

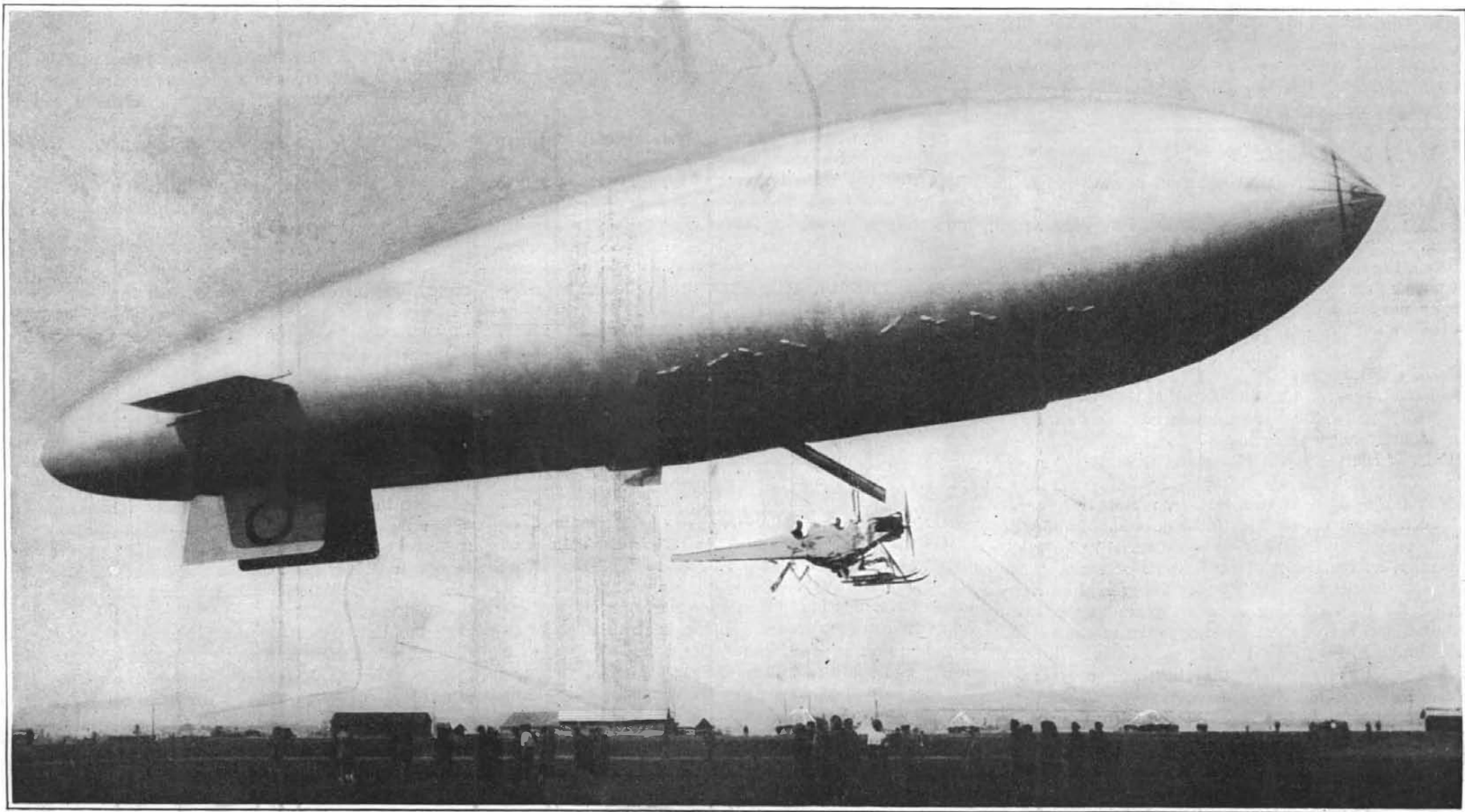
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One of the new British scouting dirigibles starting on a reconnaissance flight over the enemy lines on the Balkan front

