

THE GREAT DAM AT BEETALOO, AUSTRALIA.

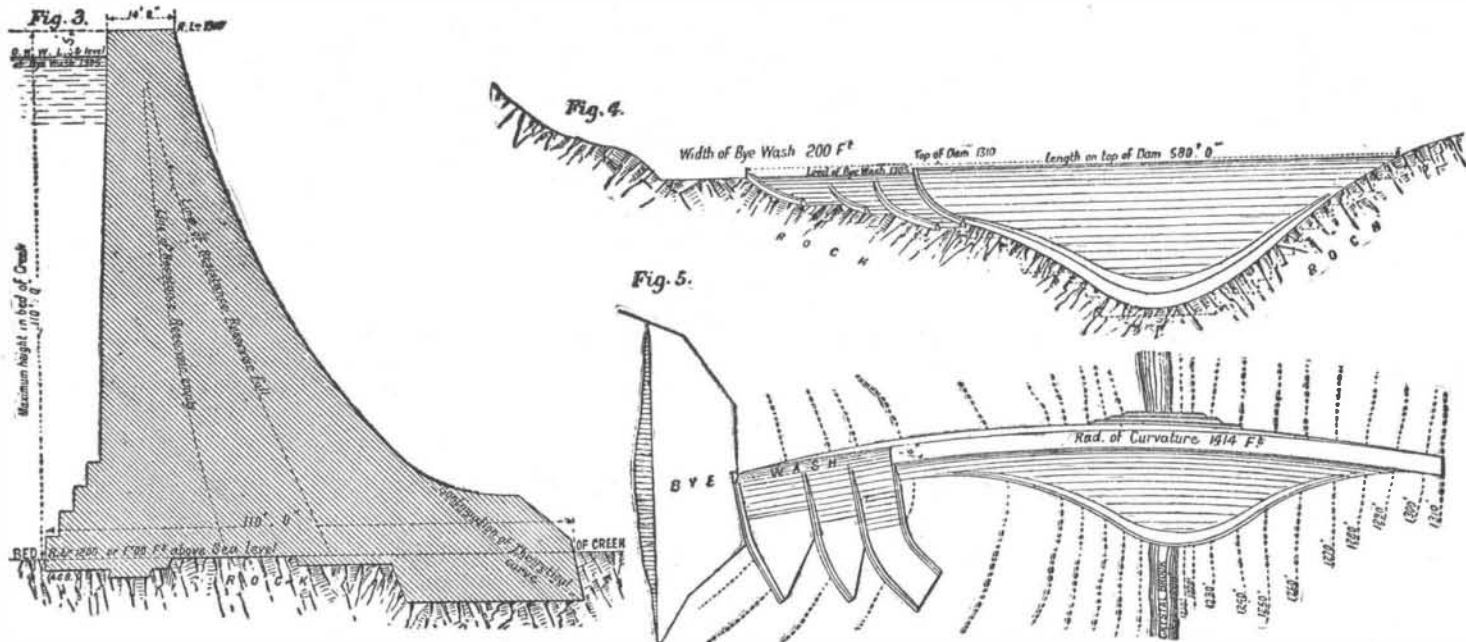
We give illustrations of what we understand is the largest reservoir dam in the southern hemisphere, and which has been recently completed by Mr. A. B. Moncrieff, M.I.C.E., at Beetaloo, South Australia, for the government of the colony. The principal picture gives a general view of the work as complete, while the profile, plan, and arrangement of by-washes are clearly shown in Figs. 3, 4, and 5. The structure is of concrete, 110 ft. high from the bed of the creek to the top of the dam, and 580 ft. long, being curved in plan to a radius of 1,414 ft., as shown in Fig. 5. The width at the top is 14 ft., and the profile of the section has been designed in accordance with Rankine's rules. The width of the section at the foundation is 110 ft. The crest of

took the work in hand, and has now brought it successfully to completion, as already stated. The quantity of concrete used was 60,000 cubic yards, the net time occupied being about 2½ years. The stone and sand were obtained in the vicinity, but the cement was imported. Special machinery was used for mixing the concrete and depositing it in place. The net cost of the dam has been \$585,000, or rather less than \$10 per cubic yard of concrete in place.

