heating surface about 5,000 square feet. The dead-weight load on board was 35 tons.

A further trial was subsequently had for eight hours at an economical speed, with a view to ascertain the distance the Havock would steam with the fuel supply she can carry on board, upon which depends her radius of action. It was found that at a speed of 11·2 knots the consumption was under a quarter of a ton an hour, and at 10 knots 3½ hundredweight an hour; and as the bunkers have a capacity of 60 tons, it follows that the distance the Havock can steam without coaling is about 3,500 knots.

THE NEW BRAZILIAN NAVY.

It has been interesting to note the mushroom growth, during the past few weeks, of Brazil's provisional navy, a navy built in a day designed to combat a navy which it has taken years to bring together.

In the early part of the present revolution, in Brazil, it became evident to the government party that the only way to dislodge the revolutionists from their stronghold, the ships, was to get and send other ships to meet them. The position, for some time past, in the game between the two parties might be likened to a stalemate in chess. Admiral Mello, the leader of the revolutionary movement, cannot move, and yet he cannot be mated by Peixoto, the President of Brazil.

In consequence of this state of affairs, Brazil, through her minister at Washington, has been purchasing ships and war material in the United States and France, the greater operations being in the United States. The Brazilians evidently recognize the superiority of American skill, and they thus complimented American shipbuilders and ordnance men.

The ships chosen are of a variety of sizes and shapes, and designs, and the armaments are novel.

We have had little or no experience in actual combat with modern war material, and the efficiency and even availabilty of many weapons of modern design are doubtful.

The Chilian civil war gave us a few lessons from actual experience, especially in the use of auto-mobile torpedoes and the small caliber magazine rifles. The interesting feature about the mushroom fleet is that it is to try the dynamite gun, with which our authorities have been so long experimenting, the Howell torpedo, which is said to be equal, if not superior, to the far-famed Whitehead, and the submarine gun, first designed by Ericsson, but since much improved by others as a result of extensive experiments.

The fleet thus largely depends for its offensive qualities on the aerial torpedo, the auto-mobile, aquatic torpedo and the submarine gun. Each of these carries a large charge of high explosive, and, if a successful hit can be made, one of these charges would disable the heaviest and strongest war vessel now in existence.

The preparing, equipping and arming of this fleet has excited much interest, and especially among naval men. Modern naval warfare is at such a point that it is almost impossible to predict the result of any given conditions. Those who are in the position and possessed of the proper knowledge to give the best judgment on the subject are very doubtful of the success of this heterogeneous squadron operating against the fairly well equipped modern ships of Admiral Mello.

President Peixoto must do something, and, as armorclads cannot be purchased in open market nor can they be built in a limited time, the present plan is the only one left to him.

What are the chances of this squadron? First, they must get to Rio de Janeiro. There is no question but that El Cid and the Britannia can get there. The Feiseen and the Yarrow boat will go safely on the decks of the larger steamers, but there is grave doubt about the Destroyer, which is too large to be taken on board of one of the steamers and perhaps too small to go by itself. None of the plans of towing it are satisfactory, and no one is confident of its ever getting as far as the West Indies.

Arriving at Rio de Janeiro, what is to become of this fleet as it approaches the rebel squadron? The long range high powered rifles of the rebels will open fire long before any of the offensive weapons of the attacking fleet can be brought to even a possible effective use. The gunnery practice of the Brazilians being notoriously bad, it is quite possible that the Feissen and the Yarrow torpedo boat, being very fast and presenting small targets, may get near enough to use their auto-mobile torpedoes with effect.

El Cid and Britannia are large targets, and vulnerable to rapid fire guns as well as those of larger caliber, and will find it difficult to get within fighting range. There is no question about the efficiency of their four and seven-tenths inch rapid fire guns, when they arrive within their fighting range, but the dynamite gun cannot be counted on with any degree of confidence at present.

The experiments with the Vesuvius showed how particularly sensitive this gun was to the troubles caused by the unstable platform offered by a ship.

The Destroyer is very slow and cannot be called an efficient boat, and the submarine gun, with which it is armed, though having met with some success lately, is still in the experimental stage.