A Novel British Airship

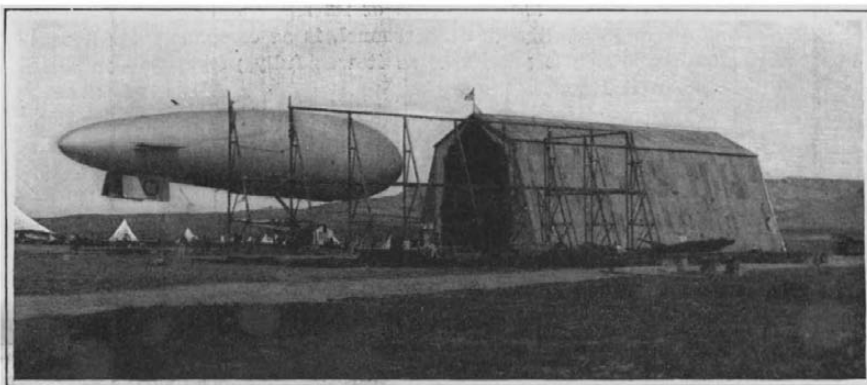
By Baron Ladislas d'Orcy

THE dirigible represented herewith is one of Great Britain's small scouting airships, which have been provided for in the new British aerial construction program for 1915-17. This program is said to comprise the laying down of 50 airships of both the rigid and non-rigid types, the construction to be completed within two years.

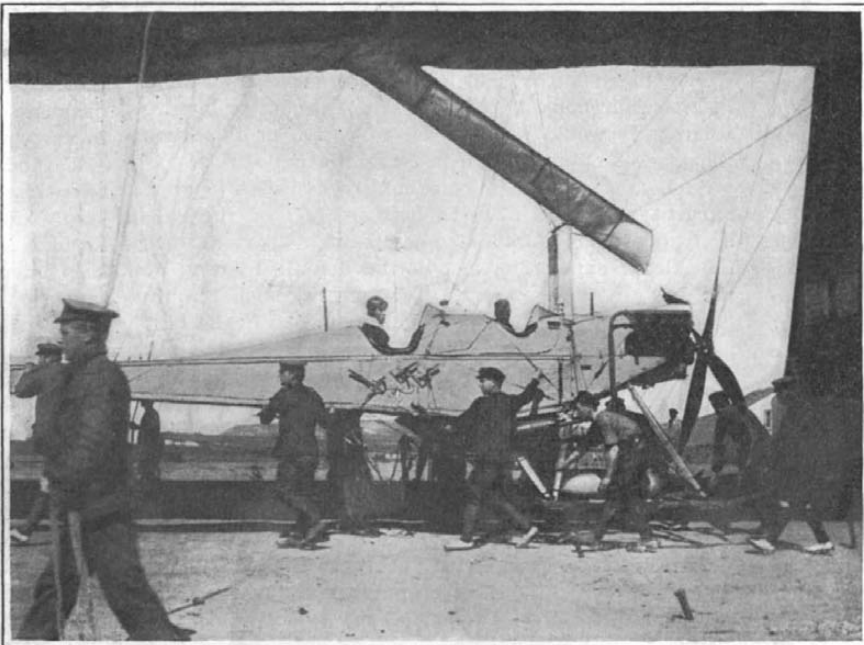
The airships of the type shown in the accompanying illustrations are comparatively small craft and their range is naturally a limited one; they are, however, capable of a great speed which makes them particularly desirable for scouting.

A unique feature of this dirigible is its car, which is constituted by an ordinary fuselage of a British army aeroplane, complete with its engine, tractor air-screw and landing gear, except for the wheels. This disposition is very commendable, particularly for small airships, as it advantageously does away with the heavy car, which, with its elaborate engine mounting and propeller transmission, greatly reduces the useful load and also creates much head resistance, harmful to the vessel's speed.

In the latter respect the design of this airship seems remarkably efficient, head resistance being cut down to the possible minimum, there being, in fact, but two stream-lined bodies (envelope and fuselage), connected by a simple suspension. The excellency of this design also accounts for the relatively small power-plant, which is constituted by a 70 horsepower, water-cooled Renault engine, driving a tractor screw. The speed airships of this class develop is not officially dis-



Light British scouting dirigible leaving its hangar at a Mediterranean base



Car of a new British dirigible, which is a slightly modified aeroplane fuselage

closed, but seems to be in the neighborhood of 40 miles per hour, rather more than less.