The foregoing particulars and illustrations are from a recent number of *Engineering*. It is interesting to compare the described structure with a proposed work for a similar purpose, the construction of which was at one time strongly urged, but is at present held in abeyance. We allude to the proposed Quaker Bridge

Electrical Observations on the Hoher Sonnblick.

From the results of a series of experiments and of observations on the Hoher Sonnblick at a height of 10,168 ft. above the sea level, Profs. Elster and Geitel draw the following conclusions in the *Wiener Berichte*: 1. The intensity of the most refrangible rays of the sun's spectrum, as measured by its discharging action on negatively electrified surfaces of amalgamated zinc, increases with the height above level ground, in such a manner that at a height of 10,168 ft. it is *twice* as great as on ordinary level ground. 2. Notwithstanding this increase, no new actinometrically active substances were discovered. 3. Waterfalls can produce negative falls of potential in a valley, and even to considerable heights, 1,600 ft. 4. Before the outburst of storms

**THE GREAT CONCRETE DAM AT BEETALOO, AUSTRALIA.**

the by-wash, which is 200 ft. wide, is 5 ft. below the crest of the dam. The reservoir behind the dam, when full, will be 1¼ miles long, with an average width of 8 chains, forming quite a fine lake. The capacity, under these conditions, will be 800,000,000 gallons, a large quantity, but not too much for the district to be supplied, which has an area of 1,715 square miles. Eight separate townships are to be supplied from this source, in addition to pastoralists and farmers. Already 255 miles of pipe have been laid, the largest size being 18 inches in diameter and the smallest 2 inches. All these pipes have been manufactured in the colony, and the engineer has expressed himself well satisfied with the quality.

The work of building the dam was commenced in 1888, under the superintendence of Mr. Mestayer, M.I.C.E. In May of the same year, Mr. Moncrieff

dam, on the line of the Croton water works of New York City.

The Quaker Bridge dam, as planned, was to have a foundation 69 ft. deep at the deepest part, and above this the dam proper was to rise 192½ ft. Width at the base, 200 ft., at the top 22 ft. wide, with roadway thereon. Length of the dam at coping 1,350 ft. Length at datum level 510 ft. Width at that level 173 ft. Foundation concrete. Main dam rubble masonry, faced with stonework. Estimated to cost \$5,000,000. The estimated impoundage of water to be held by this dam was thirty-two billions of gallons, or sufficient for 160 days' supply for the city of New York, using two hundred millions of gallons daily.

BELTS that slip from overwork are benefited by lagging the pulleys.

observed on the 16th, 18th, and 20th July, 1890, the positive fall of potential, within the cloud which sent only a small quantity of rain, sank slowly down to the value zero, at which it then remained for a long time, perhaps two to three hours, until the electrical process in the cloud definitely came to an end. 5. In storm clouds the atmospheric electricity usually changes its sign after a discharge of lightning, as with storms in the plain. 6. St. Elmo's fire was found to constantly accompany storms; it was not found that *negative* St. Elmo's fire was more infrequent than *positive*. 7. The observation that negative St. Elmo's fire follows bluish lightning, and positive, reddish lightning, was frequently confirmed. The direction, then, of the electrical current which traverses the atmosphere in the form of lightning appears to have an influence on the color of lightning.

Another Subway under the Thames.

An iron subway or tunnel under the river Thames just below Kingston Bridge has recently been completed for the Southwark and Vauxhall Water Company, under the direction of their engineer, Mr. J. W. Restler. The work has been carried out by Messrs. John Aird & Sons, who are the contractors for laying the main pipes of this company from Hampton to Nunhead, of which the subway forms a part. The necessity for the work has arisen from the circumstance that the population of the large district served by this company has greatly increased. The new scheme in its entirety consists of a cast iron main pipe, 42 inches in diameter, running from Hampton to Nunhead. In the tunnel the main is divided into two pipes of 31 inches diameter; but elsewhere throughout the length it is a 42 inch pipe. The main commences at the company's works at Hampton, and after passing under the river at Kingston it continues along main roads and across fields by Norbiton station over Coombe Hill via Raynes Park and Merton Abbey to Tooting, thence via Streatham, crossing the Croydon Road and Streatham Common, to Tulse Hill, past Dulwich College, across Dulwich Park, and by Honor Oak to the Nunhead reservoirs of the Southwark and Vauxhall Water Company.

