**SURAT,** a city and district of British India in the northern division of Bombay. The city is on the site where the English first established a factory on the mainland, and so planted the seed of the British Empire in India. Local traditions fix the establishment of the modern city in the last year of the fifteenth century, and in 1514 the Portuguese traveller Barbosa described it as an important seaport, frequented by many ships from Malabar and all parts. During the reigns of Akbar, Jahangir and Shah Jahan it rose to be the chief commer­cial city of India. At the end of the 16th century the Por­tuguese were undisputed masters of the Surat seas. But in 1612 Captain Best, and after him Captain Downton, destroyed the Portuguese naval supremacy and obtained an imperial firman making Surat the seat of a presidency under the English East India Company, while the Dutch also founded a factory. In 1664 Sir George Oxenden defended the factory against Sivaji with a bravery that deserves to rank with Clive’s defence of Arcot. The prosperity of the factory at Surat received a fatal blow when Bombay was ceded to the Company (1668) and shortly afterwards made the capital of the Company’s posses­sions and the chief seat of their trade. From that date also the city began to decline. At one time its population was estimated at 800,000, by the middle of the 19th century the number had fallen to 80,000; but in 1901 it had risen again to 119,306. Surat was taken by the English in 1759, and the conquerors assumed the undivided government of the city in 1800. Since the introduction of British rule the district has remained com­paratively tranquil; and even during the Mutiny peace was not disturbed, owing in great measure to the loyalty of the leading Mahommedan families.

The city is situated on the left bank of the river Tapti, 14 m. from its mouth, and has a station on the Bombay, Baroda & Central India railway, 167 m. north of Bombay. A moat indicates the dividing-line between the city, with its narrow streets and handsome houses, and the suburbs, mostly scattered among cultivated lands; but the city wall has almost disappeared. On the river frontage rises the irregular picturesque fortress built about 1540. A fire and a flood in 1837 destroyed a great number of buildings, but there remain several of interest, such as the mosque of Nav Saiyid Sahib, with its nine tombs, the Saiyid Edroos mosque (1634) and the ornate Mirza Sami mosque and tomb (1540). The most interesting monuments are the tombs of English and Dutch merchants of the 17th century, especially that of the Oxenden brothers. Surat is still a centre of trade and manufacture, though some of its former industries, such as ship-building, are extinct. There are cotton mills, factories for ginning and pressing cotton, rice-cleaning mills and paper mills. Fine cotton goods are woven in hand-looms, and there are special manufactures of silk brocade and embroidery. The chief trades are organized in gilds. There are many wealthy Parsee, Hindu and Mahom­medan merchants.

The District of Surat has an area of 1653 sq. m., and the population in 1901 was 637,017, showing a decrease of 2% in the decade. The district has a coast-line of 80 m., consisting of a barren stretch of sand drift and salt marsh; behind this is a rich, highly-cultivated plain, nearly 60 m. in breadth, at the mouth of the Tapti, but narrowing to only 15 m. in the southern part, and on the north-east are the wild hills and jungle of the Dangs. The principal crops are millets, rice, pulses, cotton and a little wheat. After Surat city the chief centre of trade is Bulsar. The district is traversed by the main line of the Bombay & Baroda railway, with a branch along the Tapti valley to join the Great Indian Peninsula railway in Khandesh. Near the coast, under the influence of the sea breeze, an equable temperature prevails, but 8 to 11 m. inland the breeze ceases to blow. The coast also possesses a much lighter rainfall than the interior, the annual average ranging from 30 in. in Olpad to 72 in Chikhli, while at Surat city the average is 391/2 in.

The Surat Agency consists of three native states: Dharampur (*q.v.*), Bansda *(q.v.)* and Sachin, together with the tract known as the Dangs. Total area, i960 sq. m.; pop. (1901), 179,975. Sachin has a revenqe of £17,000 and its chief is a Mahommedan.

**SURBASE** (Lat. *super,* whence the Fr. *sur,* above or upon, and base, *q.v.), i.e.* upper base, the term in architecture applied to what, in the fittings of a room, is called the chair-rail. It is also used to distinguish the cornice of a pedestal or podium and is separated from the base by the dado or die.

**SURBITON,** an urban district in the Kingston parliamentary division of Surrey, England, 13 m. S.W. of Charing Cross, London; on the London & South-Western railway. Pop. (1891), 12,178; (1901), 15,017. It has a frontage upon the right bank of the Thames, with a pleasant esplanade. The district is largely residential. Surbiton is the headquarters of the Kingston Rowing Club and the Thames Sailing Club.

**SURETY,** in law, the party liable under a contract of guar­antee *(q.v.).* In criminal practice sureties bound by recognizance *(q.v.)* are a means of obtaining compliance with the order of a court of justice, whether to keep the peace or otherwise.

**SURFACE,** the bounding or limiting parts of a body. In the article Curve the mathematical question is treated from an historical point of view, for the purpose of showing how the lead­ing ideas of the theory were successively arrived at. These leading ideas apply to surfaces, but the ideas peculiar to surfaces arc scarcely of the like fundamental nature, being rather develop­ments of the former set in their application to a more advanced portion of geometry; there is consequently less occasion for the historical mode of treatment. Curves in space are considered in the same article, and they will not be discussed here; but it is proper to refer to them in connexion with the other notions of solid geometry. In plane geometry the elementary figures are the point and the line; and we then have the curve, which may be regarded as a singly infinite system of points, and also as a singly infinite system of lines. In solid geometry the elementary figures are the point, the line and the plane; we have, moreover, first, that which under one aspect is the curve and under another aspect the developable (or torse), and which may be regarded as a singly infinite system of points, of lines or of planes; and secondly, the surface, which may be regarded as a doubly infinite system of points or of planes, and also as a special triply infinite system of lines. (The tangent lines of a surface are a special complex.) As distinct particular cases of the first figure we have the plane curve and the cone, and as a par­ticular case of the second figure the ruled surface, regulus or singly infinite system of lines; we have, besides, the congruence or doubly infinite system of lines and the complex or triply infinite system of lines. And thus crowds of theories arise which have hardly any analogues in plane geometry; the re­lation of a curve to the various surfaces which can be drawn through it, and that of a surface to the various curves which can be drawn upon it, are different in kind from those which in plane geometry most nearly correspond to them—the relation of a system of points to the different curves through them and that of a curve to the systems of points upon it. In particular, there is nothing in plane geometry to correspond to the theory of the curves of curvature of a surface. Again, to the single theorem of plane geometry, that a line is the shortest distance between two points, there correspond in solid geometry two extensive and difficult theories—that of the geodesic lines on a surface and that of the minimal surface, or surface of minimum area, for a given boundary. And it would be easy to say more in illustration of the great extent and complexity of the subject.

In Part I. the subject will be treated by the ordinary methods of analytical geometry; Part II. will consider the Gaussian treatment by differentials, or the E, F, G analysis.

Part **I.**

*Surfaces in General; Torses, &c.*

I. A surface may be regarded as the locus of a doubly infinite system of points—that is, the locus of the system of points deter­mined by a single equation U= (\**x*, *y,* *z*, *1)n,*=0, between the cartesian co-ordinates (to fix the ideas, say rectangular co-ordinates) x, *y, z;* or, if we please, by a single homogeneous relation *U= (\*x, y, z, w)n,*=0, between the quadriplanar co-ordinates x, y, *z, w.*