Though the thorough vulnerability of this fleet must be acknowledged, yet we must not forget that it carries weapons the successful use of which will cause frightful destruction.

It seems to us that President Peixoto must lean heavily for success on the armorclads, Benjamin Constant and Tiradentes, the former of which is an able, well-armed, protected cruiser.

No fleet ever sailed with more chances for and against its success than this provisional squadron, and of the men who go with it, it must be granted that their great pluck deserves good luck.

THE NEW YORK CONTINGENT OF THE BRAZILIAN NAVY.

El Cid, or the Nictheroy, as it has been re-christened, is a new and fast vessel, built to run between New Orleans and New York. She is of 4,500 tons register; length, 380 feet; beam, 48 feet; depth from keel to upper deck, 33 feet; length over all, 406 feet. The Nictheroy is provided with a 43 ton dynamite gun which can throw a 500 pound projectile. She is also armed with several small guns and torpedoes.

The Destroyer is the result of twenty years of Mr. Ericsson's experience in war vessels. She is 130 feet long, 12 feet beam, and has a draught of 10 feet. Her main feature is a 16 inch submarine gun mounted in her bow 8 feet below the water line. The gun fires a projectile weighing 1,525 pounds, being 27 feet 4 inches long, 16 inches in diameter and containing a 300 pound charge of high explosive. A feature of the projectile is a pilot shell, which is detachable, and the object of which is to open a breach of sufficient size through a torpedo net to allow the projectile to pass through.

The Britannia, now known as the Brazilian America, was originally owned by the North Atlantic Steamship Company, of Boston, and made trips between Boston and Halifax. The Britannia was built at Bergen, Norway, in 1890. She is of steel, and is 270 feet long, 34 feet 6 inches beam, and the hold is 23 feet deep. She is well armed. These vessels have lately sailed from New York for Brazil, and their careers in the war will be watched with interest.

The Flying Rocks of Mount St. Helens.

A recent issue of the New York *Sun* contains an account of the ascent of St. Helens, by Mr. Fred. G. Plummer, from which we take the following:

The State of Washington is traversed from north to south by the mountains called the Cascade range. They are the mountains which the early navigators of the North Pacific called the Snowy range, and which were delineated upon our early geographies as the Presidents' range. At that time it was proposed to name the great peaks after the Presidents of the United States, but this revision of nomenclature was a failure.

The Cascade range forms a portion of the longest range of mountains upon the earth. From Cape Horn they run along the west coast of South and North America, along the Aleutian Islands, Kamchatka, Kurile Islands, up the east coast of Asia, through Siam and Sumatra, and thence into the Indian Ocean, where they still make their location known by the volcanic islands Kerguelen, St. Paul, and Amsterdam. Indeed, this great range completely belts the planet on a great circle, and doubtless marks, as has been suggested, the former equator of the earth, for it is conceded that the poles of the earth have changed, that it might be explained how tropical plants once flourished at the poles while glaciers covered Europe. The mass of these mountains came from enormous fissures in the earth's crust, excepting the great true volcanoes which are so numerous along this line.

Within 150 miles of Tacoma are no less than twenty-three of these large volcanoes and hundreds of smaller vents. Mount Tacoma, 44 miles southeast from the city, is 15,000 feet high, and is already famed for its great glacier system.

St. Helens has shown the greatest activity in recent times. In August, 1831, there was an uncommonly dark day, which was thought to have been caused by an eruption of a volcano. The whole day was nearly as dark as night, except for a slight red, lurid appearance, which was perceptible until near night. Lighted candles were necessary during the day. The atmosphere was filled with very light ashes, like the white ashes of wood. The day was perfectly calm. There were no earthquakes or rumblings. After the ash clouds had cleared away it was seen that the pure white snow upon St. Helens was browned by the fall of ashes. It is also said that lava flows took place at that time.

In October, 1842, St. Helens was discovered all at once to be covered with a dense cloud of smoke, which continued to enlarge and move off in dense masses to the east, filling the heavens in that direction. When the first volume of smoke had cleared away it could be seen distinctly from various parts of the country that an eruption had taken place on the north side of St. Helens, a little below the summit, and from the smoke that continued to rise from this crater it was pronounced a volcano in active operation. When the explosion took place the wind was northwest, and on the same day, extending from thirty to fifty miles to the southeast, there fell showers of ashes or dust, which covered the ground in some places so as to admit of its being gathered in quantities.

