respective dimensions of which vary according to the impor­tance of the staircase and the space which has been given to it; in external flights or stairs, such as those at Persepolis, the tread is so wide and the riser so small in height as to allow of a horse ascending, and generally in garden terraces there is the same slight rise. For the stairs of a palace or municipal build­ing, 14 in. tread and 5 in. riser would be required, but as a rule 12 in. tread and 6 in. riser is adopted. In the stone staircase in the palace at Cnossus in Crete,· the treads were 18 in. and the risers 51/2 in. In ordinary houses 9 in. or 10 in. is generally .given for the tread, and 6⅛ in. to 7 in. for the riser. In the stairs leading to lofts, and in yachts or steamers, the ascent is much steeper, having sometimes 10 in. rise and 5 in. tread. The series of stairs provided to ascend from one floor to another when enclosed with walls is known as a staircase *(q.v.).* Unenclosed flights of steps placed in front of a building are known by the French terin *perron* (*q.v*.), usually applied to a structure like the horseshoe staircase of the palace at Fontainebleau, the stairs of which are carried on a support independent of the main wall of the palace. From this point of view the great return flight of steps at Persepolis might be looked upon as a staircase, because on one side the steps are all embedded in the main wall of the platform.

Belonging to the same type are the great flights of steps which led to the successive stages of the Ziggurats or Assyrian stage towers; those in front of the Propylaea, leading to the Acropolis at Athens; the stairs leading to the Propylaea (150 ft. in width) at Baalbek; others in Palmyra; and generally all the Roman temples. In medieval times should be included the great flights of steps which stood in front of the cathedrals of Europe, some of which, as those at Le Puy in France, Ste Gudule at Brussels, the cathedral at Erfurt in Germany, S. Miniato at Florence in Italy, and others, still exist, not having yet been buried by the gradual raising of the ground-level in great towns; also the immense flights of steps in Rome, leading up to the Trinita del Monte and the Capitol, and those found in all towns built on hills, when an architectural composition has guided their plan.

In Egyptian architecture inclined planes took the place of stairs, as in the sloping corridors of the Great Pyramid, the descent leading to the temple of the Sphinx, and the approaches to the two temples of Deir el-Bahri, one of them the oldest temple found. Inclined planes were also provided in front of some of the Greek temples, where the steps of the stylobate were of great height; similar contrivances were adopted by the Mahommedans in Egypt to ascend the minaret of Ibn Tūlūn and el Hakim; in the great circular tower at Amboise, and in the fallen campanile of St Mark’s, Venice. (R. P. S.)

**STAIRCASE,** the term usually applied (Fr. *cage d'escalier.* Ger. *Treppenhaus)* to the stairs leading to the upper floors in a building, including the enclosure walls. In the ordinary house a single staircase only is provided; in larger ones a second or service staircase; in those of more importance, especially where the principal reception rooms are on the first floor, a grand staircase leading to the latter, and other subsidiary stairs or staircases.

*Architecture.—*Among the earliest examples are those found in Egypt, generally built in the thickness of the walls, as in the pylons and temples; a remarkable example was found by Dr Arthur Evans in Cnossus, in Crete, consisting of a staircase in stone, 6 ft. wide, with return flights of stairs, rising through two floors; the staircase in the temple of Zeus at Olympia leading to the gallery, is supposed to have been in wood, but in some of the Greek temples have been found stairs in stone with return flights. In the Tabularium at Rome there is a long flight of 67 steps leading up from the Forum to a hall at the back, but otherwise there are few examples of ancient Roman staircases, and none of any importance have been found in Pompeii. Of medieval staircases the principal examples are those in stone built round a circular newel, to provide means of ascent to the various stages of the church towers. One of these, at St Gilles in Provence, is covered with a semicircular

rising vault, which is known as Vis St Gilles; some of these circular staircases are 12 ft. in diameter, others, like those in the campanile of Pisa, are built in the thickness of a circular hall with well-hole in centre. In the 15th century some of the stone staircases leading to the rood loft, with open tracery round the edge, are of great elaboration and beauty, as at St Maclou, Rouen. In the 16th century in France, in the châteaux of the Loire, are many examples, among which the circular staircases at Blois, two of them in square towers, the third octagonal in plan and on one side open at’intervals to the court, has a great circular newel enriched with arabesque carving, and a rising elliptical barrel vault with ribs and bosses. In the château of Chambord the great staircase in the middle, which is built round a circular well-hole, had two separate flights, one over the other, so that, starting from opposite sides on the ground floor, two persons could ascend without seeing one another. At Azay le Rideau, Loire, and in the château of St Germain-en-Laye, the staircases in return flights are built between walls, and the same is found in the ducal palace at Venice and most of the palaces of Rome. At Venice, in the Palazzo Minelli, the staircase is in a circular tower with open arcades and balustrades. The most famous staircase in Spain is that in the north transept of Burgos Cathedral, remarkable for the magnificent iron-work of its balustrade; and in England the staircase leading to the hall of Christ Church, Oxford, with a magnificent fan vault, is a fine example. In the 16th and 17th, centuries in England the grand staircases of the great mansions were usually in wood, the finest examples being those at Hatfield, Knole, Audley End, &c. They would seem also to have been regarded as part of the great entrance halls, but in France and Italy they assumed greater importance, being always in stone or marble, with colonnades or arcades round the staircase on the first floor. Of these there were three types. The first is the straight staircase with two or more landings, of which examples existed in Paris in the Tuileries and the old Hôtel de Ville, having been reproduced in the new Hôtel de Ville, and the staircase in the Vatican. The second is the staircase with return flights right and left, at the top of a first flight, sometimes built in long rectangular halls, but un­satisfactory owing to the want of concentration and to the difficulty of deciding whether to turn to the right or left at the top of the first flight; examples are in the Herrenchiemsee Palace, Bavaria, the Palazzo Reale at Naples, the Madama Palace at Turin, and the government offices in London. In the new opera house in Paris, J. L. Garnier (*q.v*.) solved the problem better by placing his staircase in a square hall, which, seen from the first floor surrounded with open balconies, forms one of the finest staircase halls known. The third alternative is that of the staircase in three flights, built round a square well-hole, of which the staircase in Holford House is ‘the best example. The vestibule staircases in Genoa which lead to a raised ground-storey, such as those in the Palazzo Durazzo, or in the university, are extremely fine in effect and are executed all in white marble. As the vestibules are open to the narrow streets, it is possible that the title of the "marble palaces of Genoa ” refers to those marble staircase halls, because the external walls of the palaces are either in ordinary stone or in brick covered with stucco. (R. P. S.)

*Construction.—*The primary object of stairs, in house-building, is to afford a safe and easy communication between floors at different levels. To make the communication easy the “ rise" and width (or “ tread ”) of the steps should be regular and suitably proportioned to each other with convenient landings; there should be no winding steps, and the rail which is fixed to render the use of the staircase safe should he strongly fixed with its top at a convenient height for the hand.

The first person that attempted to fix the relation between the height and width of a step upon correct principles was, we believe, Blondel, in his *Cours d’architecture.* His formula is applicable to very large buildings but not to ordinary dwellings. Ashpitel,who investigated the subject at length (in *Handrails and Staircases),* gives the following rules for different proportions of treads and risers :—