An interesting feature that is entirely novel and shows a persistent thought of simplifying the mechanical devices of this airship, is found in the air-blower, which compensates on non-rigid airships such losses of buoyancy that may occur through variations of temperature and barometric pressure. Instead of using an ordinary air-blower actuated by the engine, the designers of this airship utilize the "slip-stream" of the propeller; i. e., the air thrown back by the latter. For this purpose the envelope's "neck," through which air may be pumped into the compensating ballonnet, has its aperture placed right behind the propeller, the amount of air admitted into the ballonnet being regulated by a valve. Besides its great simplicity, this arrangement strongly commends itself on account of the amount and driving power of the air that thus becomes available for compensating losses of buoyancy in the gas bag of the airship.

Although their work has been less spectacular than the operations of German Zeppelins, the non-rigid and semi-rigid airships of Great Britain and France have proven very useful for night raids on enemy encampments, and, in connection with naval warfare, for harbor defense and coast patrol work. According to the *Echo de Paris*, the mobile forces of every French naval port now comprise, in addition to destroyers and submarines, two small non-rigid airships. These are chiefly used for detecting enemy submarines, and are said to have given an excellent account of themselves.

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The object of this journal is to record accurately and lucidly the latest scientific, mechanical and industrial news of the day. As a weekly journal, it is in a position to announce interesting developments before they are published elsewhere.

The Editor is glad to have submitted to him timely articles suitable for these columns, especially when such articles are accompanied by photographs.

What is Adequate Naval Preparedness?

A CORRESPONDENT asks us to state what is meant by adequate naval preparedness, and we propose to answer that question by pointing to actual conditions as they once existed and as they now exist in the navy of the United States. To begin with; let us ask first: Was there ever a time when the United States navy was adequately prepared? and secondly: Is the United States navy adequately prepared to-day? The answer to these two questions involves a comparison of conditions in the year 1905 and 1916, and the comparison proves to a demonstration that we were as completely prepared in the first-named year as we are inadequately unprepared to-day.

It is, of course, impossible within the limit of space at our disposal, to go into all the details of the condition of our navy in these two periods, and therefore we shall confine our comparison to the question of strength in ships and guns. What do we discover? In 1905, our navy, as the result of the lessons of the Spanish War and the patriotic liberality of Congress, had risen during the preceding six or seven years to the commanding position of second naval power in the world. That our rapidly-attained rank was beyond dispute is shown by the fact that the third power in rank, which happened to be Germany, was far behind us both in the number of her battleships and in the power of her main batteries; for in 1905 the main fighting line of the United States navy consisted of twenty-five battleships, as against Germany's twenty, and the total muzzle-energy of all guns in the United States battle-line was a little less than four million foot-tons, whereas the total energy of all the guns on the German battle-line was considerably less than two million foot-tons.

Now these figures, which are based upon the most authentic records, if they prove anything at all, prove just this: That in 1905 the United States, in holding the position of second in naval strength, possessed a superiority in its first fighting-line of twenty-five per cent in ships and over one hundred per cent in gun power, over the third ranking naval power, which in that year happened to be Germany.

That is what we call a condition of adequate preparedness, and it was adequate because our fleet, numerous, powerful, carrying unusually heavy batteries, and operating within easy reach of its bases, would have been more than a match for any fleet that Germany, France, Austria or Italy could send across the Atlantic Ocean. We make no mention here of the British fleet for the reason that in her possession of Canada, Great Britain has given hostages to fortune, and in the nature of things is almost as much committed to the defense of the Monroe Doctrine as we are ourselves. In fact, the "London Times," commenting upon a suggestion that England in return for certain European concessions might forego her active support of the Monroe Doctrine, stated that the thing was unthinkable, and ended its comment on the matter by saying "If the United States possessed no Monroe Doctrine, Great Britain would have to formulate one of her own."

