

ment of the Far East to which the present peaceful negotiations will prove the threshold.

The attitude of Japan at the opening of the war was shown in the following statement, which she issued to the powers at the outbreak of hostilities: "It being indispensable to the welfare and safety of Japan to maintain the independence and integrity of Korea, and to safeguard her paramount interests therein, the Japanese government finds it impossible to view with indifference any action endangering the position of Korea. Russia, notwithstanding her solemn treaty with China and her repeated assurances to the powers, continues in occupation of Manchuria, and has even taken aggressive measures on Korean territory. Should Manchuria be annexed to Russia, the independence of Korea would naturally be impossible." In the negotiations immediately preceding the war, Russia declined to give any guarantees regarding Manchuria. She also demanded the establishment of a neutral zone in Korea, extending south from the Yalu River; but she declined to establish a similar neutral zone north of the river in Manchuria. It was at this point that the negotiations broke down.

In the terms of peace, as now agreed upon by the plenipotentiaries, it will be seen that Japan secures all, and more than all, that she had asked.

1. Russia recognizes the preponderating interests of Japan in Korea, which will now be under a Japanese protectorate, and will become to all intents and purposes a Japanese colony.

2. Manchuria will be evacuated both by the Russian and Japanese forces, and that great empire will be restored to China.

3. Russia transfers to Japan the leasehold of the Liaotung Peninsula.

4. Russia returns to China its civil administration of Manchuria.

5. The southern and more valuable half of the island of Saghalien is to belong to Japan, and the two countries mutually agree not to erect any military works on that island.

6. Russia transfers to Japan, without compensation, all the docks, magazines and military works at Port Arthur and Dalny.

7. Russia transfers to Japan all of the railroad through Manchuria between Port Arthur and Kunshien, retaining that portion of the line (about one-third) from Kunshien to Harbin.

8. Russia grants to Japan valuable fishing rights along the Siberian coast.

The magnitude of the changes thus brought about in the Far East will be realized by a study of the accompanying map covering the area affected by the negotiations. Russia still retains intact the Transsiberian railroad and the splendid terminal harbor at Vladivostok; she will thus be in a position to utilize these great works for their legitimate purposes of assisting in the development of Siberia by bringing its products to the Eastern Sea. By the acquisition of the southern half of the island of Saghalien, Japan once more acquires land that was originally her own, the loss of which has ever been a sore point with that proud and patriotic people. In Korea she will have ample room for her natural instincts of colonization; and the possession of Dalny and Port Arthur will place her in a strong strategic position to maintain and protect what she has won as the fruits of this costly war.

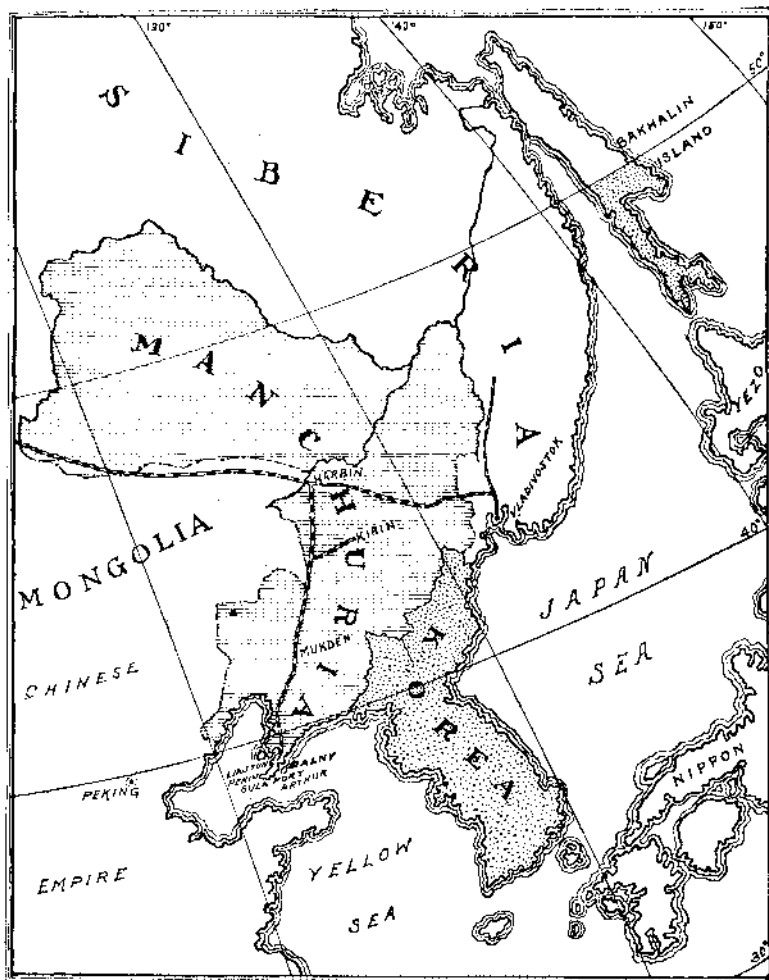
PEARLS AND PEARL SHELLS.

