were employed in the straw industry, and in 1881 the number was only about 31,000. The plaits are sewed partly by hand and in a special sewing-machine, and the hats or bonnets are finished by stiffening with gelatin size, and blocking into shape with the aid of heat and powerful pressure, according to the dictates of fashion. The annual output of the straw-plait industry in England is estimated to amount in value to about £4,000,000.

In the United States straw-plait work is principally centred in the State of Massachusetts.

Many substances besides straw are worked into plaits and braids for bonnets. Among these may be noticed thin strips of willow and cane, and the fronds of numerous palms. “ Brazilian ” hats made from the fronds of the palmetto palms, *Sabal Palmetto* and S. *mexicana,* are now largely made at St Albans. The famous Panama hats, fine qualities of which at one time were worth £20 to £30 each, are made from the leaves of the screw pine, *Carludovica palmata.* They are now manufactured at Dresden, Strasburg, and Nancy, and can be purchased at 30s. or £2.

STREET, George Edmund (1824-1881), one of the ablest architects of the present century, was born at Woodford in Essex in 1824. He obtained his archi­tectural education in the office of Mr Owen Carter at Winchester, and afterwards worked for five years as an “improver” with Sir G. G. Scott in London. At an early age Street became deeply interested in the principles of Gothic architecture, and devoted an unsparing amount of time and labour to studying and sketching the finest examples of mediæval buildings in England and on the Continent. He was a draughtsman of a very high order ; his sketches are masterpieces of spirit and brilliant touch. In 1855 he published a very careful and well illustrated work on *The Brick and Marble Architecture of Northern Italy,* and in 1865 a book on *The Gothic Architecture of Spain,* with very beautiful drawings by his own hand. Street’s personal taste led him in most cases to select for his design the 13th-century Gothic of England or France,

his knowledge of which was very great, especially in the skilful use of rich mouldings. By far the majority of the buildings erected by him were for ecclesiastical uses, the chief being the convent of East Grinstead, the theological college at Cuddesden, and a very large number of churches, such as St Philip and St James’s at Oxford, St John’s at Torquay, All Saints at Clifton, St Saviour’s at East­bourne, St Margaret’s at Liverpool, and St Mary Mag­dalene, Paddington. His largest works were the nave of Bristol cathedral, the choir of the cathedral of Christ Church in Dublin, and, above all, the new Courts of Justice in London, second only in architectural import­ance (during this century) to the Houses of Parliament. After a prolonged competition Street was appointed architect to the Courts of Justice in 1868; but the building was not complete at the time of his death in December 1881. A great deal of somewhat unfair criti­cism has been lavished on this building ; but it should be remembered that Street was much hampered both by want of a sufficiently large site and by petty economies in money insisted on by the commissioner of works. Though perhaps deficient in unity of composition, this great build­ing possesses much grace in its separate parts, and has great refinement of detail throughout. Street was elected an associate of the Royal Academy in 1866 and R.A. in 1871 ; at the time of his death he was professor of history to the Royal Academy, and had just finished a very interesting course of lectures on the development of medi­æval architecture. He was also a member of the Royal Academy of Vienna, and a knight of the Legion of Honour. His somewhat sudden death, on December 18, 1881, was hastened by over-work and professional worries connected with the erection of the law courts. He was buried in the nave of Westminster Abbey, where his grave is marked by a handsome sepulchral brass designed by Mr Bodley.

STREETS. See Roads.

STRENGTH OF MATERIALS

1. The name “strength of materials” is given to thatpart of the theory of engineering which deals with the nature and effects of stresses in the parts of engineering structures. Its principal object is to determine the proper size and form of pieces which have to bear given loads, or, conversely, to determine the loads which can be safely applied to pieces whose dimensions and arrangement are already given. It also treats of the relation between the applied loads and the changes of form which they cause.

The subject comprises experimental investigation of the properties of materials as to strength and elasticity, and mathematical discussion of the stresses in ties, struts, beams, shafts, and other elements of structures and machines.

2. Stress is the mutual action at the surface of contact between two bodies, or two imaginary parts of a body, whereby each of the two exerts a force upon the other. Thus, when a stone lies on the ground there is at the surface of contact a stress, one aspect of which is the force directed downwards with which the stone pushes the ground, and the other aspect is the equal force directed upwards with which the ground pushes the stone. A body is said to be in a state of stress when there is a stress between the two parts which lie on opposite sides of an imaginary surface of section. A pillar or block supporting a weight is in a state of stress be­cause at any cross section the part above the section pushes down against the part below, and the part below pushes up against the part above. A stretched rope is in a state of stress, because at any cross section the part on each side is pulling the part on the other side with a force in the direction of the rope’s length. A plate of metal that is being cut in a shearing machine is in a state of stress, because at the plane which is about to become the plane of actual section the portion of metal on each side is tending to drag the portion on the other side with a force in that plane.

3. In a solid body which is in a state of stress the direction of stress at an imaginary surface of division may be normal, oblique, or tangential to the surface. When oblique it is often con­veniently treated as consisting of a normal and a tangential com­ponent. Normal stress may be either push (compressive stress) or pull (tensile stress). Stress which is tangential to the surface is called shearing stress. Oblique stress may be regarded as so much push or pull along with so much shearing stress. The amount of stress per unit of surface is called the intensity of stress. Stress is said to be uniformly distributed over a surface when each fraction of the area of surface bears a corresponding fraction of the whole stress. If a stress P is uniformly distributed over a plane surface of area S, the intensity is P/S. If the stress is not uniformly distrib­uted, the intensity at any point is δP∕δS, where δP is the amount of stress on an indefinitely small area δS at the point considered. For practical purposes intensity of stress is usually expressed in tons weight per square inch, pounds weight per square inch, or kilo­grammes weight per square millimetre or per square centimetre.1

4. The simplest possible state of stress is that of a short pillar or block compressed by opposite forces applied at its ends, or that of a stretched rope or other tie. In these cases the stress is wholly in one direction, that of the length. These states may be distin­guished as simple longitudinal push and simple longitudinal pull. In them there is no stress on planes parallel to the direction of the applied forces.

A more complex state of stress occurs if the block is compressed or extended by forces applied to a pair of opposite sides, as well as by forces applied to its ends,—that is to say, if two simple longi­tudinal stresses in different directions act together. A still more complex state occurs if a third stress be applied to the remaining pair of sides. It may be shown that any state of stress which can possibly exist at any point of a body may be produced by the joint action of three simple pull or push stresses in three suitably chosen directions at right angles to each other.2 These three are

@@@1 Οne ton per sq. in.=2240 lb per sq. in.= 1·511 kilos. per sq. mm.

@@@2 See Elasticity, vol. vif. p. 819.