also obtainable, the latest type of which will cut the trenches of *two* strings in less time than it normally takes a man to *set out* one.

A simple device consists of a metal grooved templet which is graduated to permit of its adjustment to the required rise and going. The only setting out line required is that shown at M (see H, Fig. 31) which is pencil marked at the required distance from the lower or back edge of the string. The templet is clamped to the string in the desired position, and the trenches for the first riser and tread are routed out by means of a cutter which is easily manipulated between the slotted or grooved guides. A pencil mark is then made at the intersection between the gauge line M and the top of the tread cut, the templet is slid along until the outside of the riser guide intersects this mark, the appliance is again clamped and the trenches for the riser and tread of the second step are routed. This is repeated until the trenching of the string is completed.

A similar device can be attached to a spindle moulder (see B, Fig. 5 and p. 29) and the trenching of a string can be automatically completed at one setting.

The stair trencher referred to above consists, briefly, of a vertical cutter spindle, the cutter of which travels within guides (adjusted to the required going and rise) as it forms the trenches in both strings during a continuous operation.

There are several methods employed in assembling the various parts of a stair, depending upon local practice, if mass-produced, etc. In one method all of the treads are first fixed to the strings, followed by the risers. In another each step, with its tread and riser, is framed together; the steps are then fitted in the trenches of one string, after which the second string is fitted and cramped.

Briefly, the sequence of operations in the first method are: After the strings have been trenched and the treads and risers have been prepared (*i.e.*, tongued, grooved, nosed, cut square to correct length and dressed), the first and last treads are housed into the corresponding trenches of both strings, cramped after being tested for squareness, nailed and wedged. The strings are now placed with their front or upper edges resting on the bench, and the remaining treads are inserted between the trenches, each being tested, cramped and glue wedged in turn. After the outer ends of the wedges have been removed as required, the risers are inserted and wedged. The treads and risers are then screwed (in best work—see F, Fig. 30) or nailed and glue blocks are fitted to the inner angles. The treads may also be skew screwed or nailed to the string. Scotia mouldings, if required, are glued and sprigged to the treads.

In the second method the steps are made separately before being fixed to the strings. One simple appliance, called a *cradle*, which is employed to ensure that the riser is fitted at right angles to the tread, consists of two angle brackets, each being a 3-in. by 2-in. by 18-in. long wood bearer to which a shorter piece of similar scantling is securely fixed vertically and squarely at one end; each upright or leg is notched on its inner edge where it joins the horizontal bearer, the size and shape of the notch being similar to the nosing of the tread (and scotia, if needed); the brackets are screwed to the top of the bench, at about 2-ft. apart, the horizontal members being parallel to each other and at right angles to the base of a try square used for ensuring squareness. The tread, outer face downwards, is placed on the bearers with the nosing engaged in the notches of the uprights. The upper tongued edge of the riser is glued and fitted into the groove of the tread as the riser is held against the uprights. The blocks are then glued and fitted to the inner angle. If required, the scotia is glued and inserted before the riser is fitted. When the glue is sufficiently dry, the step is carefully removed and allowed to set. After all the steps have been formed in this manner, the next operation is to fix them to the strings. A string, with its trenched face uppermost, is placed on the bench and each step is placed vertically with its lower end fitted into the trench. When all the steps have been housed, the second string is placed in position with the upper ends of the steps engaging in the trenches. The stair is then cramped; if the flight is assembled on a bench specially equipped for this purpose, the cramps employed will be of the overhead type; otherwise ordinary T-cramps are used. The treads and risers are now wedged, care being taken to see that each tread is driven tightly against the trench nosing before the tread wedge, well glued, is driven home. To ensure that none of the nosings are out of winding, a straight edge is applied to them and any nosing not touching it is driven tighter as required. Glue blocks are fitted between the treads and strings, and treads are screwed to risers, etc., as described above. The top nosing is neatly tongued and grooved or splay jointed to the adjacent floor boards after the stair has been fixed.

As previously mentioned, the stair is well secured by nailing the strings to plugs which have been driven into the joints of the brickwork. The 4-in. by 3-in. bearer or carriage (see C, Fig. 30) is then birdsmouthed and securely nailed to the fillet at the foot and the wall plate at the head. The 1-in. rough brackets are sawn to shape and each is well spiked to the side of the bearer after its upper edge has been glued and fitted to the underside of the tread.

The ends of the strings are cut to the required length—any easings having been previously formed—and the skirtings are neatly fitted to them. Attention is drawn to the note at G, Fig. 30, to the effect that the moulding on the skirting should conform to that on the string, and its thickness should be equal to the projection of the string beyond the face of the plaster. A clumsy finish frequently results because of inattention to this detail.

Fixing of the handrail to the wall, at the required height, completes the stair.

DOG-LEG STAIR

This is so called because of its appearance in sectional elevation. It is a convenient form when the going is restricted and sufficient space equal to the combined width of two flights only is available. It is illustrated at B and H, Fig. 29, and in Figs. 32, 33, 34 and 35.

Small scale plans of a house showing the application of this type of stair are given at A and B, Fig. 32, and a larger scale plan and sections are shown at C, D and E. Reference to the isometric sketch of this stair at A, Fig. 34, will give a better idea of its appearance. It will be seen that the balustrade of the upper flight is immediately over that of the lower.

STEPS.—A detail of the steps and a note upon their proportions are given at F, Fig. 32. The inclined risers are an alternative to the more usual vertical form already described and give an attractive appearance to the stair, especially if a simple nosing is employed. The edge of the nosing is parallel to the riser, the slope of which should not be too flat, otherwise the projection of the nosing beyond the bottom of the face of the riser will be excessive (see p. 82). The jointing, housing, wedging, blocking and bracketing of the steps are as described for the straight flight stair. The bottom splayed step is detailed at D and E, Fig. 39.

STRINGS AND NEWELS.—The outer ends of the steps are housed into the outer strings, the thickness of which is usually $\frac{1}{2}$ in. more than that of the wall strings, *i.e.*, 2-in. As the stair is 3-ft. wide and the upper flight at least has a plastered soffit, the upper string is necessarily wide (see L, Fig. 34), but the lower outer string need only be 10-in. (nominal) wide (see F, Fig. 32), as the spandrel is panelled (see C). This outer string of the upper flight may be in one piece, 15-in. wide (see M, Fig. 34), or it may consist of two tongued and grooved pieces (see B and L, Fig. 34); for narrower stairs, when a rough carriage is not required, the laths of the plastered soffit may be nailed direct to the steps and parallel to the pitch (shown by broken lines in the detail in Fig. 33). Both outer strings are secured to 4-in. by 4-in. newels placed at the foot and head of