On November 23, 1843, St. Helens scattered ashes over the Dalles of the Columbia River, fifty miles away, and burned continuously until February 16, 1844. Dense masses of smoke rose from the craters in immense columns, and in the evenings the fires "lit up the mountain side with a flood of soft yet brilliant radiance."

I determined to investigate the most active volcano in Washington.

We left Tacoma by the midnight train on August 10, 1893, with packs containing the necessaries for the trip and the instruments for observing and recording all we were to see.

When we reached the mountain, with the aid of a glass I was able to map out a route to the larger of the craters, which would not cross any of the great crevasses in the ice slopes. Our ascent began immediately, and in less than an hour became very steep and in places dangerous.

Our progress was checked by an enormous cañon, several hundred feet deep, which appeared a counterpart of the grand cañon of the Yellowstone. Its formation showed several old lava flows, which, being firmer than the cinders and broken rock, in most places overhung the walls of the cañon and made descent out of the question. The great glacier at its head was fully 100 feet deep at the foot, and was plowing its way into a huge terminal moraine of small rocks. We could plainly hear the rocks grinding together as the great body of ice slowly forced them down the cañon. This great glacier headed in the ice cap at the summit of the mountain, and, although it looked steep and slippery, we decided to try this route. It was then 10 o'clock in the morning—a bad time to climb ice slopes and snow fields—but we had been gone from Tacoma nearly a week and had only provisions for two more days.

We had proceeded but a short distance cutting steps in the steep ice slope, when a bombardment of rocks warned us that our route was to be a dangerous one. The surface of the glacier seemed a sheet of ice clear to the summit, and down its slippery surface came rocks large and small as fast as the noonday sun melted the ice and snow which held them near the top.

Imagine a toboggan slide about three miles long, starting nearly 10,000 feet above the sea with an initial grade of forty-five degrees. The speed of the rocks as they passed us was terrific. They whirled at such a rate that they seemed spherical in form, and as they flew down the slope seemed only to touch the high places in the slightly wavy surface of the glacier, making a metallic sound as they chipped the ice into a cloud which trailed them like a comet's tail. Here and there great rocks lay upon the surface of the glacier, probably having been held by a fall of new snow, and now and then one of these flying rocks would strike those which were held by the ice, and, amid a shower of sparks and chips, would bound into the air fifty feet or more, still whirling like a buzz saw and giving out a sound which I cannot describe. All this would have been very entertaining if so many of the flying rocks had not passed near us.

We were exposed to this danger for over an hour while climbing a quarter of a mile, and to say that we were all thoroughly frightened would not do the rocks justice. When at last we reached a place of comparative safety, we were too much awed to speak.

A New Deep Water Port.

The commercial interests of east Texas will be advanced by the new deep water port at Sabine Pass, Texas. The bar has been dredged so that vessels drawing 18 feet of water can pass the bar and reach the natural and spacious harbor every twelve hours. Jetties have been constructed on either side measuring 17,100 feet and 14,750 feet, with the walls above high tide. The new harbor will be especially valuable to the lumber and cotton trade. Instead of expensive transfers, cotton can now be shipped to Manchester or London direct. There are extensive deposits of coal in this part of Texas which, it is thought, will now be developed. A deep water celebration was held October 24 in honor of the event.

Curiosities of Science.

The weight of a molecule of hydrogen, as given by an eminent authority, says the *Chemist and Druggist*, is approximately 0·000,000,000,000,000,000,000,04 of a gramme; multiplying this inconceivably small number by 55, the atomic weight of iron, the weight of a molecule of iron is ascertained—0·000, 000,000, 000,000, 000,002,2 gramme. In the sulphocyanide test we are able to detect the presence of thirty-three ten-millionths of a gramme of iron; dividing this number by the weight of one molecule of iron, we find that this apparently delicate test is unable to indicate to our senses a less number of molecules than 1,500,000,000,000,000.