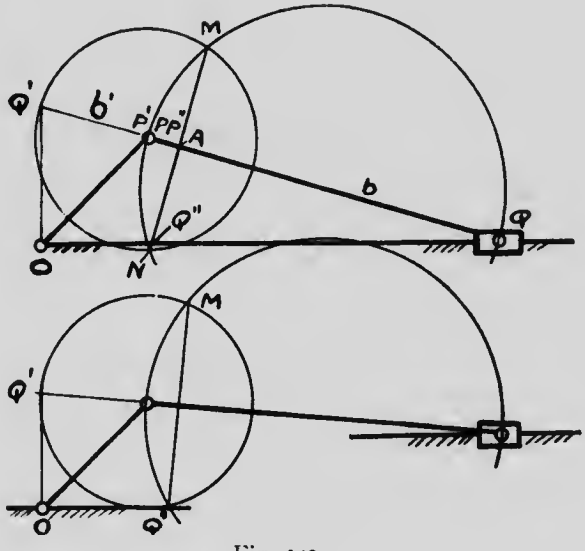

Fig. 143

or $PA \cdot b = b'^2$ or $PA = \dfrac{b'^2}{b}$ which proves that the construction is correct.

THE EFFECTS OF THE ACCELERATIONS OF THE PARTS UPON THE FORCES ACTING AT THE CRANK SHAFT OF AN ENGINE.

In order to accelerate or retard the various parts of the engine, some torque must be required or will be produced at the crank shaft, and a study of this will now be taken up in detail.

(a) *The effect produced by the piston.*

By the construction already described the acceleration of the piston is readily found and it will be seen that Q'' lies first on the cylinder side of O and then on the opposite side. When Q'' lies