On the route between Kingston and Nunhead, the main passes five times through subways constructed under the London, Brighton & South Coast Railway and its branches. The total length of the main is about 15½ miles. The tunnel is of a circular section, 9 feet in diameter, and is constructed of cast iron plates 1 inch thick, bolted together in segments, and in lengths of 18 inches. The method employed in driving the tunnel and fixing the plates is similar to that adopted in the construction of the City and South London Electric Railway from Stockwell to London Bridge. An iron shield of slightly larger diameter than the tunnel itself is forced forward into the clay by means of powerful hydraulic jacks, for a distance of about 18 inches, sufficient to insert one ring of the cast iron plates. The plates are then fixed and bolted together in position, and the shield impelled forward as before. [This is the Beach hydraulic shield, an American invention, first used in constructing the short section of railway tunnel under Broadway, New York, 1869-1870.—Ed. S. A.] By these means the earth in the tunnel is taken out as nearly as possible to the precise dimensions of the iron ring to be inserted; but in order to make the work perfectly solid and secure, a grouting of liquid cement was forced in behind and around the ring when finally fixed, thus filling up every possible space, fissure, and crevice between the iron and the surrounding clay. The progress made in this way was very rapid, as many as eight 18 inch rings or 12 feet of tunneling being sometimes completed in 24 hours, the whole work of tunneling under the river, a distance of about 190 yards, having been actually completed in 9 weeks. It may be mentioned, as a somewhat remarkable circumstance, that the depth between the top of the tunnel and the bed of the river was in one place not greater than 2 feet 6 inches. The whole length of the tunnel is in the London clay.

To Remove Tannin from Tea.

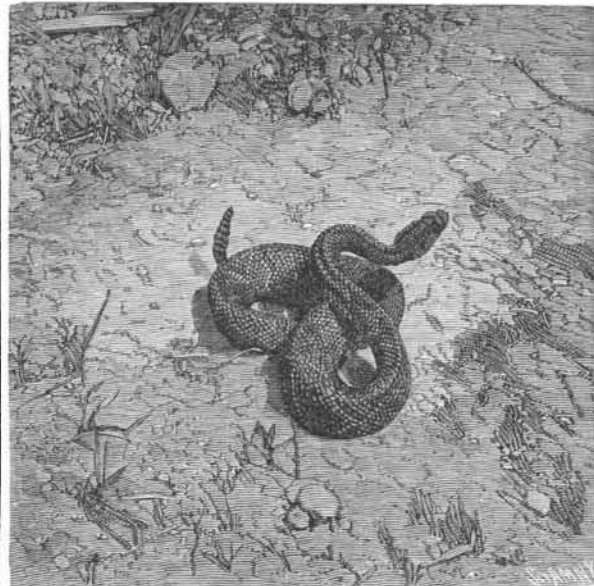
The tannin present is absorbed by means of suitable animal substances, such as horn shavings, dried albumen, hide clippings, and the like. It is preferable to add the material to the tea in the dry condition before the infusion is made. But it may also be added to the infusion, or the infusion may be passed or filtered through a layer of the substance. The quantity of animal substance to be added to the tannin-containing material must be determined by the amount of tannin

contained in it. In the case of tea the proportion may vary from one to two parts of animal substance to ten parts of tea.—H. Grimshaw.

CHARACTERISTIC POISES OF SNAKES.

