

one lock will be required to get around each of the upper three dams. From the fourth dam to Greytown in the Caribbean Sea an independent canal will be required 41.9 miles in length with seven locks, which apparently presents no difficulty. The total length of the proposed canal is 61.7 miles, and no tunnel is required. The harbour of Greytown has been partially destroyed by a silt which comes from the San Carlos, and others of the lower tributaries of the San Juan, and the branch of the river leading to Greytown has become so much filled up that it is now, at the lowest stage of the water, only 324 feet wide and 6 inches deep at the fork. It is proposed to shut off this branch entirely and send all the silt-bearing water through the Colorado mouth, which empties into the sea 18 miles from

Greytown, and to admit to the harbour only the water of the canal, which, being drawn from the main river above the mouth of the San Carlos, will be perfectly clean. The harbour then cleared out, will leave nothing to deteriorate it again.

Short breakwaters will be required to protect the entrances from the surf, both of which are included in the estimate for the work.

Careful gauging at the lowest stage shows that Lake Nicaragua, which has a surface area of 2700 square miles, and a drainage area of 8000 square miles, will supply thirty-eight times the maximum possible demand of water.

The depth of water is to be 26 feet, the width at bottom 72 feet, and at surface 150 feet. The locks, twenty-one in



FIG. 12.—Lines of proposed Darien and Nicaragua Canals.

number, with a lift of from 8 to 10 feet, are to be 400 feet long and 72 feet wide. The estimate is stated at £15,900,000.

M. Lesseps, in a lecture on the Suez Canal, delivered before the Société des Gens de Lettres at Paris, has given it as his opinion that unless the Atlantic and Pacific can be united by simply piercing the Isthmus from sea to sea without locks, as at the Suez Canal, the proposed scheme cannot possibly succeed as a commercial enterprise, because of the inadequacy of a canal with locks to pass the traffic that will frequent it, and also of the uncertainty of sufficient water to supply the lockage and evaporation. This latter objection, however, seems to be disproved by the researches of the American engineers who have investigated the subject. A further difficulty arises in maintaining a sufficient sea-water depth to the canal even after it has been formed. On this point the writer of this article, judging from documents prepared under the sanction of the Government of the United States and submitted to him by an authorized official of the Government, arrived at the conclusion that there are very formidable obstacles to the establishment and future maintenance of a deep-water entrance to the proposed Nicaraguan Canal at Greytown in the Caribbean sea. These obstacles involve the engineering problem of main-

taining permanent deep water through an extensive shallow foreshore composed of soft materials and exposed to heavy seas. The reports state "that at Greytown there are now islands where twenty years ago there was water enough to float a frigate." It remains to be seen whether the same difficulties apply to the entrance to the proposed Darien scheme; and, to show that such fears may not be unfounded, we may remind the reader that the difficulties exist, as we have stated, at the Mediterranean entrance to the Suez Canal.

The question as to the best route for transit between the Atlantic and Pacific is, it will be seen, still far from being solved, but the necessity for free access from sea to sea remains an acknowledged fact. Its importance, especially to the United States, but in some degree to all the world, is such that, great as are the engineering difficulties, this long-cherished bold idea may yet become a stupendous reality.

(D. S.)  
Reference is made to the following works:—Chapman, *On Canal Navigation*; Frisi, *On Canals*; Fulton, *On Canal Navigation*; Tatham's *Economy of Inland Navigation*; Vallancy's *Treatise on Inland Navigation*; *Principles and Practice of Canal and River Engineering*, by David Stevenson, 2d edition, A. and C. Black, Edinburgh; *Report of the Secretary of the United States Navy* for 1873.

CANAL, or CANALETTO, ANTONIO (1697-1768), a Venetian painter, born 18th October 1697, was bred with his father, a scene-painter at Venice, and for some time followed his father's line of art. In 1719 he went to Rome, where he employed himself chiefly in delineating ancient ruins, and particularly studied effects of light and shade, in which he became an adept. He was the first painter who made practical use of the camera lucida. On returning home he devoted his powers to views in his native city, which he painted with a clear and firm touch and the most facile mastery of colour in a deep tone, introducing groups of figures with much effect. In his latter days he resided some time in England. His pictures, in their particular range, still remain unrivalled. He died on 20th August 1768. Belotto (commonly named Bernardo) Canaletto, 1724-1780, was his nephew and pupil, and painted with deceptive resemblance to the style of the more celebrated master.

CANANDAIGUA, a town in the United States, capital of the county of Ontario in New York, is situated at the northern end of a lake of the same name, 29 miles S.E. of Rochester by rail, in 42° 54' N. lat. and 77° 27' W. long. It is a railway junction of some importance, and has a court-house, an academy, and two printing-offices. Its incorporation dates from 1815. The lake is a beautiful sheet of water about 15 miles long, with a breadth varying from less than a mile to more than a mile and a half. It is about 437 feet above Lake Ontario. The population of the town is 4862, and of the township 7274.

CANANORE. See KANANORE.

CANARA. See KANARA.

