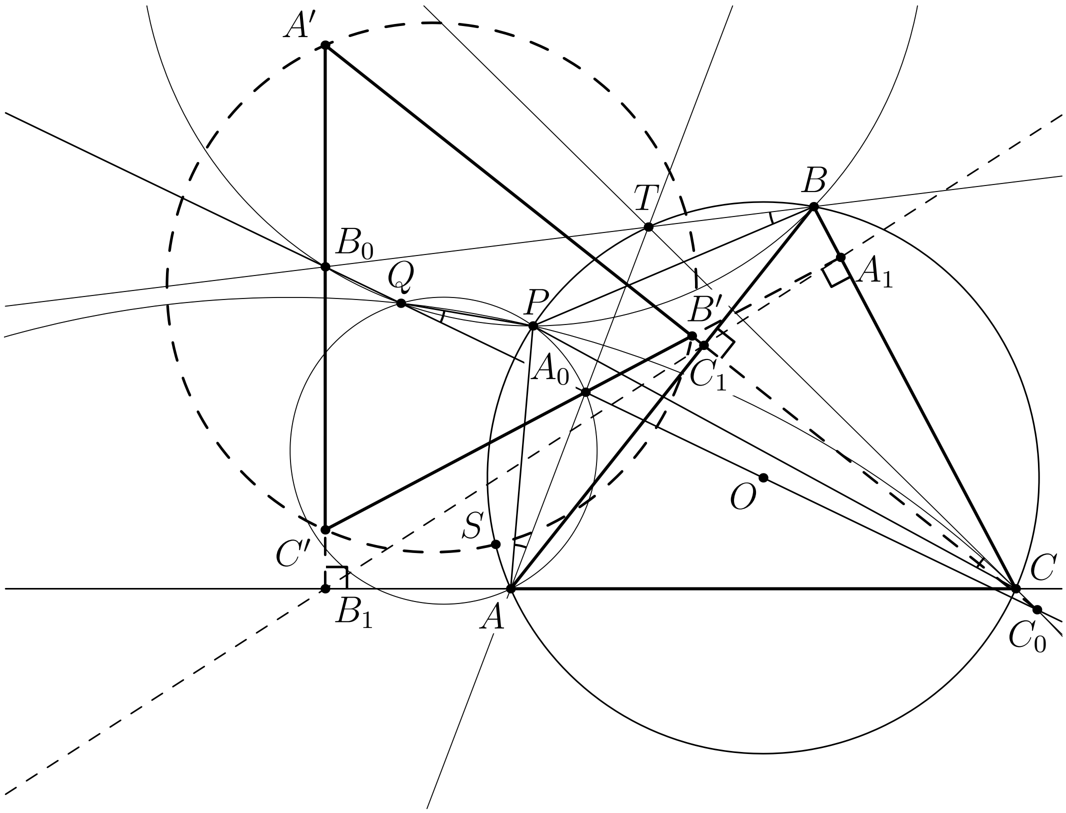

Solution. As usual, we denote the directed angle between the lines a and b by $\measuredangle(a, b)$.

Claim 1. Lines AA_0, BB_0, CC_0 are concurrent at T, which lies on the circle (ABC).

Proof. Let $T = BB_0 \cap CC_0$. Since quadruples of points P, Q, B, B_0; Q, P, C, C_0; Q, P, A, A_0 are concyclic, we have $\measuredangle(PB, BT) = \measuredangle(PB, BB_0) = \measuredangle(PQ, QB_0) = \measuredangle(PQ, QC_0) = \measuredangle(PC, CC_0) = = \measuredangle(PC, CT)$, which means, that poins P, B, C, T are concyclic. It follows, that $T \in (ABC)$ and $T \in BB_0$. Now we define $T' = BB_0 \cap AA_0$. Similiraly, points P, B, A, T' are concylic. That gives us, that $T' \in (ABC)$ and $T' \in BB_0$, which means, that $T = T'$ and we are done. □

Let A',B',C' denote the intersection points of lines BB_0 and CC_0, AA_0 and CC_0, BB_0 and AA_0 respectively.

Claim 2. Let $S = (ABC) \cap (A'B'C')$. Then S is symmetric to P with respect to line OQ.

Proof. □

Claim 3. Lines AA', BB', CC' are comcurrent at S.

Proof. □