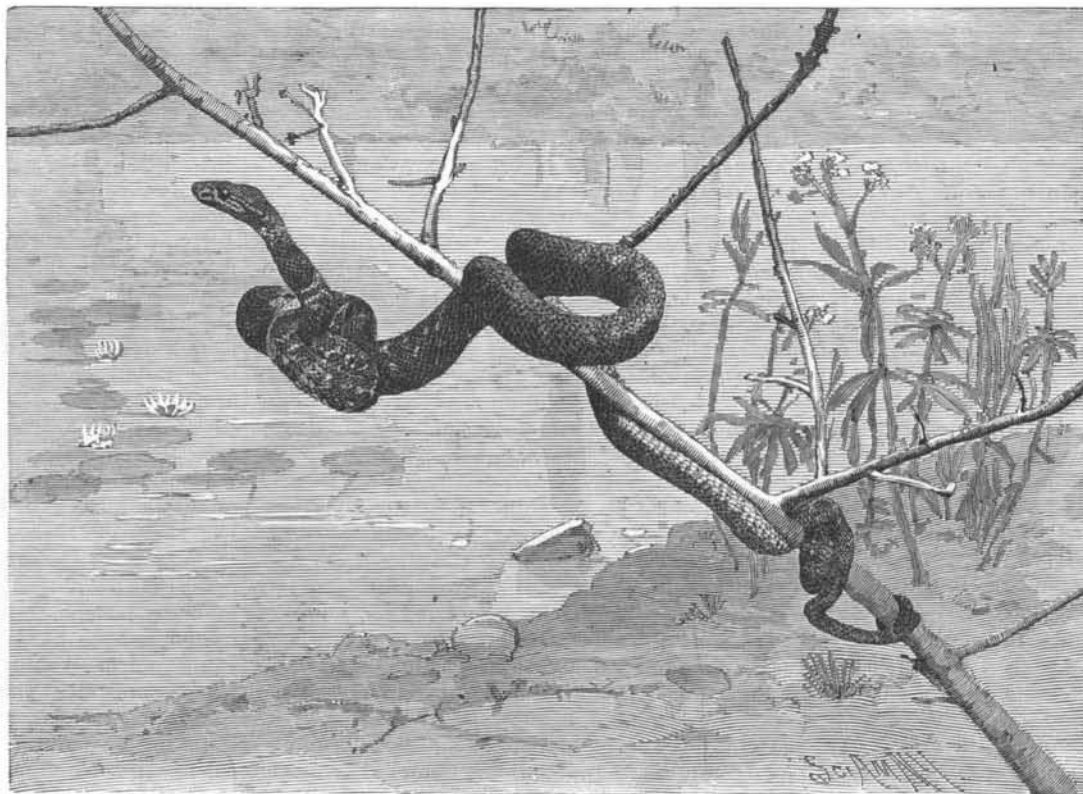
BY G. R. O'REILLY.

Snakes assume many attitudes when on the defense.



THE RATTLESNAKE IN THE ACT OF RATTLING.

sive, and show their excitement in many different ways. For instance, the rattlesnake does not hiss, but vibrates the extremity of his tail, placing it in a somewhat vertical position, while the cribro, of Trinidad



A TREE SNAKE (XIPHOSOMA HORTULANA) COILED FOR STRIKING.

(*Spilotes corais*), and other snakes without rattles vibrate theirs horizontally. Many African species seem fond of hissing, and the American varieties of shaking their tails.

The boa constrictors hold the head well above the ground, while the neck is bent into a series of S-like

lapped round a branch, and saves his breath rather than waste it in hissing. The body of the boa is usually flattened at the points of contact with the limb, and this serves to give him greater purchase and a better hold in striking at his prey. The boa's head is always advanced.

The vipers, on the contrary, hold the head rather drawn back, and most of them keep it somewhat down. The terrible fer de lance, of the West Indies, and the labarri, of Demerara, as shown in the cuts given, remain carefully coiled. The traveler who has wandered on South American river banks will never forget the coiled death dealer labarri (*Bothrops atrox*), which, ready alike for enemy or prey, refuses to move from his path. In color he is like the dead leaves of the forest among which he lives. This renders him very difficult to see, and so adds considerably both to the apprehension and to the danger of hunters and others whose business or pleasure leads them to journey on foot through these tangled tropical wilds. When he strikes, his head, with perhaps two-thirds of his body, is shot out like lightning. This snake will strike again and again, unlike the rattlesnake, the bushmaster, and others that are usually satisfied with one injection of poison.

The fer de lance makes his home in the cane fields of Martinique. His coil is exactly like that of the labarri. And so with the bushmaster of Demerara (*Lachesis mutus*). The three last mentioned species all vibrate the tail. The coil of the rattlesnake is not so compact. Another snake that has a peculiar characteristic is the lora (*Ahetulla liocerca*), of Venezuela. He is a whip-like diurnal tree snake, of four or five feet in length and half an inch in diameter at his thickest part. His coloring is of the richest imaginable hues. The head and back are of the most beautiful green. Along each side is a band of golden yellow and beneath he is of a mother of pearl white. His home is among the flowers of the vine-laced forest. There he lies in wait for his favorite prey, the humming bird, or chases the agile tree lizard from branch to branch. In Trinidad he is often seen in the gardens of the town of Port of Spain.

