# SCIENTIFIC AMERICAN

**ESTABLISHED 1845**

**MUNN & CO., - - Editors and Proprietors**

**Published Weekly at**

**No. 361 Broadway, New York**

*TERMS TO SUBSCRIBERS*

One copy, one year for the United States, Canada, or Mexico ..... $3.00
One copy, one year, to any foreign country, postage prepaid. £0 16s. 5d. 4.00

*THE SCIENTIFIC AMERICAN PUBLICATIONS.*

Scientific American (Established 1845) ..... $3.00 a year
Scientific American Supplement (Established 1876) ..... 5.00 "
Scientific American Building Monthly (Established 1885) ..... 2.50 "
Scientific American Export Edition (Established 1878) ..... 3.00 "

The combined subscription rates and rates to foreign countries will be furnished upon application.
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, JUNE 14, 1902.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates


## NAVAL BUREAU CHIEFS AND THE SUBMARINE BOAT.

The submarine is one of those devices which have suffered from the zeal of its friends, and the naval world is just now experiencing the first stages of that reaction of sentiment which was bound to follow, sooner or later, as the result of the terms of exaggerated praise in which the submarine has been spoken of, and the claims for unlimited powers of destruction which have been made for it.

Although the submarine has always been more or less in the air, if we may use such a phrase, it was not until the last decade of the nineteenth century, when the French navy began its series of elaborate and very thorough experiments, that the type was brought into the extraordinary prominence which it now holds. To the naturally sanguine Gallic temperament the performance of the "Narval" and her sisters presented a great opportunity for doubling the offensive and defensive power of the French navy at a stroke and for a relatively small outlay of money. England, it was argued, might add battleship to battleship and cruiser to cruiser, at a cost of four or five million dollars a ship, but of what avail was it when France, for an expenditure of a tenth part of that sum per vessel, could people her own and the enemy's harbors and roadsteads with a swarm of death-dealing underwater craft. In the enthusiasm of the new movement it was natural for newspaper correspondents, more or less, and generally less, qualified to write on naval matters, to magnify every performance and minify every defect of the new craft.

Ultimately the submarine fever reached this country, with the result that we have now some seven or eight of these boats, built or building; and even Great Britain, skeptical as she has always professed to be of the value of the submarine, has now under construction some half dozen, two or three of which have by this time been launched and tried. Germany, indeed, seems to be the only first-class naval power that has steadily refused to be drawn into submarine construction. She has none afloat, nor have any been authorized.

It was only a question of time when the inherent, and what would almost seem to be the ineradicable, defects of the submarine would become clearly manifest; and to-day we can see a marked reaction from the temporary extravagant favor with which they have been regarded. It is but fair to say, just here, that the Naval Board of Construction has always been very conservative in its attitude toward the submarine; and its members, collectively and individually, have always urged that we move slowly in adopting a device so radical and largely untried. The fact that we have half a dozen submarines already in the navy is due to the desire of Congress to have some of these vessels included in our fleet. For purposes of experiment and further improvements, perhaps, it is as well that we possess them; but when it comes to a question of building thirty additional submarine boats of the Holland type, as is proposed in the bill before the House, it is certainly time for someone who has technical knowledge and authority to call a halt. This has been done by several of the Chiefs of the Bureaus who are opposed to the purchase at this time of any more of these craft. Rear-Admiral O'Neil, Chief of the Bureau of Naval Ordnance, refers to his opinion on submarine boats in general, expressed by him over a year and a half ago, and he states that he still regards them as experimental craft, whose utility for efficient service has yet to be demonstrated. He considers that the Holland boat does not fulfill all the necessary requirements of a successful instrument of warfare; and he furthermore believes that the whole science of submarine navigation is yet in its infancy, and has not even passed the experimental stage. What we have now to do is to develop submarine boats having fewer limitations than the Holland boats, and this the Admiral thinks can only be done by throwing the door open to other inventors. Nothing more is needed at present than that the government give such encouragement as will awaken interest in the subject, and induce competition among designers and builders in the production of the best craft of the type.