Adequate naval preparedness, then, means for the United States the possession of a fleet so strong and efficient that no hostile nation could cross the Atlantic or Pacific Ocean and attack with any hope of success.

For illustration of a state of naval unpreparedness it is sufficient to quote by way of contrast the statistics covering the status of the second and third naval power for the year 1916; for to-day the conditions have been absolutely reversed. Germany has moved up from a poor third to a commanding second position, whereas we have not only dropped into the third position, but that position is shared jointly with us by France, which is about equal to us in its number of first-line battleships, and is greatly superior to us in the strength of

its personnel; that is to say, in the number of its officers and men.

Comparing the two fleets then, under their reversed positions, we find that to-day Germany's first fighting-line includes twenty-six ships, the total energy at the muzzle of all guns on those ships being over thirteen million foot-tons, as compared with the United States first fighting-line of only twelve ships actually completed, whose total gun-energy is something over seven million foot-tons or a little over one half that of the German fleet. So that to-day the situation is that there is one fleet, that of France, which is about equal to our own, and there is another fleet which possesses in its first fighting-line twice as many dreadnoughts mounting over twice as many armor-piercing guns, whose total energy is nearly double that of our own fleet. That is what we have in mind when we state that the United States navy to-day is in a condition of very alarming unpreparedness.

Thus far, we have been making our comparison on a basis of material—ships and guns—and we have found that on this basis the fleet which a decade ago was a poor second to our own, possesses to-day a one-hundred-per-cent superiority. This is bad enough; but our unpreparedness becomes shockingly apparent, when we state that the United States navy, for war purposes, is short over thirty thousand men and over two thousand officers. What this means is best told in the report of the minority members of the House Committee on Naval Affairs:—"To provide, says the report, full complements for all dreadnoughts, predreadnoughts, cruisers, scouts, destroyers, submarines and the necessary auxiliaries now in the navy, or that will be during 1917, will require 82,762 men or approximately 31,000 more than the present authorized strength of the navy. This number of men, 82,762, required on a war basis, does not include 10,015 men required for merchantmen scouts and other auxiliaries needed in the service in time of war, nor an additional 10,000 men to man mine sweepers, patrol boats and smaller craft."

Now let us get the full significance of these figures firmly fixed in our minds. Our navy is now manned, or rather undermanned, by 52,000 men. In the opinion of the General Board, which is composed of the ablest officers of our navy, it should be manned by 82,762 men to render it efficient. That the great fleet, which has taken from us the second position, is at all times properly manned, goes without saying, and to-day, with nearly two years of war conditions behind it, you may be sure the personnel—the officers and men—have been trained to a high pitch of efficiency.

Remembering that the question of naval preparedness is relative, that a navy is prepared or unprepared according as it measures up to, or falls short of, its ability to uphold the country's policies, and prevent the outbreak of hostilities by offering a fighting-line so strong as to discourage aggression—remembering these things, we do not hesitate to say that the United States navy, in spite of the excellence of its ships and guns and the high quality of its personnel, is as completely unprepared in the year 1916 as it was fully prepared in the year 1905.

Our Opportunity in the Antarctic

THE only party of polar explorers from this country now in the field, the Crocker Land expedition, is expected to return home during the present summer. Meanwhile, our British cousins, notwithstanding the distractions of the war, are represented in the Antarctic by the two branches of the Shackleton expedition, and in the Arctic by the two branches of the Stefánson expedition; while a new Canadian expedition, under Captain Bernier, is in preparation. Norway is backing Amundsen's forthcoming Arctic drift. Denmark has provided the means for Rasmussen's exploration of northern Greenland. Russian explorers, since the war began, have achieved the splendid exploit of the Northeast Passage. All of which suggests that our own polar explorers should look to their laurels, and makes it pertinent to inquire whether it would not be well to revive at this time the project of an American Antarctic expedition.

