OCEANIC BIRDS.

The sub-family of web-footed oceanic birds known to zoölogists as the *procellarinæ* contains several *genera*, the best known of which are *procellaria* or petrel proper, and *thalassidroma* or stormy petrel. The name petrel is derived from Peter, in remembrance of the apostle's walking on the water, a characteristic of the bird excellently shown in the first of our two engravings. The birds here shown, commonly called by sailors Mother Carey's chickens, are readily distinguished from the common petrel by the shorter and slenderer bill. The species are about twelve in number, and inhabit the oceans of both hemispheres, skimming lightly over the waves or running along their tops; they are dark in color, but more or less marked with white. The Mother Carey's chicken (*thalassidroma pelagica*) is about six inches long in the body, with wings opening to a width of over thirteen inches; the bill and feet are black; the body is grayish, black above, tinged with brown. The presence of these birds is supposed by mariners to forebode stormy weather, and they are never molested by sailors, as their warnings are usually accepted in perfect faith; they are found all across the Atlantic, especially in the temperate zone, and are common on the banks of Newfoundland. They breed on rocky shores and islands, in the North Atlantic.

On the Shetland Isles, Scotland, they begin to lay toward the end of June, depositing a single egg in a nest made of plants and earth, which they carefully conceal, sometimes placing it three or four feet under a heap of stones. The naturalist Brünnich states that these birds become so fat that the inhabitants of the Faroe islands attach wicks to them and burn them as lamps.

Our second engraving represents another of the tireless wanderers of the deep, the albatross, also of a web-footed genus. Three species are known—the common albatross (*diomeda exulans*),the albatross of China (*diomeda fuliginosa*), and the yellow and black beaked albatross(*diomeda chlororynchos*). The first is the species chosen by the artist for representation; it is also called the man of war bird. The genus is distinguished principally by a very strong, hard, straight beak, which suddenly curves downwards, with a sharp hook at the point. The feet are short, the three toes long and completely webbed, the wings long and narrow. The common albatross is the largest sea bird known, weighing from twelve to twenty-eight lbs. Its wings measure, when extended, about eleven feet across; but a specimen, measuring seventeen and a half feet was shot off the Cape of Good Hope. The top of its head is of a ruddy gray, all the rest of its plumage, with the exception of some black bands on its back and a few wing feathers, being white. It is abundant from the Southern Ocean to as far north as Kamschatka, but scarcely ever visits our coasts. Its voracity is extreme, its ordinary food being fish and fish spawn; it can readily be caught, however, with a strong line and a hook baited with a piece of fat pork. Its powers of flight are very remarkable; and its voice is harsh and disagreeable, resembling the braying of an ass. The albatross is regarded with superstitious awe by sailors; and the killing of one is believed to bring down disasters on the ship.

Suggestions about Breeding Cattle, etc.

1. A perfect development and sound vigorous health, constitutionally, especially in the generative organs, are conditions of fertility.

2. In the maintenance and improvement of a breed, the truth that "like produces like," that the reproductive germ will stamp upon the animal developed from it the characters of the parent organisms, is the backbone of success.

3. We can, in a great degree, at will, produce variations and improvements in breeds, as by abundant feeding, a mild and salubrious climate, a rich and healthy soil, moderate use, education, stimulation, or selection of desirable qualities; by disease or rejection of undesirable characters and properties; by soliciting the weight of imagination in our favor; by allowing the breeding animals to mix only with those of the stamp desired; by crossing less improved breeds systematically with mates of a better race, and by crossing animals faulty or deficient in some particular point with others, in which this point is developed in excess.

4. The herding of pregnant high-class animals with low-bred ones, and the resulting attachment between the two races, are to be especially avoided, as occasionally affecting the progeny injuriously; strong impressions from a new or unusual condition of surrounding objects are to be equally guarded against.

5 If a valuable female is allowed to breed to an inferior male, she cannot be relied upon to produce pure-bred animals for several succeeding pregnancies. Through a strong and retained impression, through the absorption into the system of living particles (germinal matter) from the fœtus, or through some influence, during pregnancy, on the ova,
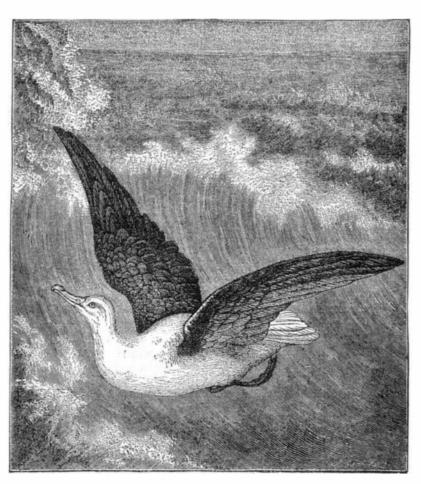
then being most actively developed, the good or bad features of the first sire are perpetuated in the progeny of succeeding ones.

6. All breeds show a tendency to breed back, or to produce offspring bearing the marks of their less improved and comparatively valueless ancestors; hence, individuals of this kind must be rejected from the best breeds if we would maintain their excellence.

