

Northern Hemisphere. The international charts show that when a period of abnormal weather prevails over a considerable area of the United States, there is a disarrangement of the normal distribution of atmospheric pressure over a great part of the Northern Hemisphere. They show that in the presence of unseasonable weather in any part of the Northern Hemisphere the so-called permanent continental and oceanic areas of high and low barometric pressure present abnormal aspects, and there is an interruption in the normal succession and progression of the areas of high and low barometric pressure of the middle latitudes.—Prof. E. B. Garriott, in the Monthly Weather Review.

THE NAVAL WAR GAME—II.*

THE WAR—VARIOUS MOVEMENTS.

By FRED T. JANE.

DIRECTLY war broke out, both sides put all available ships in commission. Mostly this affected the coast defense squadrons, both far removed from the scene of war, and commerce-attack cruisers, which were destined to have an early meeting.

The United States Mediterranean squadron, which was assumed lying at the Piræus, was cabled to proceed to the Far East, and sailed for Suez the next day.

The South Atlantic squadron proceeded to sea, with a view to trying to entice to action the Germans in those waters. The Home fleet cruised up and down the coast, awaiting developments and practising battle evolutions, etc. Its cruisers, together with others newly commissioned, went out along the trade route.

On the German side the first Home squadron went to Gibraltar at full speed, accompanied by colliers and its destroyers. It reached Gibraltar on the 7th of August, 1903—seven days after the breaking out of the war. By this time the United States Mediterranean fleet was well down the Red Sea. This German squadron, short of several cruisers, coaled at Ceuta from its own colliers.

Both sides adopted somewhat similar dispositions for their cruisers, that is to say, there was little spreading with them. All ships maintained close touch with consorts, hunting rather for hostile cruisers than attempting action against commerce. A few liners were chased, but the speed of these saved them, nor were the attempts to follow serious. In this way the rival squadrons had fairly clear ideas of each other's whereabouts, and a meeting was not therefore long delayed.

CRUISER ACTION IN MID-ATLANTIC—GERMAN VICTORY—CAPTURE OF THE FLAGSHIP "OLYMPIA" AND THE "DETROIT"—FOUR AMERICAN CRUISERS SUNK.

Informed by wireless telegraphy from the "Columbia" and the "Thetis," which were the first ships to establish touch, both sides concentrated in mid-Atlantic. Neither was in a hurry to open the battle, preferring to wait for fresh reinforcements; and so for a whole day nothing happened save attempts to secure the most advantageous position. Toward sunset, however, both squadrons edged in toward each other, and the Germans, though they had fewer ships, being the heavier, took advantage of this to open the battle.

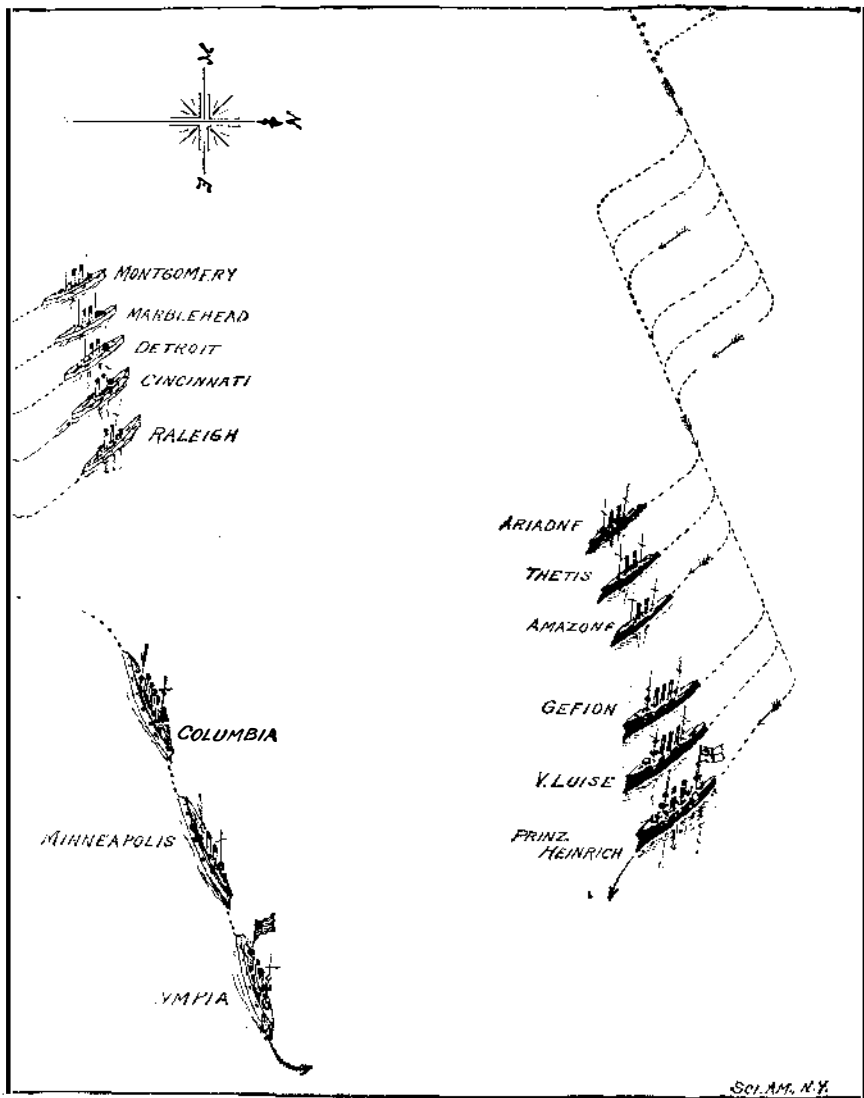
They then lay to the north of the Americans, being in the following order, the flagship to the eastward: "Prinz Heinrich" (flag), "Victoria Luise," "Gefion," "Amazone," "Thetis," "Ariadne," all steaming due south at 18 knots in line abreast. The Americans at that moment were in two divisions some half a mile apart. The first, steering northeast, consisted of the

