BALL JOINTS

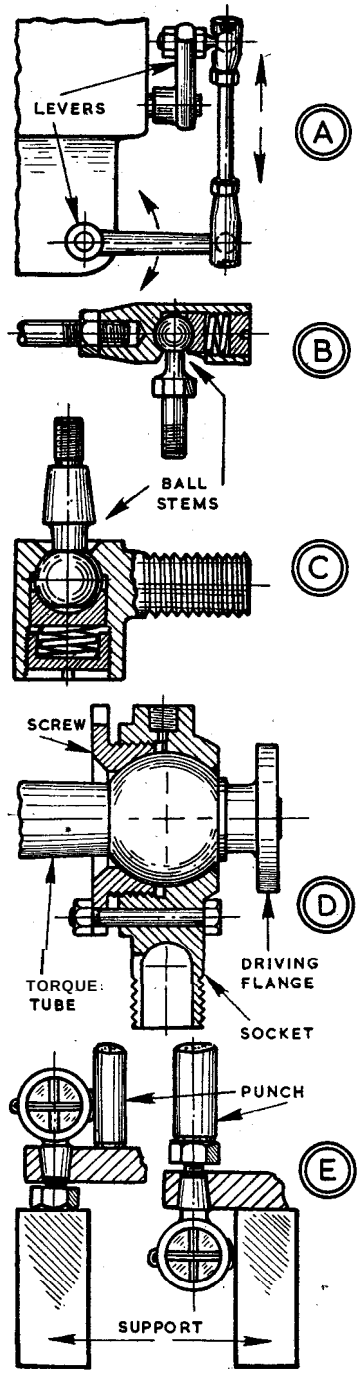
By GEOMETER

THE particular value of a ball joint in mechanisms is that, unlike a hinge or pin joint which constrains movement to a given plane, movement in any direction within set limits is possible. A ball joint may be likened to the shoulder joint of a person, permitting the whole arm to be raised or lowered, directed forwards or backwards, and 'the hand to be swung in circles of varying size; whereas, the elbow joint, a hinge type, has a much more limited movement.

A ball joint can be utilised broadly in three ways in mechanisms, to provide-(l) directional setting with clamping, as on swivelling vices or the heads of camera tripods; (2) location at a fixed point for an arm or link, the movement of whose opposite end must not be constrained to a single plane, examples being torque tubes of rear axles on cars like old type Austin Sevens and Ford Populars; (3) connections between levers swinging in different planes, as on throttle and steering linkages on cars, on the principle shown at ***A***.

Three conditions

The first consideration for a ball joint is that on its functional surfaces the ball must be a reasonable " sphere," since in the absence of this there is certain to be a "tight and loose " effect, reducing the efficiency of the joint whether it is employed for clamping or locating, or for transmitting movement. Secondly, the cups or containing surfaces must agree sufficiently well with the ball to avoid rapid initial wear and bedding down. Thirdly, when the connection is between two



levers, the bodies or housings forming. the cups must be appropriately set to eliminate binding or cutting on the ball stems at all positions.

Thus, however, the levers at ***A*** may be moved, it should be possible to twist the rod connecting them to and fro to a small extent. This requires the ends to be set at suitable angles by the locknuts. It is important in the case of throttle linkages to obviate jerky movement-or in some instances the joints springing off; while on steering linkages it is vital that the ball stems should not be cut and weakened.

Without affecting the principle, a ball joint for a linkage can be arranged as at ***B*** and C. At ***B,*** the ball passes through an elongated hole in the side of the body; and at C, the ball stem itself is passed through the body. In each joint, one cup is formed in the body, and the other is held up by a spring, which is backed by a cap that can be adjusted with a screwdriver and secured by a split pin.

Automatic adjustment

Provision of spring loading for one of the cups ensures automatic adjustment for wear and maintains the joint tight without binding in the event of a ball not being perfectly spherical. Where there are heavy thrust loads, as on steering mechanisms, the jomt at C keeps deflections in both directions to a minimum, for neither way is there a direct push on the spring loaded cup as occurs at ***B.*** For light loads, ball stems are made with parallel shanks, but for heavy duty the shanks are tapered to fit in arms.

The torque tube joint of the Austin Seven, an example of a specialised ball joint, is as at ***D.*** The ball is part of the tube and the large diameter screw has a serrated flange, locked by a bolt passing through. The socket is located on a chassis cross member by a small ball joint. To adjust the joint, the bolt is removed, and the screw tightened by levering or punching on the flange. Free movement should obtain without play. All adjustment being taken up, some extra can be provided by facing the front of the socket and deepening the recess in a lathe, to allow the screw to go further in.

Freeing of taper ball stems can be effected as at ***E,*** supporting either the nut or the arm on a block or jack, and punching the other down. ❑