SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO. - - Editors and Proprietors

Published Weekly at
No. 361 Broadway, New York

CHARLES ALLEN MUNN, *President*
361 Broadway, New York.

FREDERICK CONVERSE BEACH, *Sec'y and Treas.*
361 Broadway, New York.

TERMS TO SUBSCRIBERS.

One copy, one year, for the United States or Mexico $3.00
One copy, one year, for Canada 3.75
One copy, one year, to any foreign country, postage prepaid, 18s. 6d. 4.50

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (established 1845) ..... $3.00 a year
Scientific American Supplement (established 1876) ..... 5.00 "
American Homes and Gardens ..... 3.00 "
Scientific American Export Edition (established 1878). ..... 3.00 "

The combined subscription rates and rates to foreign countries, including Canada, 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, APRIL 3rd, 1909.

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.

LIEUT. SHACKLETON'S ANTARCTIC EXPEDITION.

Lieut. Shackleton's feat in reaching latitude 88 deg. 23 min., only 111 miles from the South Pole, marks a new and remarkable record in polar exploration, not only because it outdoes Capt. Scott's achievement, but also because it surpasses even Commander Peary's Arctic record for closeness of approach to a geographical pole.

When Lieut. Shackleton sailed from England in July, 1907, success seemed possible. No similar expedition was ever more elaborately fitted out. Shackleton had accompanied Capt. Scott in 1902 on an expedition which reached latitude 82 deg. 17 min, and which brought back such details of the Great Ice Barrier as to warrant the belief that the South Pole might be reached by over-ice travel. Therefore he had a more or less intimate acquaintance with the scene of operations. Even though the temperature at one time fell to 88 deg. F. below freezing, he was favored by an exceptionally mild winter.

Profiting by experience, he took with him fifteen hardy Manchurian ponies and twelve Esquimau dogs, together with a motor sled, the first mechanically driven vehicle ever employed in polar exploration. Only by rapid means of locomotion was there any hope of covering the 463 miles that separated the pole from Scott's farthest south. The partial substitution of ponies for dogs resulted in a reduction of the food consumption, and accordingly fulfilled Shackleton's expectations. The motor sled seems not to have realized whatever hopes it may have engendered; for Shackleton states in his dispatch that it could not cope with the huge upheavals produced by the grinding pack of the Great Barrier, although it covered more than 400 miles and proved serviceable enough in laying depots on the ice.

It can hardly be expected that the expedition contributed much to our store of biological knowledge, for the simple reason that in the very heart of the frigid zone there is but little life. Dr. Wilson, the zoologist of the Scott expedition, found a few sea mammals within the Antarctic Circle. Along the Great Ice Barrier a few birds were seen. Penguins and gulls all but shared the Scott winter quarters at Mount Erebus. But in the dreary interior Wilson could report no life, with the exception of a few mosses and lichens and a wingless fly. If Scott's expedition found only these few evidences of life, it is safe to prophesy that the zoologist who accompanied Lieut. Shackleton can add nothing to Dr. Wilson's report.

Much, however, has been contributed to our geographical knowledge of the Antarctic region. All told Shackleton covered 1,708 statute miles. As a result of his intrepidity our atlases will henceforth appear with firmer outlines of Antarctic continents and islands and with more definite locations of plains and peaks. Shackleton passed the very point reached by Scott in 1903, pushed on for 325 miles, and was eventually compelled to turn back by hunger, fatigue, scurvy, and the loss of his dogs and ponies when he had reached a point distant from the Pole not much more than New York from Philadelphia. It seems unfortunate that with another month of favorable weather before him his hardships were such that he could not push on to the Pole itself. In all probability he might have seen the locality of the Pole from a mountain top on a clear day. He discovered eight new and distinct mountain ranges and more than a hundred mountains. Of great scientific importance was his daring ascent of Mount Erebus, the most southerly of volcanoes, towering 13,120 feet above the sea level and ejecting vast volumes of steam and sulphurous gas in the midst of perpetual ice and snow. The south magnetic pole was reached in lat. 72 deg. 25 min.