Such a suggestion is particularly appropriate at a moment when the news is not yet cold of the safe arrival at the Falkland Islands of a part of the Shackleton expedition, and of the definite location of the balance of his party. This means much to any prospective American expedition. It means in the first place that the work of rescue could be pushed promptly to success or definite failure, and that thereafter the expedition would be under no urge to devote valuable time and effort to this matter. It means, too, that there would be no unconscious duplication of the labors of Shackleton; the work could be taken up at the precise point where full reports show the British lieutenant to have left off.

On the other hand, with the seafaring nations of the Old World all seriously handicapped by the war, it would seem especially opportune to revert to the plan, so earnestly advocated by Admiral Peary and

others about six years ago, of an American expedition to Weddell Sea. Our country has conspicuously neglected the exploration of the Antarctic ever since the epoch-making discoveries of Wilkes, in 1840. Indeed, although American whalers and sealers were among the pioneers in the exploration of the Antarctic seas, and the first to glimpse the Antarctic continent, the only regular scientific expedition we have ever sent to the Antarctic was that of Wilkes.

There is still time to organize and equip an expedition before the season of navigation opens in southern seas, i.e., about the end of the year. Peary estimated in 1910 that such an undertaking would cost from \$75,000 to \$100,000 per annum. A well-trained personnel could easily be recruited in this country.

Some Aspects of "Daylight-Saving"

THE great war in Europe has been prolific in unexpected by-products. Not the least interesting of these is the action just taken by several of the belligerent and adjacent neutral nations to give official sanction to a scheme which, though it originated in England and not in Ireland, disguises its purpose of saving gas and electricity under the name of the "daylight-saving plan." This scheme has been persistently agitated for many years, not only in Europe, but also in America and Australia. Innumerable public bodies have passed resolutions in favor of it, and many legislatures have given it serious consideration. At least three bills in behalf of its adoption on a national scale were introduced in the British Parliament, previously to the one which recently passed the House of Commons. A few scientific men of good standing have favored the project, but the consensus of scientific opinion, so far as expressed, has been opposed to it.

The daylight-saving plan of advancing the clock one hour on a single date in spring and retarding it one hour on a single date in autumn, is the scheme which is being tried in western Europe. So far as it applies to countries using standard time, it is equivalent to the adoption in each time zone, during the summer months, of the mean solar time of the central meridian of the zone next east of it. Opponents of the plan profess to see in it an abandonment of standard time, but the meridian of Greenwich still remains the foundation of the system.

In the United States, where winter daylight begins much earlier than it does in England and northern Europe, there have been advocates of the still simpler plan of using earlier time throughout the year. This idea has manifested itself especially in the adoption by certain communities lying near the boundaries of the standard time belts of the time pertaining to the belt east of them.

The whole subject is much more complicated than might appear at first sight. The duration of daylight in summer depends upon latitude. Opponents of the daylight-saving scheme in England have pointed out that there would be no advantage in adopting such a plan in Scotland, where people already have more daylight in summer than they can use. There is still less reason for advancing the clocks in Norway and Sweden, and that these countries have, as reported, adopted the new plan, or are favorably considering it, is hardly explicable except on the supposition that they wish to conform to Germany's newly inaugurated time.

The expedient of changing the clock in order to change people's habits has its pros and cons. Wherever standard time is in use, people have already abandoned the idea that the "time o' day" depends strictly upon the position of the sun in the sky. The process of altering the clock and retaining the present nominal hours for various daily events is undoubtedly much simpler than to change these hours nominally as well as actually. On the other hand, the alternate setting of the clock forward and back twice a year undoubtedly presents opportunities for much confusion. The conflict between scientific and popular requirements is probably not so serious as has been claimed in certain quarters. Astronomy and other sciences will continue to use the time best adapted to their needs.

A fundamental question, not yet satisfactorily answered, is whether a general change in the hours of people's daily activities is really desirable, or even practicable. In all civilized countries there is a tendency to keep later instead of earlier hours, and the daylight-saving plan appears to be a somewhat violent effort to combat the instinct, whatever it is, that underlies this tendency. A very large part of the population, including farmers and artisans whose work is carried on out of doors, is already compelled to utilize the early daylight hours. The rest of the population has apparently adjusted itself to an alternation of natural and artificial illumination that is perhaps analogous, in its psychical if not its physical effects, to the alternation of summer and winter, or to the warm and cold spells of a cyclonically-controlled climate. It remains to be proved that this adjustment is not a wise and wholesome one, and whether we should be justified in upsetting it for the sake of curtailing the cost of lighting.

