CHAPTER VII.

CONSTRAINT AND VELOCITY RATIO IN HIGHER PAIRING INVOLVING PLANE MOTION.

60. Constraint of Bodies having Plane Motion.—It has already been stated that a body free to move in a plane possesses three degrees of freedom and has three degrees of constraint. Further constraint may be applied by causing such a body to touch certain points on the surface of a second rigid fixed body, these points being known as points of restraint. A *point of restraint* of a figure or body may be defined as a point on its outline, so touched by a point on the outline of a second fixed figure or body, that no relative sliding motion is possible along or parallel to the common normal to the two figures at the point of contact. When thus restrained the body or figure is considered as being kept in contact with the point or points of restraint.

We may take an example to illustrate the meaning of this definition, and to show the actual nature of points of restraint. Suppose (in Fig. 116*a*) that it is required to arrange a support or base, *a*, for a tripod, *b*, so that an instrument fixed on *b* can be removed from its support and replaced exactly in its previous position. This may be effected by providing *b* with three rounded points or legs, *CDE*. A hole, *F*, is made in the base, *a*, and is of pyramidal or conical form, so that if the rounded end of *C* is placed in *F*, there will be contact at three points of restraint; in this way, so long as the contact is maintained, the only possible relative motion of *c* and *a* will be one of rotation about some axis