If you approach him too closely, he gets ready for defense in a strange way; for while other snakes as a rule keep their mouths closed, the lora, like a scolding wife or a noisy politician, keeps it open all the time, but all this fuss means nothing; as he is not poisonous and can kill nothing larger than a humming bird or a small lizard. His head is raised, flattened and drawn backward, and his apparently toothless mouth is ever constantly open to its widest extent. He bites fiercely, nevertheless, at whatever approaches him. The liquer (*Dryophis acuminata*) acts similarly, but does not bite at all.

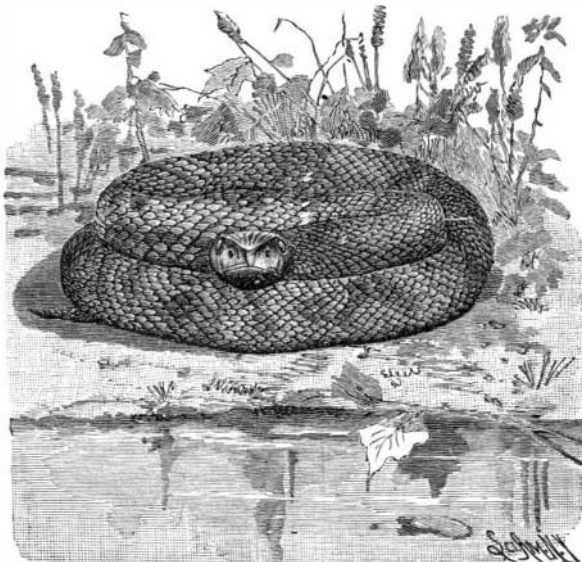
Among the Elapidae we find two of the most opposite manifestations, for, while the cobras flatten the neck and stand up perpendicularly, facing their assailant, the coral snakes neither flatten themselves out nor stand up, but lie as close to the ground as possible, with the head placed sideways to the object of danger.

Most snakes inflate themselves somewhat when excited, but some, like the small water snake of Trinidad, flatten themselves out as if they had been pressed.

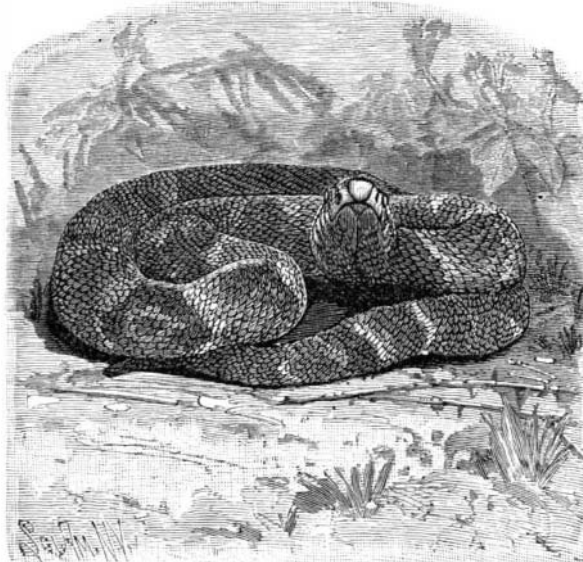
They neither hiss, at least audibly, nor vibrate their tails. This water snake is the only one I know that can actually jump. I have known one ten inches long to jump fifteen inches from the ground.

It has been concluded that whatever preservative is to be applied, the timber for piles,

subjected to the action of seaworms, should first be charred, so as to kill any germs near the surface, open the pores of the wood for the antiseptic and destroy the nutritive matter upon which the worms live.



THE COIL OF THE FER DE LANCE (VENOMOUS).



THE LABARRI (VENOMOUS) READY TO STRIKE.

curves, as may be seen in the engraving of mapanari, *Xiphosoma hortulana*, a tree boa of South America, a bold biter, who considers excitement in a warrior injudicious. Consequently he keeps his tail quietly