"Olympia" (flag), "Columbia" and "Minneapolis;" the second of the "Raleigh" (senior ship), "Cincinnati," "Detroit," "Marblehead" and "Montgomery," steering northwest in line abreast, while the first division was in line ahead.

Fire was opened at 6,000 yards, but this range was speedily reduced to 3,000. All German guns were laid on the foremost of the flagship "Olympia," with the result that the incident of the battle of Cape Bojeador

apolis," rather mauled, and the "Gefion," which declined close action, were in any condition to do much further work in the two first divisions.

Meanwhile the second German division, headed by the "Gefion" from the first, passed up between the two American divisions, torpedoing the disabled "Columbia" to port and the "Marblehead" and "Montgomery" to starboard. The range was small, and many of the American ships being without torpedo tubes, and none



MID ATLANTIC CRUISER ACTION—POSITION AT OPEN FIRE.

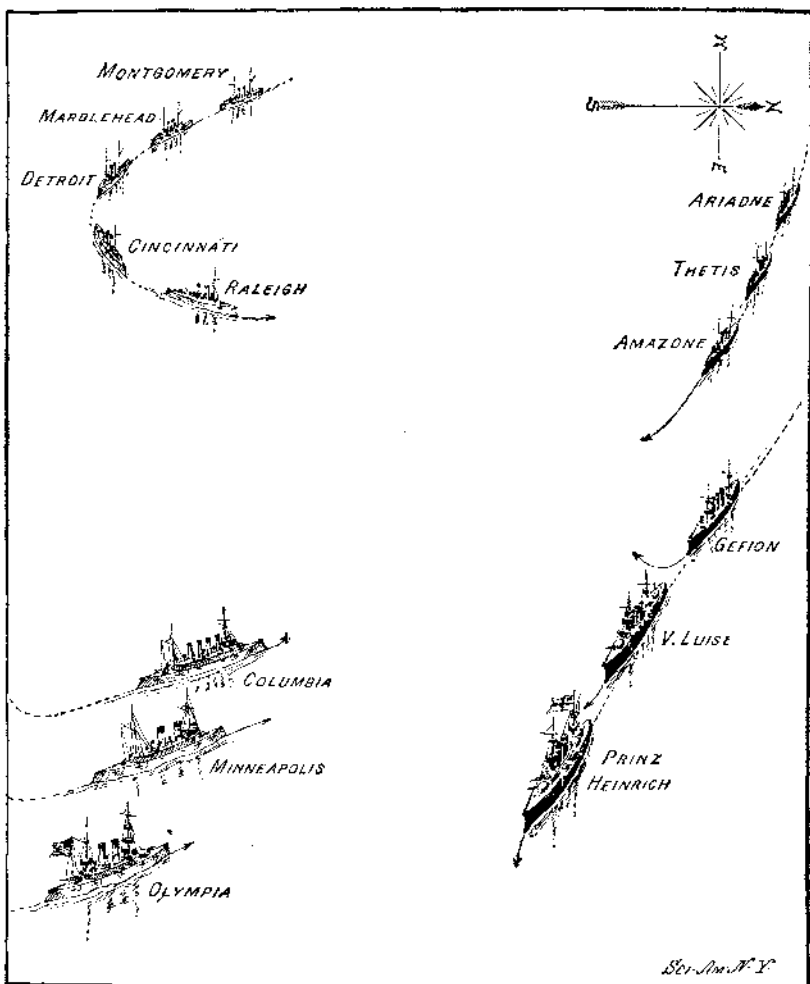
was repeated in so far as the American admiral was concerned. At an early stage he was umpired "killed," and command passed to the captain of the "Minneapolis," who was second in command. American guns were, however, directed with a similar objective and with a similar result.