BY RANDOLPH I. SEARE.

Speaking generally, the substance forming the inner layers of the shells of any nacreous mollusk is termed "pearly." In the mass it constitutes what is known as "mother-of-pearl," while in the form of a detached lustrous concretion it is a "pearl." Dr. W. A. Herdman, of the University of Liverpool, England, in reporting recently on the pearl-oyster fisheries of Ceylon, makes some very interesting statements as to the origin of pearls, from which it appears that some pearls, or pearly excrescences on the interior of the shell, are due to the irritation caused by boring sponges and burrowing worms. It would seem that minute grains of sand and other foreign particles gain access to the body inside the shell, which are popularly supposed to form the nuclei of pearls, only under very exceptional circumstances; in fact, only one pearl out of a large number which Dr. Herdman decalcified, contained in its center what proved to be beyond doubt a grain of sand. It is only when the shell is injured, as by breaking off or crushing the projecting "ears"—thereby enabling some fine sand to work in—that such inorganic particles supply the irritation which gives rise to pearl formation. Another class of pearls, found in the muscular tissue of the animal, are

called "muscle-pearls." They have no organic nuclei, but seem to start as minute calcareous concretions in the tissue. The choicest pearls, to which Dr. Herdman gives the name "cyst" or "orient," occur in the thin muscular margin of the mouth, or in the thick, white, lateral part over the stomach and liver, or at times are found free in a cavity of the body; and Dr. Herdman's observations have caused him to remark that the majority of the fine pearls found in the soft tissues contain more or less recognizable remains of parasitic worms, so that the stimulation which eventually causes the formation of an "orient" pearl, is due to infection by a minute worm which becomes incased and dies; thus, as Dr. Herdman puts it, justifying in a sense Dubois's statement that "the most beautiful pearl in the world is in short nothing more than the brilliant sarcophagus of a worm."

Dr. Kelaart, another prominent authority on pearls, is credited with having been the first to connect their formations with the presence of wormy parasites, although as far back as 1852 Filippi proved that the trematode worm, known as *Distomum duplicatum*, was the cause of pearl formation in some of the fresh-water mussels. Other authorities, such as Humbert, the Swiss naturalist, agree that these worms play an important part in the formation of pearls; and, this being so, it may be asked, What is to prevent the possibility



The horizontally-shaded portion of the map shows the vast area of Manchuria, which Russia returns to China. The other shaded portions show the southern half of Saghalien which will belong to Japan, and Korea which passes under Japanese control. The Liaotung Peninsula with Port Arthur and Dalny are transferred to Japan.

MAP SHOWING THE SCENE OF THE RUSSO-JAPANESE WAR AND THE TERRITORY ACQUIRED BY JAPAN.

of infecting oysters with these worms, and thereby increasing the supply of pearls?

The true pearl oyster (*Meleagrina margaritifera*) is found chiefly in the Indian Ocean, the Red Sea, the warmer parts of the South Pacific, the Gulf of California, the Caribbean Sea, and other bodies of water. The local conditions, supply, etc., vary greatly in different regions.

The pearl fisheries of India have long been famous. The most important are in the Gulf of Manar. On the Ceylon side the fisheries were very profitable in 1903 and 1904. The seasons are irregular here, as elsewhere, owing to the frequent disappearance of the oysters before they reach the proper age of production, which is four to six years.

