allel to SQ, which determines S^1; also $R^1T^1 : T^1Q^1$ = RT :) determines T^1. Next, since we know the motions of $U \to S$ and $U \to T$, we draw U^1T^1 parallel to UT and S^1U^1 parallel to SU, and thus U^1 is determined. If a be assumed to turn in the sense shown with angular velocity ω, then the angular velocity of SU is $\frac{S^1U^1}{SU} \cdot \omega$, and is in the same sense as a, and the angular velocity of UT is $\frac{U^1T^1}{UT} \cdot \omega$ in opposite sense to a. The linear velocity of U is $OU^1 \cdot \omega$, the direction is to OU, and the sense is to the left.

Fig. 7 gives a further example in which a sliding pair is introduced. OP is again the link of reference and P^1, Q^1, R^1 and S^1 are found as before. The direction of T is given in space by construction. It slides in the directions shown. Hence T^1 will

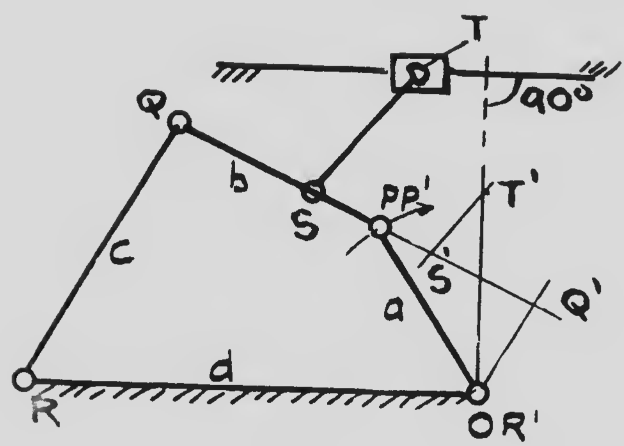

Fig. 7.

lie on a line through O ⊥ to the direction of T, and as T^1 lies on S^1T^1 parallel to ST, T^1 becomes fixed. The velocity of T is $OT^1 \cdot \omega$ its direction ⊥ to OT^1, and its sense is to the right.

Fig. 8 shows the engine m anism in two forms, (a) where the piston direction passes t the crank shaft, (b) where the cylinder is offset. The same letters and description apply to both. Evidently Q^1 lies on P^1Q^1 through P^1, parallel to PQ (here on QP produced), and also since the motion of Q in space is horizontal, Q^1 will lie in the vertical through O. Thus the velocity of the piston Q is $OQ^1 \cdot \omega$ in the direction and sense shown, and offsetting the cylinder evidently decreases the piston velocity in this position, and it may be shown that there will be a corresponding increase in the return stroke. The angular velocity of the rod is $\frac{P^1Q^1}{PQ} \omega$. Inspection shows that