Another strongly dissenting voice is that of Rear-Admiral Bowles, Chief of the Bureau of Construction and Repair, who has submitted a written suggestion to the effect that "the Secretary of the Navy be authorized to procure four or more submarine boats of the most approved design, either by purchase or by construction under contract, or in navy yards, provided that not more than one of these boats shall be procured from or built upon designs of the same individual or company." It is furthermore suggested that before purchasing or contracting for any boat, the Secretary of the Navy must be satisfied that such a boat is, or will be, more effective as a weapon of war than any of the submarine boats heretofore procured or now under construction for the navy. It is proposed that a sum of five hundred thousand dollars be appropriated for this purpose.

The wisdom of the course outlined by these two Chiefs of Bureaus is obvious. The statement of Admiral O'Neil to the effect that the submarine has not yet left the experimental stage, is fully borne out by such tests as have been made with our naval boats of the Holland type; and we therefore sincerely hope that Congress will pass a bill embodying the suggestions made by the Chief Constructor. In speaking of the present submarine as experimental, it is not necessary to particularize. If asked to do so, we would refer to the one important fact that all submarines are "blind." When at the surface, the craft can see; but when it is submerged to its working condition, it is as impossible for the craft to see as it is for it to be seen by the enemy. Among the many problems awaiting complete solution in the submarine, this one of "blindness" is certainly the first. If the bill suggested by the Bureau Chiefs be passed, we venture to say that the experimenting that will follow both by naval men and civilians will be directed first and last to this most crucial point.

## A DARING INVESTIGATION OF MONT PELEE.

Interesting reports come to us from Martinique. Prof. Angelo Heilprin, president of the Philadelphia Geographical Society, who has made two ascents of Mont Pelée, has just made known the results of his investigations. Several important discoveries have been made which throw light on the nature of the eruption, and which expose many of the wild exaggerations that always follow a terrible catastrophe. The first ascent of the mountain was made on May 31, and the second on June 1. On the first expedition, when the edge of the old crater was reached, the party was overtaken by a terrific thunderstorm. Clouds of rain and steam from the volcano so completely enveloped them that they were able to see only a few feet. Further progress was impossible, for on account of the electrical disturbances their compass refused to work, varying as much as twenty degrees to the eastward. With great difficulty they groped their way down the steep ridge, slipping at every step; for the rain-soaked ashes afforded a precarious footing and threatened to hurl them down the yawning gulfs at each side. The terrific detonations heard were supposed to be of volcanic and not electrical origin, for when the River Fallaise was reached it was found to be filled with steam and mud indicating a fresh volcanic disturbance. The party reached Acier, caked with mud and much disappointed. However, on the next morning, Prof. Heilprin was ready for another encounter with Mont Pelée. We cannot but admire the bravery and devotion of this man who, with his followers, twice climbed the angry volcano and who once, by a sudden dash during a lift in the clouds of vapor, reached the very lip of the crater, from which point stones could be dropped into the white-hot mass, 200 feet below. Standing on the very brink of the crater, he was witness of a most awful, yet fascinating scene. As was to be expected, the principal output of the crater was steam, and but for a favorable shift in the vapor clouds the party could not have made the valuable observations that they did. So far as known, steam is always found in volcanoes, and seems to be the main cause of the eruption. Scientists divide volcanoes into two classes: The quiet, characterized by a flow of lava, and the explosive, characterized by the blowing out of fragments. Prof. Heilprin states positively that no lava has flowed from the crater of Mont Pelée. One of the main characteristics of the explosive volcano is what is called the "cinder-cone." This is formed of material which is cast out and which drops back around the orifice from which it was thrown, forming a cone. Prof. Heilprin, however, states that no such cone was found in this volcano. What was taken to be a cinder-cone proved to be but a pile of ejected rocks with no central vent. Of course, in the present condition of Mont Pelée it is impossible to state absolutely that there is no cinder-cone, for it was possible to see down only about 200 feet, and it is believed that the crater is much deeper than this. In shape, the new crater appears like a great gash in the mountain, running north and south and expanding into a bowl. The fissure runs transversely to the old crater, and appears to have nearly rifted the mountain. In the first reports of the eruption statements were made that the mountain had been reduced to one-third its original height. This is now shown to be utterly untrue, for from a number of observations taken with an aneroid barometer it was found that the height of the mountain had remained unaltered and that no important topographical changes had taken place. The exaggerated reports may have had their origin in the fact that a dense cloud of steam normally covers the top of the mountain, which might lead to the supposition that the mountain was much reduced in height. From the investigations made, Prof. Heilprin considers violent eruptions improbable. Mont Pelée has freed itself of interior pressure, and while small disturbances may continue to occur, they will probably decrease in frequency and power. However, no one can prophesy with certainty on subjects of this sort. Volcanic action is very little understood; new and unexpected phenomena are continually occurring. The explosion of flaming gases is unprecedented, so far as known, and was probably the main cause of the terrible loss of life. The electrical phenomena were also new, though they probably did not play an important part in the destruction of the city. Specimens collected by Prof. Heilprin show that the lightning bolts were small and very intense, penetrating the walls of the houses. No other volcano was ever so rapid in action, and never before has such a loss of life resulted directly from a volcanic eruption.