7. Certain races and individuals have their characters more

THE STORMY PETREL.

fixed, and will transmit and perpetuate them in greater proportion than others with which they may be crossed. If their qualities are desirable, they prove highly valuable in raising other stock of greater excellence. If undesirable, they will depreciate the value of any stock crossed for many generations. That fixity of type, however, is, above all, a characteristic of those which have been carefully selected and bred up to a certain standard for many generations, so that, in our best, longest established, and most esteemed breeds, we have a most valuable legacy left us by the suc-

THE ALBATROSS.

cessful breeders of the past, with which we may mold our inferior races almost at will.

8. While breeding continuously from the nearest relations tends to a weakened constitution, and the aggravation of any taint in the blood to sterility, these may be avoided by infusing at intervals fresh blood of the same family which has been bred apart from the branch of it for several gene-

rations. Moreover, the highest excellence is sometimes attained only by breeding very close for a time.

9. Diseased or mutilated animals are generally to be discarded from breeding. Mutilations resulting from disease during pregnancy, and disease with a constitutional morbid taint are, above all, to be dreaded as transmissible.—*Professor James Law.*

Laying the First Cables of the East River.

New York and Brooklyn are at last joined together. The bond is a frail one at present, being only two ⅞-inch wire ropes stretched from tower to tower of the future East River bridge, but it is the beginning of the great superstructure, marking the first step in the second portion of the enterprise, and the substantial completion of the vast stone monuments which form the foundation for the whole. The two cables, each 3,600 feet long, were made fast near the Brooklyn anchorage, drawn up over the top of the pier, and then lowered to a scow, which carried the ends over to the New York side, the slack being paid into the river. A hemp rope, leading from a drum on a small engine, and previously brought over the New York tower, was made fast to the end of one cable, which was thus hauled over the pier until said end could be attached to a larger engine. The latter then hauled the cable taut and to an altitude of 180 feet above the river. The second cable was then raised in similar manner.

The work occupied five hours, and was witnessed by a large number of people. The cables will next be stretched from the towers to the respective anchorages, and all will then be joined together to form an endless chain, by means of which the material used in the construction of both the temporary and the permanent bridges will be transported across the river.

Facts and Simple Formulæ for Mechanics, Farmers, and Engineers.

The following are fair approximate rules for the power required to drive cotton machinery: Cotton openers, 1 horse power per 1,000 lbs. of cotton delivered; cotton pickers, 3 horse power per 1,000 lbs. of cotton delivered; cotton cards, $\frac{1}{20}$ horse power per lb. of cotton delivered per day, and, at 125 revolutions per minute, 0·125 horse power; railway heads, breakers, 1 horse power per each 10 yards per minute; railway heads, finishers, 0·001 horse power per revolution per minute; drawing frames, 0·002 horse power per revolution per minute; spindles, 0·005 horse power per spindle per 1,000 revolutions.

To find the safe pressure a cylindrical boiler will bear in lbs. per square inch: Divide the thickness of the plate in inches by the diameter of the boiler in inches, and multiply the quotient by 5,000 for a copper boiler with single riveted shell; by 6,400 for a copper boiler with double riveted shell; by 7,600 for a wrought iron boiler with single riveted shell; by 9,000 for a wrought iron boiler double riveted; by 10,000 for a steel boiler single riveted; by 12,000 for a steel boiler double riveted.

To determine the amount of coal in lbs. which will be burned per square foot per hour with chimneys of good proportions, Professor Thurston's rule is to subtract 1 from twice the square root of the hight of the chimney. To determine the hight of chimney required to give a certain rate of combustion, add 1 to the weight to be burned per square foot per hour; divide by 2 and square the quotient.

Pulleys covered with leather, iron pulleys polished, and mahogany pulleys polished, rank for working value as 36, 24, and 25, respectively, wood and iron uncovered being almost identical.

Iron castings shrink $\frac{1}{16}$ inch to the foot in cooling in the mold.

To find the weight of pipe per lineal foot in lbs., subtract the square of the inside diameter in inches from the square of the outside diameter in inches, and multiply for cast iron by 2·45, for wrought iron by 2·64, brass by 2·82, copper by 3·03, lead by 3·86.

The natural slopes of earths, with horizontal line, are as follows: Gravel (average)40°, dry sand 35°, sand 22°, vegetable earth 28°, compact earth 50°, shingle 39°, rubble 45°, clay well drained 45°, clay wet 16°.

Sand weighs about 30 cwt. per cubic yard, gravel the same; mud 25 cwt., marl 26 cwt., clay 31 cwt., sandstone 39 cwt., shale 40 cwt., quartz 41 cwt., granite 42 cwt., trap the same, slate 43 cwt.

To true a carpenter's grindstone, use a ⅜-inch bar of iron or a gas pipe, for a turning tool, holding it below the center of the stone.

Chipping hammers should weigh about 1¼ lbs. and have handles 15 inches long.

A 6 inch emery wheel should make about 2,400 revolutions per minute, an 8 inch 1,800, a 12 inch 1,200.

The pressure in lbs. per square foot of water acting against a plane surface at right angles to the direction of movement is 0·976 times the square of the velocity in feet per second