Even a cursory reading of Lieut. Shackleton's dispatch must convince one that there is no ground for believing in the existence of that region of atmospheric calm in the vicinity of the Pole which meteorologists have long supposed to exist. Time and time again blinding storms were encountered which raged for days and which completely blocked the progress of the adventurous explorers.

It is inevitable that comparisons should be drawn between Commander Peary's exploit in reaching north lat. 87 deg. 6 min. and Lieut. Shackleton's achievement in planting his country's flag in south lat. 88 deg. 23 min. The topography of the North and South Poles is radically different. For every mile that he crept along the shore of Grant Land, Peary was obliged to travel five or six miles. The South Pole is more continental in character and offers so stable a footing that it could be traversed almost in a straight line, were it not for crevasses, drifts, and gigantic masses of ice and snow. It is therefore difficult, if not impossible, to draw anything like an accurate comparison of the difficulties encountered by the two explorers.

TO TEST FULL-SIZED COMPRESSION MEMBERS.

The fall of the Quebec Bridge, as the result of the crumpling up of one of its main compression members, proved the necessity for testing compression members of the largest size in a machine built for that purpose, in order to determine the correctness, or otherwise, of the formulæ by which the strength of such members is computed. It was realized that a formula which gave reliable results in the smaller sizes might give false results when the structure reached the huge size of the Quebec Bridge members. Many years ago a series of tests was made, which generally confirmed the prevailing theories of that day as to the strength of built-up columns; but because of the limited size of the testing machine, the largest specimens tested were small in comparison with the members which enter into our modern steel structures.

When the Quebec Bridge failed, there was a general call on the part of the technical journals and technical societies for the construction of a testing machine capable of handling the largest pieces and testing them to destruction. The Quebec Bridge member, which was about 5 feet square and nearly 60 feet long, was supposed to carry a load of between 11,000 and 12,000 tons. It failed under a little less than 9,000 tons. Now, a machine capable of taking such a member and crushing it to destruction, must necessarily be planned on a gigantic scale, and must needs be difficult and costly to design and construct. We are pleased to note that a machine of this character (though not large enough to take a Quebec Bridge member) is about to be erected by the United States government at the Geological Survey Testing Station at Pittsburg. It will stand 80 feet above its foundations, will weigh over 200 tons, and will be capable of exerting a maximum crushing pressure of 5,000 tons. The work of the Pittsburg machine will be general in character. It will be used for testing the strength of large blocks of stone, and of columns of concrete and brick, such as are used in the general building and construction work of the government. The Federal government has in hand and will undertake during the next few years works which will require the expenditure of over $70,000,000 per annum. In this work is included a programme on public buildings costing from $12,000,000 to $15,000,000 annually. Hence, the great value to the government of the huge testing machine which is about to be built at Pittsburg.

THE SO-CALLED "DREADNOUGHT" CRAZE.

It is a curious fact, the psychological import of which we will not now discuss, that a chance catchphrase, applied carelessly to some question of importance, will frequently be accepted by the public at large at its face value, and used as if it were a true measure of the scope and meaning of that question. A case in point is the habit into which many people have fallen of speaking of the present activity in the construction of battleships of the "Dreadnought" type as a craze; of referring to the ships as marking a departure, radical if not revolutionary. Great Britain is credited with having started the movement by challenging the world in the production of the original "Dreadnought," which is popularly regarded as having been an entirely new type of warship, in which old ideas and all the ripe naval experience of Great Britain were thrown overboard; the 400 or 500 ships of her existing navy discredited; and an era of warfare, novel, mysterious, and altogether terrible, introduced. In producing this ship Great Britain has endeavored to steal a march upon the world, and render her naval pre-eminence, impregnable before, doubly impregnable for the future. The United States, Germany, and Japan are supposed to have answered the challenge by making more or less improved copies of the "Dreadnought," and building them with an outlay of national treasure that bids fair to bring ultimate financial ruin to those who have entered this race for supremacy.

