

PLAN OF A CURVE-TRACING APPARATUS.

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I HAVE devised a curve-tracing apparatus on the following plan :

Imagine two planes Π , Π' moving in the same horizontal plane, and above the two planes respectively the two points P , P' moving in the same or a parallel plane.

To fix the ideas, suppose that the two planes each move according to a law (that is, let the motion of each of them depend on a single variable parameter; for instance, they may each of them rotate about an axis); but let the motion of the two points be free.

Suppose, next, that the planes are connected together in such manner that the motion of one of them determines the motion of the other (e.g. by a train of wheel-work); and that the two points are also connected together in such manner that the motion of one of them determines the motion of the other (e.g. by a pentagraph; or by a slotted rod, the slot of which works on an axle, so as to allow the rod to move lengthways as well as rotate).

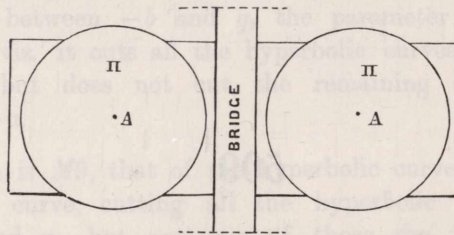
Suppose, finally, that one of the points, say P' , is attached to a point of the plane Π' ; then the plane Π being set in motion, this determines the motion of Π' , consequently of P' , consequently of P ; and the moving point P , or say the pencil P , will describe on the moving plane Π a curve, the nature of which will of course depend on the nature of the motions of Π , Π' , and on that of the connection between these planes and of the connections between the points P and P' .

I propose to describe the apparatus as nearly as I have actually constructed it. (See sketch-plan Fig. 1, and side-elevation Fig. 2.)

The framework of the instrument consists of two longitudinal bars (B) each about three feet long, one inch thick, and three inches broad, supported edgewise at a distance of about eighteen inches on the cross-pieces C , C ; and half-way between them, supported by the same cross-pieces, is an axis carrying at each extremity two mitre wheels. The bars B support three cross-pieces D , D , D , and between these are

the moveable cross-pieces E, E carrying the axes A, A with the attached mitre wheels, and circular disks X, X . Each of these wheels separately may be placed (as in the figure) out of gear with the two vertical wheels, or it can (by moving the

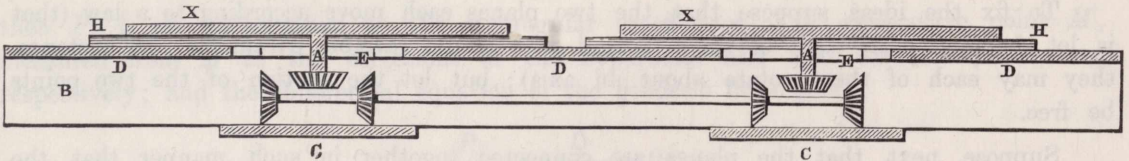
Fig. 1.



cross-piece E) be brought into gear with either of these wheels. Each axis A passes through a circular disk H , capable of rotating about it, so that it may be fixed in any position, and serving as the bearing for the plane X .

The disks X, X may be regarded as being themselves the planes Π, Π (say these planes are rigidly attached to X, X respectively); or we may, in any other manner, move the plane Π by means of the disk X ; for instance, X may carry a spur-wheel gearing into a spur-wheel on the under surface of Π , and thereby communicating a

Fig. 2.



rotation of different velocity to the plane Π ; or the connection may be as in the ordinary oval chuck. In any such case, the disk H (which, for this reason, was made to project beyond X) serves as a support for the plane Π , and the apparatus connected therewith; and observe that the angular position of such apparatus, and therefore of the path of any point of Π , may be varied at pleasure by moving the disk H through any angle.

Detached altogether from the rest of the instrument, or what is better, supported on longitudinal pieces carried by the cross-pieces C, C we have a bridge (see fig. 1) capable of adjustment as regards height, and serving as a support for the pentagraph-apparatus, or other connection of the one plane Π with the pencil which works upon the other plane Π .

It is hardly necessary to remark that in the simple form of the instrument where the disks X, X are themselves the planes Π, Π , then putting the mitre wheel of one plane X in gear with either of the corresponding vertical wheels, and making the plane rotate, the other plane X will rotate with the same angular velocity, in the same or the opposite direction, or it will remain at rest, according as its mitre wheel is in gear with one or the other of the corresponding vertical wheels, or is out of gear with each of them.