purpose. Stairs of fine concrete to which is given the name of "artificial stone ” have largely superseded those constructed of genuine stone. It is very strong and capable of being further forti­fied by the introduction of steel core bars, without detriment to its appearance; it is consistent in quality and special shapes are readily moulded; it is very hard-wearing, especially when the aggregate consists of a hard nature such as granite chippings. The stairs are built by pinning each step in the wall either at one or at both ends. In the first case they are termed *cantilever* or *hanging steps,* and it is advisable to use steel reinforcement and pin the end of the step at least 9 in. into the wall. When fixed at both ends the pinning need not be so deep, and unless the stairs arc very wide the steel core may be omitted. The steps are either rectangular or spandrel-shaped in section (figs. *2* and 3); the former are stronger and easier to fix than the latter, which, however, give a better appear­ance and can be finished with a plain smooth soffitt. Iron balus­ters are generally used for stone and concrete staircases, and are fitted with lug terminations which arc let into dovetailed mortices formed in the top or side of the stair tread and held fast by molten lead, neat Portland cement, or a mixture of sulphur and sand.

The construction of wood staircases forms a special branch of the joinery craft, and many books have been written on the subject. Numerous methods of setting out the handrails have been put forward by different authors, among them being the tangent system, which gives excellent results at perhaps the smallest cost compatible with good work. It is noteworthy that the common practice in England with regard to wood stairs is to frame and form the finished work in the workshop and fix it bodily in the position it has to occupy. In America, especially in the eastern states, the finished staircase is built up piece by piece upon a rough framework which has been used by the workmen during the erection of the carcase of the building. In many instances the strings consist of easings and panellings nailed upon the rough skeleton work.

Stairs are built in many kinds of materials, such as wood, stone, concrete, iron and brick. Often two or more kinds of materials are used in the same staircase, as when constructions of concrete or stone are reinforced with iron or steel. It is common also to fit to a staircase handrails, balusters and newels of a different nature from the steps themselves. The spandrel or triangular-shaped space between a flight of stairs and the floor is frequently enclosed with wood-panelled framing and fitted with a door so that it may be made use of for cupboard accommodation.

There are a number of technical terms connected with staircases which require some explanation to enable the drawings to be easily understood :—

*Staircase.*—This comprises the whole of the stair construction and is the name given to the space or enclosure which contains the stairs.

*Well-hole,* the open space enclosed by the stairs.

*Flight,* a continuous series of steps between two landings.

*Landing,* a platform forming a kind of halting-place between two flights of stairs. A *quarter-space landing* forms a space, usually a rectangle, equal in width and length to the breadth of the two flights which it separates. A *half-space landing* extends the total width of the staircase.

*Flier.—*Fliers are steps that have the nosings of the treads parallel one to another..

*Winder.—*This is an angular-shaped step. A winder fitted into a wall angle is often termed a *kite winder,* from the fact that it resembles a kite. In planning stairs the width of the winder tread at a distance of 18 or 20 in. from the handrail should equal the width of a flier.

*Curtail Step.—*This may be either a flier or a winder. One or both ends of the step arc projected to form a base for the newel and are shaped to a scroll which often follows the line of the curve terminat­ing the handrail. It is usually the step or steps at the base of a staircase that are formed in this way.

*Bull-nosed step,* one having a blunt rounded end. It may be shaped to a quarter or half circle.

*Dancing Stairs.*—The introduction of winders in geometrical staircases brings about awkward complications in the curve of the handrail and strings, for the width of the. winding steps at the hand­rail being much less than that of the fliers, while at the same time the rise is necessarily equal, causes an unsightly knee in the handrail and in the strings. To obviate this the whole of the steps are made to dance, that is, they are all shaped as winders in order to divide the going equally between them and thus obtain a regular slope for the strings and handrail. Often the first and last three or four steps of a flight are made ordinary fliers. In a polygonal or elliptical staircase the whole of the flight is constructed in this way so as to obtain a regular sweep up from the bottom to the top *step.* Each step may be divided into several different parts such as the *tread,* the *riser* and the *nosing.* The tread is the horizontal upper surface of the step which supports the foot when ascending or descending the stairs. The riser is the upright member of a step which supports the tread. It fills in the vertical space between the nosing of one tread and the back edge of the one below. The edge of the tread usually projects some little distance beyond the face of the riser and is formed into a rounded or moulded nosing, Stone stairs and those of concrete usually have each step formed separately in a solid piece of stone of square or triangular section, and these are fixed in position by being pinned into the wall at one or both ends with each step resting upon the back edge of the one below. Stairs of costly marble are frequently built up in a manner somewhat similar to that adopted for wood construction.