Aeronautical Notes

The World's Altitude Record was broken on April 26 when Harry G. Hawker flew to a height of 24,408 feet in an aeroplane at Brooklands, England, according to an announcement made by the Royal Aero Club. Although Heinrich Hoelrich, a German aviator, attained a height of 25,756 feet in 1914, this feat has not been recognized by the Royal Aero Club.

New Battleplanes of the Italians.—A correspondent of the *Berlingske Tidende* who has visited the Austrian front reports that the Italian battleplanes are superior to those of the Austro-Hungarian forces, and that the latter have not been slow in realizing the fact. The large battleplanes of the engineer Caproni are specially marvelous and better than all other types. He goes on further to state that on the Isonzo front alone there are 80 of these huge machines, and the Austrians have not as yet succeeded in bringing down a single one.

New Speed Records in France.—In the *Journal M. Georges Prade* makes the following announcement: "On April 10 French aviation established new speed records. Needless to say, no exact figures can be published, so that we must perforce be content with stating that a new aeroplane, driven by a new engine, has beaten, on two occasions, all the previous world's speed records, not only for military machines, but also those set up in time of peace by machines which at that time did not appear to possess any military value."

Successful Raids on Constantinople by British Aviators.—On the evening of April 14, three British seaplanes flew over the Aegean Sea across the Sea of Marmora to Constantinople and back, a total distance of 300 miles, and dropped bombs on the Zeitunlik powder factory and on the aeroplane hangars. A fourth machine visited Adrianople and dropped bombs on the railway station. All four aeroplanes returned safely. Although the weather was fine at the start, adverse wind and a thunder shower were encountered later on. The powder factory blew up and the war office was hit, a great deal of damage being done. This raid was remarkable in view of the fact that the British aeroplanes are not up-to-date machines and their motors are very often unreliable.

An Enemy Opinion of the German Fokker.—In reply to a newspaper correspondent's request for an opinion concerning the German Fokker monoplanes, of which so much has been heard of late, M. Bleriot, the aviation pioneer, replied: "It is a very greatly overrated machine, and no better than the aeroplane we have had in France for a long time. I refer to Morane-Saulnier. The German machines are, without doubt, inferior to ours or yours, but they have an engine, the Mercedes, which is as good as, but no better, than the French engines. Never for a moment has Germany had the mastership of the air, and now that we have this machine we have established a lead which will never be wrested from us." The new machine referred to is called the "spad," and has a speed in excess of 125 miles per hour.

Remarkable Raids by French Aeroplanes.—On April 17, 22 French aeroplanes flew over the headquarters of the Bulgarian staff of Doiran at 3 A.M. and inflicted considerable damage. German aeroplanes attempting to defend the position were driven off by special rapid fighting aeroplanes of the French which made tremendous speed. Other French air squadrons bombarded the camp of the enemy at Strumnitza and Bogantizi the day before. There has also been great activity at Verdun, a French squadron of machines having dropped bombs on the railway stations at Conflans, Pagny, Arneville and Rombach. A French aviator, during the night of April 15-16, succeeded in dropping 16 bombs from a height of 300 feet on the deck of a German vessel on the North Sea. The war office reported that 11 of the bombs hit the ship, resulting in extensive damage.

The Dropping of Bombs on Washington and New York.—To arouse the populace, on the evening of April 16, aviator De Lloyd Thompson looped the loop over Washington and dropped numerous fireworks bombs. His aeroplane was illuminated with magnesium flares to make this exhibition. The bombs were dropped so that they exploded above the capitol and other public buildings. Aviator Thompson showed how easy it would be for aviators from an enemy fleet to swoop down upon the capitol and destroy it. He repeated his performance above lower New York and Brooklyn, on the evening of April 19, making a triple loop and performing astonishing gyrations. He dropped bombs over the Custom House and Whitehall Building. One of these failed to release and exploded while attached to the aeroplane damaging the fuselage and almost upsetting the machine. Aviator Thompson managed to resume control, however, and alighted safely on Governor's Island at 8:31 P.M. after having flown for 14 minutes.