Thus, in a recent speech in this city, Mr. Carnegie, speaking of the building of the "Dreadnought," says that the British Cabinet "approved of what has amounted almost to a revolution in naval armaments." He tells us that by setting an example which other nations have energetically followed, England has jeopardized her previously existing supremacy; and the building of this ship is designated as "the fatuous blunder of the government of Britain."

Now, as a matter of fact, the "Dreadnought" is not the first battleship of her type that has existed in the British navy. She is a reversion to an earlier type of ship of thirty years before, which bore the same name, and, by a curious coincidence, was herself an all-big-gun ship. In the sixties the line-of-battle of the British navy was made up of large ships, each mounting, in broadside, many guns of various calibers. Then, in the seventies came, if you please, the first "Dreadnought" "craze"; and it was believed that a few (generally four) powerful, armor-piercing guns, mounted in turrets behind thick armor, and carried on vessels of large displacement, would give the most effective type of fighting ship. England produced the "Devastation," with its four 35-ton muzzle-loading guns. The "Dreadnought," "Thunderer," and "Inflexible" were other ships of that date of the all-big-gun type. Then the pendulum swung in the opposite direction, and the development of the rapid-fire gun, with its ability to smother an enemy's ship with a cloud of projectiles fired in rapid succession, led to the enlargement of the big-gun ship so as to admit of carrying amidships a broadside battery of rapid-fire guns. It was reserved for the United States, in the reconstruction of its navy in the early eighties, to partially revive the all-big-gun idea, which she did by mounting in the intermediate batteries of the "Oregon," "Massachusetts," and "Indiana," eight 8-inch armor-piercing guns.

Fifteen years later came the first great test of modern naval material; and the conflict between Russia and Japan proved the enormous superiority, in accuracy and in power to inflict vital injury, of the 12-inch gun. The swing of the pendulum of naval opinion back to the all-big-gun ship, which was commenced in our "Oregon," was completed by the overwhelming victory of the 12-inch gun at Tsushima. It was realized by every thoughtful naval man throughout the world that the battleship of the future would be an all-big-gun ship; and it was merely because England, always alert and to the forefront in naval construction, was the first power to set afloat the new type of ship (which, as we have seen, was a reversion to an earlier type), and name her the "Dreadnought," that the origination of this class is credited to her. The "Dreadnought" merely marks a logical step in the gradual growth of the battleship in size, speed, protection, and gun power. Had Great Britain not built the "Dreadnought," somebody else would; and the first ship so built would have given her name, whatever it might have happened to be, to the type.

To make the statement, as Mr. Carnegie does, "that Britain's navy of more than 400 efficient warships is now held to be of little worth," is to come pretty near to talking arrant nonsense. The construction of our own "North Dakota" has not rendered the "Connecticut" so much junk, fit only for the boneyard. The earlier ships of any navy are just as efficient against ships of the same date in other navies as ever they were. Because the "Dreadnoughts" will be formed into independent squadrons and fleets, it does not follow that the "Connecticuts" and "King Edwards," the "Mikasas" and "Deutschlands," are one whit less effective if employed against one another, or as forming the second line of battle in the great fleet engagements of the future.

Before leaving this subject, we wish to draw attention to the article on another page of this issue, describing our new 26,000-ton "Dreadnoughts," and ask whether we are not pushing the matter of size a little too far. The SCIENTIFIC AMERICAN has always been alive to the inherent value attaching to size in a battleship; but we think the time has come to put a question mark against a ship of the size of these huge fighting leviathans which together displace 52,000 tons. The same displacement would give us three ships of the size of the first British "Dreadnought." If the wing turrets of that ship were shifted to the median line, giving two forward of the superstructure and three astern, the three smaller ships would be able to concentrate twelve guns ahead or astern as against eight ahead or astern for the two big ships, and thirty guns on the broadside as against twenty-four. And, moreover, there would be three ships to two; that is to say, there would be fifty per cent more ships in numbers; a fifty per cent heavier end-on fire, and a twenty-five per cent more powerful broadside fire.

These facts present food for serious thought.