works of foreign engineers. Already by his papers read before the Royal Society and his intercourse with scientific men his abilities as an engineer had become well known, and in 1756 application was made to him to reconstruct the Eddystone lighthouse, which had been burnt down in December of the previous year. After the completion of the new tower in 1759, Smeaton’s advice was frequently sought in regard to important engineering projects, including the construction of canals (especially the Forth and Clyde canal), the drainage of fens, the designing of harbours and the repair and erection of bridges, though many of the schemes he drew up were not carried out on account of the general lack of capital. He was also employed in designing numerous waterwheels, windmills, pumps, and other mechanical appliances. A considerable portion of his time was devoted to astronomical studies and observations, on which he read various papers before the Royal Society. A year before his death he announced that he wished "to dedicate the chief part of his remaining time to the description of the several works performed under his direction,” but he completed nothing more than the *Narrative of the Building of the Eddystone Light- house,* which had already appeared. He died at Austhorpe on the 28th of October 1792, and was buried in the old parish church of Whitkirk.

See John Holmes, *A Short Narrative of the Genius, Life and Works of the tate Mr John Smeaton* (1793); and S. Smiles, *Lives of the Engineers.*

**SMEDLEY, FRANCIS** [Frank] **EDWARD** (1818-1864), English novelist, was born at Great Marlow, Buckinghamshire, on the 4th of October 1818, a member of a Flintshire family. A cripple from his birth, he was educated privately, and contri­buted his first book, *Scenes from the Life of a Private Pupil,* anonymously to *Sharpe's London Magazine* in 1846-1848. His first essay proved so successful that it was expanded into *Frank Fairleigh,* and published in book-form in 1850. His next book *Lewis Arundel: or the Railroad of Life* was originally contributed to the same magazine, which he for some time edited, and was published in book-form in 1852. Of his other writings the best- known is *Harry Coverdale's Courtship* (1855). These are all capital stories, racily told. Either Hablot Knight Browne ("Phiz ”) or George Cruikshank supplied illustrations for most of his books. Smedley died in London on the 1st of May 1864.

**SMEDLEY, WILLIAM THOMAS** (1858- ), American artist,

was born in Chester county, Pennsylvania, of a Quaker family, on the 26th of March 1858. He worked on a newspaper, then studied engraving and art in Philadelphia, in the Pennsylvania Academy of the Fine Arts, and—after making a tour of the South Seas—in Paris under Jean Paul Laurens. He settled in New York City in 1880; in 1882 went with the Marquis of Lome through Canada, preparing sketches for *Picttιresque Canada;* and in 1905 became a member of the National Academy of Design. Most of his work was magazine and book illustration for stories of modern life, but he painted portraits and water colours, and received the Evans Prize of the American Water Color Society in 1890, and a bronze medal at the Paris Exposition of 1900.

**SMELL** (connected etymologically with "smoulder " and “ smoke ”), a sensation excited by the contact with the olfactory region (see Olfactory Organ, for anatomy) of certain substances, usually in a gaseous condition and necessarily in a state of fine subdivision. The sense is widely distributed throughout the animal kingdom. The lower animals, especially those breathing in water, become cognizant of the presence of odoriferous matter near them without touch, vision or hearing, and we suppose that they do so by some sense of taste or smell, or a combination of both. In such cases smell has been appropriately termed "taste at a distance,” by which is meant that particles of matter may be diffused through the water so as to come into contact with the terminal organ, and give rise to a sensation such as would have been excited had the matter from which the particles emanated come directly into contact with the nerve-endings. It is therefore of no great importance whether such sensations in humble aquatic organisms are termed taste or smell. In the higher air-breathing animals, however, the senses are differen­tiated: that of taste is found at the entrance of the alimentary canal, whilst that of smell guards the opening of the respiratory tract. This view assists in the interpretation of various structures met with in the lower forms which have been fairly regarded by naturalists as olfactory organs. It has not yet been decided whether the sense of smell depends, in the first instance, on a chemical or on a physical process. All that can be said is that sensory impulses arc excited when odoriferous particles come into contact with the free ends of peculiar rod-like cells found in the olfactory mucous membrane. The free olfactory surface is always covered with a thin layer of fluid, and all odoriferous matters must be dissolved in this fluid so as to reach the rod-cells. There is fiere an analogy with the conditions found in the sense of taste, where sapid substances must be soluble in the fluid of the mouth. The intensity of the sensation of smell depends on the size of the area of the olfactory membrane affected. No satisfactory classification of odours can be given.

The interior of the nose (see Olfactory Organ and Epi­thelial and Endothelial Tissue) is divided physiologically into two portions—(1) the upper *(regio olfactoria),* which embraces the upper part of the septum, the upper turbinated

Longitudinal section through the olfactory membrane of guinea- pig. ×about 400. I, Olfactory epithelium on free surface; 2, Plexus of olfactory nerve-fibres ; 3, Pouches of serous glands containing epithelial cells.

bone, and a portion of the middle turbinated bone; and (2) the lower portion of the cavity *(regio respiratoria).* The olfactory region proper has a thicker mucous membrane than the res­piratory; it is covered by a single layer of epithelial cells, often branched at their lower ends and containing a yellow or brownish red pigment; and it contains peculiar tubular glands named u Bowman’s glands.” The respiratory portion contains ordinary serous glands. In the olfactory region also are the terminal organs of smell. These are long narrow cells passing to the sur­face between the columnar epithelium covering the surface. The body of the cell is spindle-shaped and it sends up to the surface a delicate rod-like filament, whilst the deeper part is continuous with varicose nerve-filaments, the ends of the olfactory nerve.

*Physical Causes of Smell.—*Electrical or thermal stimuli do not usually give rise to olfactory sensations. J. Althaus states that electrical stimulation caused a sensation of the smell of phosphorus. To excite smell it is usually supposed that substances must be present in the atmosphere in a state of fine subdivision, or existing as vapours or gases. The fineness of the particles is remarkable, because if the air conveying an odour be filtered through a tube packed with cotton wool and inserted into the nose a smell is still discernible. This proceeding completely removes from the air micro-organisms less than the 1/100000th of an inch in diameter. A grain or two of musk will scent an apartment for years and at the end of the time no appreciable loss of weight can be detected. Substances exciting smell are no doubt usually gases or vapours. Sir William Ramsay has endeavoured to connect the sense with the chemical