To this, perhaps, rather than to any direct intent was due the fact that the first divisions became involved in a *melée* well inside torpedo range. As a result of this and short range gunfire the "Olympia" was soon reduced to a sinking condition, the "Prinz Heinrich" sunk (by torpedo), the "Columbia" and "Victoria Luise" rendered unmanageable. Only the "Minneapolis" was left of the two American divisions.

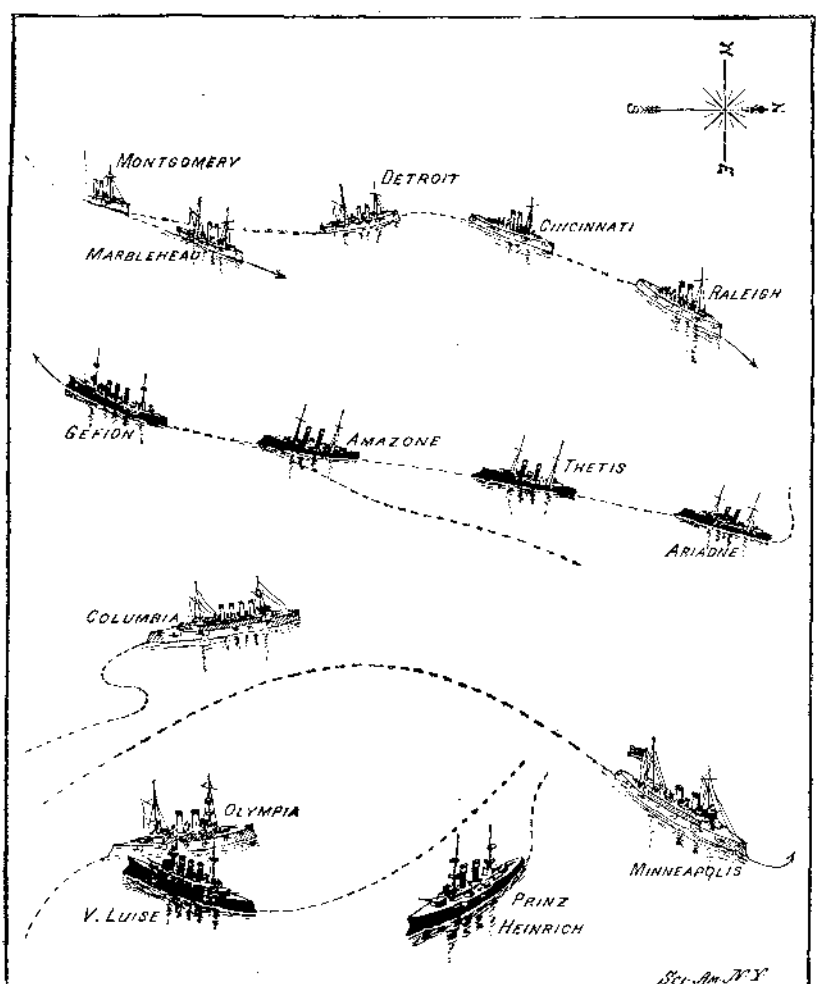
having submerged ones, all the advantage of this stage lay with their German adversaries. Perhaps, indeed, it lost them the day. Possibly the Germans would never have attempted the maneuver had the torpedoes been more equally matched.

What was left of the two American divisions went on, seeking to join the "Minneapolis," while the Germans, with one cruiser unmanageable, still bore northwest for a while. Here they reformed into line abreast, and returned to the fight.

Meanwhile the "Victoria Luise," torpedoed in the bow, made use of such headway as was left her to drift alongside the disabled American flagship



MID-ATLANTIC CRUISER ACTION—SECOND STAGE.



MID-ATLANTIC CRUISER ACTION—THIRD STAGE.

* Prepared especially for the SCIENTIFIC AMERICAN by the well-known naval expert and inventor of the naval war game; with exclusive rights in the United States and Great Britain. This series was begun in the SCIENTIFIC AMERICAN SUPPLEMENT of December 20, 1902.

"Olympia." After the desultory exchange of a few shots, the Germans made an attempt to board. This attempt was a failure; but as at this time the second German division was close by, threatening to torpedo, the "Olympia" was compelled to strike—further fighting being massacre only.

The delay consequent on this incident, coupled with the previous delay due to the reforming of the second German division, enabled what was left of the Americans to get into line, and three ships, led by the "Raleigh," opposed the German advance, bearing off to the northeast. In the encounter that ensued the "Cincinnati" was sunk and the advancing Germans mauled enough to make them slow down, thus permitting the two remaining Americans to escape. Giving up the chase, they returned to the prizes, scuttling the "Olympia" and towing the "Detroit" back to Kiel.