Astronomy

Observations of Nocturnal Radiation were made in Swedish Lapland during the continuous darkness of last January by Dr. A. K. Angström, well known for his studies on solar and terrestrial radiation in this country and Europe.

Markings of a New Kind on Mars were observed at the Lowell Observatory at the recent opposition, according to note by Director Lowell. The new features appear to be secondary to the main canal net work. A tiny dot is seen within some of the polygons made by the intersections of certain canals, and from this extremely delicate lines extend to a corner and to the sides of the polygon. The effect is described as that of a centrally woven web, spun within the borders of the polygon, of a more minute order of tenuity than the polygon itself.

The Value of Meteor Observations is possibly even greater from a meteorological than from an astronomical point of view. This aspect of such observations is emphasized in the last report of the meteor committee of the American Astronomical Society, the chairman of which, Prof. Abbe, is the dean of American meteorologists. Meteors furnish information regarding the composition and movements of the atmosphere at levels far above those attainable by balloons. In this connection it is only necessary to recall the studies of Prof. C. C. Trowbridge, of Columbia University, on the drift of meteor trains; similar studies by the little band of British meteor observers, headed by the veteran Denning; and recent investigations by Dr. A. Wegener in Germany on the composition of the air at different altitudes as indicated by the colors of meteors.

The Discoverer of the Great Nebula in Orion.—The discovery of this object was formerly attributed to Huyghens, who describes it in his "Systema Saturnium," published in 1659. In 1854 R. Wolf called attention to an earlier description by J. B. Cysatus, of Lucerne, published in 1619. Cysatus saw the nebula as early as 1618, and possibly as early as 1611. The history of this greatest of all nebulae is now carried still farther back by G. Bigourdan, who quotes in the *Comptes Rendus* from the manuscript journal of Peiresc observations of this nebula in November and December, 1610. Thus it appears that Peiresc made the first telescopic observation of a nebula of which we have any record. The earliest telescopic observation of the Andromeda nebula was made by S. Marius in 1912. Bigourdan is inclined to doubt the earlier observations of the Andromeda nebula with the naked eye, mentioned in most books on astronomy.

Arequipa Pyrheliometry.—Dr. C. G. Abbot, of the Smithsonian Astrophysical Observatory, has recently published a discussion of the pyrheliometric observations made from 1912 to 1915 at the high-level station of Harvard College Observatory at Arequipa, Peru. He states that "the Arequipa results confirm the variability of the sun, both from year to year and from day to day, shown by investigations at Mount Wilson and elsewhere." He suggests that if similar observations could be maintained at eight or ten favorable stations at high altitudes in various parts of the world the variations of the sun could be determined almost or quite as certainly therefrom as from two stations equipped for complete spectrometric measurements of the solar constant. One interesting result of the Arequipa observations is that no effect upon atmospheric transparency was produced there by the dust from the eruption of Mount Katmai in 1912, though such effects were general in the northern hemisphere for more than a year after the eruption.

Astronomical "Bulls" are a sovereign antidote to the tedium of plodding *per aspera ad astra*, and their number appears to be unlimited; hence the astronomer has no excuse for being melancholy. Many delectable specimens have been recorded in our columns, and we are always glad to add to the list. From the current number of *Popular Astronomy* we learn that a certain newspaper, in describing the February solar eclipse, announced the time at which observers might see the "shadow" coming across the face of the sun. Since the sun is the source from which planetary bodies are illuminated, one wonders by what process the newspaper writer supposed that a shadow could be thrown upon this luminary. From a recent number of *Sirius* we learn that when the German astrophysicist, J. F. Krüger, died recently in Denmark, he was quite generally described in the newspapers of his own country as an "astrophysiologist." *Sirius* points out, however, that the term "astrophysiologist," although inapplicable in Krüger's case, is not so incongruous an expression as it appears to be at first sight. It applies very well to such persons as Prof. Adolph Marcuse, of Berlin, who has made a special study of errors in astronomical observations due to physiological defects in the observer.