As the *modus operandi* of these fisheries is in general similar in every region, a brief description of that employed in the Ceylon fisheries will suffice for all. When conditions are favorable, a fishery is organized, and two hundred or more large boats are fitted out, manned by sturdy natives, each boat having its complement of divers. The boats, grouped in fleets of sixty or seventy each, start at night so as to reach the banks by sunrise. Each boat generally carries two divers, and is manned by ten rowers, a steersman, and a shark-charmer (*pillal karras*). He is a very important personage, for upon his mystic ceremonies the diver chiefly relies for protection from the numerous sharks; but he also arms himself with a club in case the incantations of the "charmer" should fail! As soon as the

bank is reached, a signal gun is fired and diving commences. The diver has a stone of granite weighing about forty pounds attached to the cord by which he is let down in order to facilitate his descent. Divers work in pairs, one going down while the other stays on board to watch the signal cord. When this is jerked, the stone is pulled up first, then the basket of oysters, and lastly the man! Divers generally remain below about a minute, and are expected to make forty or fifty descents a day. The pearls are sorted into ten different sizes by passing them through brass sieves containing respectively 20, 30, 50, 80, 100, 200, 400, 600, 800, and 1,000 holes. The number of oysters obtained daily in these fisheries is estimated at about a million. These are auctioned off, and frequently bring \$10 to \$14 a thousand, while even as high a price as \$24 a thousand has been reached. The present local price for selected pearls of one carat and upward is about \$20 per carat. In 1903 the government realized \$271,850, and in 1904, \$351,564 from these fisheries.

Among other localities where pearl fisheries are carried on may be mentioned the Merguian Archipelago under the government of Burma, the lower end of the Red Sea, the Persian Gulf, the waters around the Molucca Islands, in the neighborhood of Zanzibar, and on the west coast of New Caledonia. Nearer home are the fisheries of La Paz, in Lower California, British Honduras, Panama, along the coast of Ecuador and of Peru; and in the lower Gulf of Maracaibo. There is also a flourishing pearl fishery on the northern coast of Australia, where a large fleet of vessels is employed, and another extensive industry has lately been reported in the neighborhood of Thursday Island, north of Queensland.

The gathering of pearls from fresh-water shells has been carried on for centuries on this continent. When De Soto was made governor of Cuba, it was agreed that one-fifth of all treasures won in battle, including pearls, should be given to the Spanish crown, and on one occasion his men are said to have obtained three hundred and fifty pounds weight of pearls from Indian graves in Cutifachiqui. The value of pearls from fresh-water shells varies greatly, depending on their size and color. One pearl from a fresh-water mussel was sold for \$1,500, while a round, pink pearl from Tennessee brought \$650. One of the finest pearls ever collected in the United States was the "Queen." It had a beautiful luster and weighed ninety-three grains. It was found near Paterson, New Jersey, in 1857, and was sold to the Empress Eugenie for \$2,500. To-day it is probably worth \$10,000.

Pearl-fishing in the United States has been carried on in many States, including Kentucky, Tennessee, Texas, Wisconsin, Illinois, Arkansas, Missouri, Georgia, and Kansas.

The manufacture of ornamental objects, such as pocket-books, hand-satchels, jewel-cases, etc., from pearl-shells, has during recent years become an important industry, and with their iridescent shades of salmon, purple, pink, and cream, very beautiful articles are made.

The pearl-button industry has increased extensively during the last eight years, and several factories, especially in towns in Iowa and Illinois bordering on the Mississippi River, are now in operation. The principal species of fresh-water mussels whose shells are used in their manufacture is the "niggerhead" (*Quadrula ebena*), while several varieties of "sand shells" are also employed, including the "yellow" (*Lampsilis anodonta*), the "black" (*L. rectus*), and the "slough" (*L. fallaciosus*). One of the best shells is the "deerhorn" (*Tritogonia verrucosa*), and another favorite is the "butterfly" (*Plagiola securis*). The pearl-button industry in the United States began in 1891, the first factory being established at Muscatine, Iowa. The largest factories turn out as many as a thousand gross of finished buttons a day, the average price obtained being thirty-five to forty cents a gross.

Forty feet was formerly considered the maximum height at which centrifugal pumps could operate efficiently, and experiments conducted in 1874, 1875, and 1876 by William O. Webber seemed to demonstrate that the highest efficiency in the single-stage pump was found at a height of about 32 feet, and a maximum velocity of the liquid being pumped through the discharge orifice of the pump of not exceeding 12 feet per second. In Appold's experiments it was determined that the efficiency mainly depended upon the form of the blades in the impeller or vane and the shape of the volute or enveloping case, and that the best form for the blade was a curve, pointing in the opposite direction to that in which the impeller revolved, and for the case, that of a spiral tapering type or volute.