DAMAGES SUSTAINED.

German Ships.

"Prinz Heinrich." (Two 9.4-inch, ten 6-inch, ten 3.4-inch.) Sunk by torpedoes.

"Victoria Luise." (Two 8-inch, eight 6-inch, ten 3.4-inch.) Torpedoed in extreme bow. One casemate out of action; little damaged otherwise.

"Gefion." (Ten 4-inch.) Two guns out of action. No other damage.

"Amazone." (Ten 4-inch.) One funnel gone and forward guns out of action.

"Thetis." (Ten 4-inch.) Badly raked on waterline. Boiler room penetrated. Scuttled by the Germans on account of the impossibility of getting her home.

"Ariadne." (Ten 4-inch.) Funnels damaged; otherwise unhurt.

American Ships.

"Olympia." (Four 8-inch, ten 5-inch.) Torpedoed in the extreme stern. Nearly all guns disabled. Compelled to strike. Subsequently scuttled by the Germans.

"Columbia." (One 8-inch, two 6-inch, eight 4-inch.) Sunk by torpedoes.

"Minneapolis." (One 8-inch, two 6-inch, eight 4-inch.) Waterline aft badly hit. Forward 6-inch out of action. Escaped.

"Cincinnati." (Eleven 5-inch.) Sunk by gunfire.

"Raleigh." (Eleven 5-inch.) Amidship guns all disabled. Escaped.

"Marblehead." (Nine 5-inch.) Sunk by torpedo.

"Montgomery." (Nine 5-inch.) Sunk by torpedo.

"Detroit." (Nine 5-inch.) Battery severely damaged by gunfire. Ship rendered unmanageable. Cut off and compelled to strike.

A summary of the guns in the opposing fleets is as follows:

Inches	9.4	8	6	5	4	3.4
German	2	2	18	—	40	20
U. S. A.	—	6	4	59	16	—

Here, though a numerical equality is apparent, there is, when we remember that a single 6-inch is probably worth two 5-inch so far as shell effect is concerned, a great German superiority. The "Columbia" type in particular is very lightly gunned. The absence of submerged tubes was, however, the thing from which the Americans suffered most. The first division risked using their above-water ones, and, as luck would have it, were not hit in the torpedo rooms till the tubes had been emptied; but all these tubes were put out of action before the battle was half over.

(To be continued.)

FIXATION OF NITROGEN BY ALGÆ.

WHEN we expose pots of sand to which phosphates, potash and magnesium salts have been added, to the usual soil of a garden, we soon find that they get covered with various green algae; and if we chemically analyze the surface of the sand, we often find a considerable amount of nitrogen, rising sometimes to as much as 0.08 per cent.

Messrs. Schloesing, Jr., and Laurent, observed the fixation of nitrogen by algæ in experiments, in which they noticed the diminution in volume of this element in a confined atmosphere, even in the presence of Leguminous plants, if the sand were covered with green algae.

Later, M. Kossowitsch has reported that this fixation of nitrogen from the atmosphere by the algæ only took place when these were associated with bacteria. M. Bouillac found by exact experiments that the algæ, *Nostoc punctiforme*, sown in a sterilized mineral solution without a supply of nitrogen, does not develop, but that it is otherwise when this algæ is associated with soil bacteria; this fact has been observed at Rothamsted.

M. Stoklasa often got vigorous blue Lupins growing in sand, and yet bearing no nodules on their roots. M. Denoussy also observed the same fact, but only when the pots of sand had been invaded by algæ, and especially by certain species, which avoid full daylight, by retiring below the surface of the sand. It must, however, be recognized that though it is easy to observe the various algæ which cover the sand, and to note that the sand has gained nitrogen, it is much more difficult to see the bacteria presumably associated with the algæ.

To sum up the subject, it is perfectly established that Leguminous plants bear bacterial nodules on their roots, and fix free and uncombined nitrogen from the atmosphere. This is a point gained, and it explains the name of ameliorant plants, by which they have long been designated.

The question must be asked: Are these the only plants which have this power? Do the Algæ equally possess it? Can the lower plants get possession of atmospheric nitrogen only as far as they are associated with bacteria organisms? These points further investigations have to prove.

The above facts have been summarized from Prof. Dehérain's second edition of his *Traité de Chimie Agricole*, 1902. J. J. Willis, Harpenden.

* By direction of the umpire, whose decision alone governs such questions.

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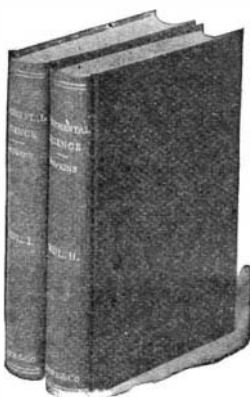
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