CANARY (*Fringilla canaria*), a well-known species of Conirostral Bird, belonging to the family *Fringillidae* or Finches. It is a native of the Canary Islands and Madeira, where it occurs abundantly in the wild state, and is of a greyish-brown colour, slightly varied with brighter hues, although never attaining the beautiful plumage of the domestic bird. It was first domesticated in Italy during the 16th century, and soon spread over Europe, where it is now the most common of cage-birds. During the 350 years of its domestication, the canary has been the subject of careful artificial selection and of crossing with allied species, the result being the production of a bird differing widely in the colour of its plumage, and in a few of its varieties even in size and form, from the original wild species. The prevailing colour of the most admired varieties of the canary is yellow, approaching in some cases to orange, and in others to white; while the most robust birds are those which, in the dusky green of the upper surface of their plumage, show a distinct approach to the wild forms. The least prized are those in which the plumage is irregularly spotted and speckled. In one of the most esteemed varieties, the wing and tail feathers are at first black—a peculiarity, however, which disappears after the first moulting. Size and form have also been modified by domestication, the wild canary being not more than 5½ inches in length, while a well-known Belgian variety usually measures 8 inches. There are also hooped or bowed canaries, feather-footed forms, and top-knots, the latter having a distinct crest on the head; but the offspring of two such top-knotted canaries, instead of showing an increased development of crest, as might be expected, are invariably bald on the crown. Most of the varieties, however, of which no fewer than twenty-seven were recognized by French breeders so early as the beginning of last century, differ merely in the colour and the markings of the plumage. Hybrids are also common, the canary breeding freely with the siskin, goldfinch, citril, greenfinch, and linnæus. Some of the hybrids thus produced are, according to Darwin, almost completely fertile,

but they do not seem to have given rise to any distinct breed. It is the female canary which is almost invariably employed in crossing, as it is difficult, if not impossible, to get the females of the allied species to sit on the artificial nests used by breeders. In a state of nature canaries pair, but under domestication the male bird has been rendered polygamous, being often put with four or five females; still he is said to show a distinct preference for the female with which he was first mated. It is from the others, however, that the best birds are usually obtained. The canary is very prolific, producing eggs, not exceeding six in number, three or four times a year; and in a state of nature it is said to breed still oftener. The work of building the nest, and of incubation, falls chiefly on the female, while the duty of feeding the young rests mainly with the cock bird. The natural song of the canary is loud and clear; and in their native groves the males, especially during the pairing season, pour forth their song with such ardour as sometimes to burst the delicate vessels of the throat. The males appear to compete with each other in the brilliancy of their melody, in order to attract the females, which, according to Bechstein, always select the best singers for their mates. The canary readily imitates the notes of other birds, and in Germany and especially Tyrol, where the breeding of canaries gives employment to a large number of people, they are usually placed for this purpose beside the nightingale. In England they are taught in a similar way to imitate the woodlark. They are also taught to whistle one or two airs, and even to articulate a few words. The female possesses considerable vocal powers, but her notes are weaker than the male's, and her song usually less consecutive.

CANARY ISLANDS, THE, lie in the North Atlantic Ocean, between the parallels of 27° 4' and 29° 3' N. lat., and the meridians of 13° 3' and 18° 2' W. long. The seven principal islands, with their area in English square miles, and their population in 1860, are as follows:—

	Teneriffe.	Grand Canary.	Palma.	Lanzarote.	Fuerteventura.	Gomera.	Hierro.
Area.....	877.7	758.3	718.5	323.5	326.1	169.7	82.2
Population, 1860	93,709	68,970	31,138	15,837	10,996	11,360	5028

Fuerteventura lies nearest to the African coast, the interval being between 50 and 60 miles. Besides these there are many islets, most of which are uninhabited.

*History.*—There is ground for supposing that the Phœnicians were not ignorant of the Canaries. The Romans, in the time of Augustus, received intelligence of them through Juba, king of Mauritania, whose account has been transmitted to us by the elder Pliny. He mentions "Canaria, so called from the multitude of dogs of great size," and "Nivaria, taking its name from perpetual snow, and covered with clouds," doubtless Teneriffe. Canaria was said to abound in palms and pine trees. Both Plutarch and Ptolemy speak of the Fortunate Islands, but their description is so imperfect that it is not clear whether the Madeiras or the Canaries are referred to. There is no farther mention of them until we read of their rediscovery about 1334, by a French vessel driven amongst them by a storm. A Spanish nobleman thereupon obtained a grant of them, with the title of king, from Clement VI., but want of means prevented him from carrying out his project of conquest. Two expeditions subsequently set out from Spanish ports, and returned without having taken possession. At length three vessels, equipped by Jean de Bethencourt, a gentleman of Normandy, sailed from Rochelle in 1400, and bent their course to the Canaries. He landed at Lanzarote and Fuerteventura, but being opposed by the natives, and finding himself deficient in means to effect his purpose, he repaired to the court of Castile, and obtaining from Henry III. a grant of the islands, with the title of