*Rise,* the vertical distance between the surface of one tread and that of the next.

*Going,* the horizontal measurement between two adjacent risers. In America this is termed the *run.*

*Newels,* strong posts occurring at intervals in a newel staircase. They are placed at the ends of flights where junction is made to landings, at turnings, and at the top and bottom of the staircase. They should be strongly framed in the stair construction, and have the string and handrail housed into them. Newels are sometimes of iron, and in large stone staircases of stone. They are sometimes of elaborate form and often designed as a pedestal carrying a lamp or statuette, or they may be carried up to form part of some orna­mental framing around the staircase. In America the *newel* is the main post where the stairs begin, and the remainder of the posts used in the framing are termed *angle posts.*

*Handrail.—*This is a rail commonly of hard wood which runs up at the same slope as the stairs at a height above the nosing line of about 2 ft. 8 in. (that is 3 ft. minus half a rise) to the upper surface of the rail. On the level, such as on landings, it is. usually fixed 3 ft. above the surface. These are the heights at which a handrail is found to give most assistance to persons going up or down stairs. Handrails are made in other materials such as iron and bronze. A handrail is generally upheld by *balusters,* which are vertical bars or posts filling in the space between the handrail and the string or the treads. They are made in many shapes and in many different materials such as wood, iron, bronze, stone and marble. Sometimes in the place of balusters the space usually occupied by them is filled in with scrollwork of wrought or cast iron or bronze, or with panels of wood perforated, perhaps, and richly carved.

*Core-rail.—*An iron band is frequently used in geometrical stairs to give extra strength and stiffness to the handrail. It is generally about 1/4 in. thick, being screwed into a groove formed in the under­side of the handrail. It is especially necessary for the curved portions of the handrail, where the grain of the wood is often cut across.

*String.—*Strings are the members that carry the treads and risers which in wood stairs are housed into them or else fitted into notches cut in the strings to receive them. In the former case the supporting member is termed a *close string,* but if notched out for the steps it is known as a *cut string* (see details, fig. 4). A *cut and mitred string* is similar to this last, but has the vertical cut of each notch splayed and the riser is mitred to it so as not to show the joint. Strings are either *wall strings* or *outer strings*; the former are fixed against the wall, the latter run up from newel to newel or in geometrical stairs ramp and curve according to the nosing line. *Rough strings* or *rough carriages* are placed between the inner and outer strings to afford additional support to the treads and risers, and *rough brackets* about I in. thick are fitted into the steps and spiked to the carriages.

*Ramp.—*This is a concave curve formed in one plane when changing the direction of the handrail or string. In America it is known as an *easing.*

*Knee.—*This is a convex curve in one direction.. When used in conjunction with a ramp it forms a *swan-neck,* which is a combination of ramp and knee.

*Wreath.—*This is a curve formed both horizontally and vertically in the handrail or string. It is often necessary in geometrical stairs where a change of direction takes place.

Although more in the nature of a mechanical lift or elevator than a stair, moving stairways may perhaps find a place in this article owing to their resemblance and to the fact that their object is to convey the passenger quickly and easily to a higher level without the necessity of a tedious climb up stairs, or of a wait such as is often entailed with a vertical lift. The contrivance consists of an endless inclined platform formed of links bolted together, which allow it to travel round wheels fixed at the top and bottom of the stairway and hidden within its framing. This is kept in continual motion by mechanical means, usually by an electric motor, which causes it to travel at the rate of about 100 ft. a minute. The handrail also moves at the same rate, so that a passenger merely steps on to the lower portion of the stair, places his hand upon the handrail, and is carried swiftly and safely up to the next floor, where he is depositcd without any effort on his part. The process of stepping on and getting off the stairway is amazingly simple and without any element of danger