Radio Communication

A New Wireless Record is believed to have been established, on April 26th, when the operator in the San Francisco beach station picked up a message stating the position of the steamer "Sierra," 4,870 miles out from that port on her journey to Sydney, Australia.

Australian Radio Service.—The Australian Minister for the Navy states that the Cabinet has decided that the whole of the wireless telegraph stations should be under the control of the Navy Department, and the new service will be called the Royal Australian Navy Radio Service. Those employed on shore will wear uniforms similar to the naval uniforms, with a slight difference in badges.

Weather Observations Reported by Radio.—At the request of the Weather Bureau arrangements have been made by the United States Bureau of Lighthouses for taking weather observations on the light vessels at Nantucket Shoals, Mass.; Diamond Shoals, N. C.; Fry's Pan Shoals, N. C., and Heald Bank, Tex. These light vessels are all equipped with wireless apparatus by means of which observations may be transmitted to any point desired.

A New Wireless Station for Norway is announced in a recent issue of *Engineering*. The station is to be erected at Ooresäter, and the contract for the work has been let to the Gesellschaft für Drahtlose Telegraphie of Berlin. The station, which will have masts 300 feet high, is intended for communication with the large European wireless stations. It is also proposed to erect a small station for shipping. It is expected that the new station, which will be equipped on the same principle as that at Nauen, near Berlin, will be ready in the autumn, and the cost will be about \$110,000.

Work at the Mare Island Station.—The construction of the 300-foot towers for the new long-distance station at Mare Island, near San Francisco, is well under way. It is believed that when the 30 kw. apparatus is installed, the Mare Island station will be in constant touch with ships of the navy along the Pacific Coast as far as the southern boundary of Mexico. The station will also be able to communicate with land stations along the coast and with the Government station at Arlington, near Washington.

Wireless Communication Between Kentucky Mines. It is reported that two Kentucky coal mining companies are preparing plans for wireless telegraph service between several coal mines in Harlan County, Kentucky, and the main offices in Louisville. It is said that the sending station is to be located in the Black Mountains, where the Cumberland range reaches its highest elevation in the state. The receiving station will be on the Starks Building, Louisville. The distance on an air line is in the neighborhood of 200 miles, although by rail it is nearer to 300.

New Theory for Electrolytic Detector Operation.—In a paper presented by Prof. Wilder D. Bancroft before the recent Washington meeting of the American Electrochemical Society, an interesting theory is presented and offered for the *modus operandi* of electrolytic detectors, crystal rectifiers and coherers, namely, that electric voltage squeezes out, or at least in some way decreases, the thickness of the absorbed gas film, and thereby decreases the resistance of the detector. The paper is certainly welcome as a stirrer of opinions, comments the *Electrical World*, and as a gauntlet thrown to the advocates of thermoelectric action.

Radio Phenomenon Encountered in Mexican Campaign.—According to the *Wireless Age*, the wireless service men with the American punitive expedition into Mexico were surprised to discover that conditions in that country were exactly the reverse of those in the United States. In our own country the wireless operators find that the night time is much better for the transmission of dispatches. South of the border the day time is best. There is so much atmospheric disturbance at night in Mexico that wireless men prefer the day as a time for operating. This is not due to the altitude, which is 7,000 feet, but to the minerals in the mountains, especially iron ore.

A Concealed Wireless Telegraph Station which exists in some part of Brussels has caused much annoyance to the local German authorities because of the fact that it has furnished the people of Belgium with war news which the Germans desired to keep from them. According to reports, the search for the station has thus far been unsuccessful, although as an added incentive a reward of \$2,500 is being offered for information that will disclose the location of the troublesome plant. Since the wireless station appears to be used for receiving messages only, its detection is extremely difficult and resolves itself into practically a house-to-house search; but if the station were also used to transmit messages, its apprehension would be a simple matter.