## THE COMMERCIAL PROSPECTS OF AFRICA.

The declaration of peace in South Africa, which is to be followed by the reopening of the greatest gold-producing mines of the world and presumably by a general revival of business in that greatest consuming section of Africa, lends especial interest to a monograph on Commercial Africa in 1901, just issued by the Treasury Bureau of Statistics. The commerce of Africa, according to this authority, amounts to over $700,000,000, of which $429,000,000 represented the value of the imports. About three-fourths of the imports of Africa are through the ports of the extreme north and south of the continent, those at the north being for the consumption of the more densely populated regions bordering on the Mediterranean and considerable quantities going to the interior by caravans —a large part across the Sahara to the densely populated regions of the Soudan. At the south, a large share of the imports is, under normal conditions, for use at the gold and diamond mines, which lie a few hundred miles north of the Cape, and are reached by railway lines from Cape Colony and Natal at the south and from ports of Portuguese East Africa on the southeast.

A very large proportion of the trade of Africa is with England. There are numerous reasons for this, the most important, however, being that her colonies —Cape Colony and Natal—on the south are the avenues through which pass most of the goods for that section, and that a very large share of the growing trade is also carried by British vessels; while the bulk of the mining, as well as the stock raising and general development of that section, is in the hands of British colonists or capitalists. In the north, a large share of the trade of Egypt is given to Great Britain, whose influence in the management of Egyptian affairs is well recognized; while in Algeria, which has a large trade, a very large proportion is with France, the governing country.

The total recorded imports into Africa, aggregating in the latest available year $429,461,000, were distributed as follows: Into British territory, $157,575,000; French territory, $92,004,000; Turkish territory, $77,787,000; Portuguese territory, $20,795,000; German territory, $8,336,000; and in the Congo Free State, $4,722,000. Of this importation of $429,461,000, about 5 per cent was furnished by the United States, the total for 1901 being $25,542,618. Our total exports to Africa have grown from $6,377,842 in 1895 to $18,594,424 in 1899, and $25,542,618 in 1901. This rapid increase is largely due to the fact that orders sent to the United States for mining machinery and other supplies so much in demand in South Africa are promptly filled with goods of the latest pattern and most acceptable character.

Africa occupies fourth place in the list of the grand divisions of the world in its consuming power in relation to international commerce, the imports of the grand divisions according to the latest available figures being as follows: Europe, $8,300,000,000; North America, $1,300,000,000; Asia, $900,000,000; Africa, $430,000,000; South America, $375,000,000; and Oceanica,