

descend at some distance to resume their original course.

The ideal system of signaling would be one whose action was at all times entirely automatic and unaffected by atmospheric conditions. We have lately received from Mr. Hermann Herberts, of Newark, N. J., a description of a beautiful, scientific device of this kind, which, for want of space, we publish in the current issue of the SUPPLEMENT. Mr. Herberts discards the field of acoustics and calls to his aid the wonderfully sensitive and infallible powers of the thermopile. This delicate instrument in its most recent and highly developed form will register changes of temperature as small as  $\frac{1}{100000}$  degree Centigrade. An ordinary thermopile will indicate the radiant heat from a person's hand at a distance of a yard or more, and Prof. Boys has been able to detect the heat of a candle that was a quarter of a mile distant from the thermopile.

Mr. Herberts' instrument consists of two thermopiles, each provided with a funnel for collecting the heat rays, which point in opposite directions and revolve in a horizontal plane upon a fixed standard, so that the full circle of the horizon is swept twice in every revolution of the pair. The piles are connected with a galvanometer scale and with a local circuit provided with call bells. If a ship is approaching from a given quarter, its heat radiations are caught in the revolving funnels every time they swing past the ship, and as she draws nearer, the strength of the current set up in the thermopile increases until the alarm bell is rung. By means of a revolving position indicator, an observer is able to determine the direction of the approaching ship. The increasing or diminishing action of the thermopile tells whether the ship is approaching or receding. The same laws of radiation make it possible for the instrument to indicate the approach of an iceberg, and in many cases the proximity of a sunken wreck or of the land itself. The instrument is a most ingenious adaptation of science to commercial uses, and it gives promise of solving one of the most perplexing problems connected with deep sea travel.

THE APPROACHING SCIENTIFIC JUBILEE.

BY HORACE C. HOVEY.

A widespread interest is felt in the elaborate preparations that are now in progress for the fiftieth anniversary of the American Association for the Advancement of Science, to be celebrated in Boston, from the 22d to the 27th of August. The council will have its headquarters at the Copley Square Hotel, while those of the association will be in the Rogers Building. The general and special meetings will be held in the rooms and halls of the Boston Society of Natural History, the Harvard University Medical School, and the Massachusetts Institute of Technology, all in the vicinity of Copley Square, where are also located the Boston Public Library, the Museum of the Fine Arts, and other buildings of interest. The place is easily accessible from suburban points by electric lines. Round-trip tickets may be had on all the railroads for one and one-third fare, good from August 18 to September 15, on certificates from local agents officially indorsed at Boston. Lunch will be furnished daily without charge to members, and most of the hotels offer reduced rates. Special arrangements will be made as to mail, telephone, telegraph, and express facilities.

Preliminary programmes have been issued as to the general and sectional meetings, from which it is evident that Boston is to have one of the most remarkable scientific gatherings ever held in this country. Every branch of science will be represented, and the members and guests will come from all parts of the continent and from many foreign lands. There will be addresses and papers on a vast variety of topics, many of them made clear by experiments or illustrated by the stereopticon. The first general session will be held in Huntington Hall, at 10 A. M., Monday, August 22, when addresses of welcome will be made by Governor Walcott, Mayor Quincy, and President Crafts, to which President F. W. Putnam will reply. Then will follow meetings of the nine sections into which the association is divided, to listen to addresses by their respective vice-presidents. These will be at different hours, to enable as many to hear them as possible. The address by the retiring president, Prof. Wolcott Gibbs, of Newport, R. I., will be Monday evening, and his subject will be, "Some Points in Theoretical Chemistry." Following the address will be a general reception. The wealth of material to be brought out by the sections may be inferred from the fact that nearly two hundred papers are already announced and many more are to follow.

Wednesday, August 24, will be "Salem Day," the association being the guest of the famous Essex Institute. In a similar manner Friday will be "Cambridge Day," on the invitation of the faculty and alumni of Harvard University. Numerous excursions are to be enjoyed, as the members may find the time and inclination, to localities of historic or educational interest in the vicinity of Boston. And after the adjournment of the association, more extended trips are planned to Cape Cod, the White Mountains, and other attractive resorts for pleasure or instruction.

Information as to the presentation of papers may be had by addressing the secretaries of the respective sections. Letters as to the general business of the body should be sent to the Secretary of the Association, Salem, Mass., previous to August 15, who will also receive assessments and nominations to membership. Prof. H. W. Tyler, local secretary, A. A. S., Boston, Mass., will give all desired information as to local arrangements.

SPAIN'S LOSSES ON THE SEA.

Now that Spain has definitely made overtures looking toward a cessation of hostilities and eventually peace, it is time to make an estimate of her losses at sea, which have been severe. Some fifteen or twenty merchant vessels have been seized as prizes and eighteen war vessels have been destroyed or captured. It is probable that the total money loss inflicted by the sunk or captured war vessels is not far from \$35,000,000, as the fleet of Admiral Cervera is alone estimated to have been worth \$20,000,000. The first merchant vessel which was captured was the "Buena Ventura," which was seized on April 22. Then followed the capture of the "Pedro," "Catalina," "Saturnina," "Panama," "Ambrosia," "Guido," "Bolivar," "Lopez," "Reina de los Angeles," besides a number of schooners, tugs, etc. We give below a table of the principal war vessels which were sunk or captured. No mention is made of such unrated gunboats as the "Alvarez," captured in Santiago Harbor after the surrender, the gunboats "Baracoa" and "Lijera," and the tugs "Rapido" and "Hercules."

| Name.                     | Material of Hull. | Displacement. | Length. |     | Beam. |     | Maximum Draught. |     | Indicated Horse Power. | Armor. |     |     | Armament.  |       | Torpedo Tubes. | Speed. | Normal Coal Supply. | Complement. |
|---------------------------|-------------------|---------------|---------|-----|-------|-----|------------------|-----|------------------------|--------|-----|-----|--|-------|----------------|--------|---------------------|-------------|
|                           |                   |               | Tons.   | Ft. | In.   | Ft. | In.              | Ft. |                        | In.    | In. | In. | In.  | Guns. |                |        |                     |             |
| Almirante Oquendo.....    | Steel.            | 7,000         | 340     | 65  | 21    | 6   | 13,000           | 12  | 10½                    | 3      |     |     | Two 11-in.; ten 5.5-in.; eight 2.2-in. Q. F.; eight 1.4-in.; two machine guns.             | 6     | 20             | 1,200  | 700                 |             |
| Infanta Maria Teresa..... | "                 | 7,000         | 340     | 65  | 21    | 6   | 13,758           | 12  | 10½                    | 3      |     |     | Two 11-in.; ten 5.5-in.; eight 2.2-in. Q. F.; eight 1.4-in.; two machine guns.             | 6     | 20             | 1,200  | 500                 |             |
| Vizcaya.....              | "                 | 7,000         | 340     | 65  | 21    | 6   | 13,000           | 12  | 10½                    | 3      |     |     | Two 11-in.; ten 5.5-in. Q. F.; two 2.7-in.; eight 2.2-in.; four 1.4-in.; two machine guns. | 6     | 21             | 1,200  | 500                 |             |
| Cristóbal Colon.....      | "                 | 6,840         | 328     | 59  | 8     | 24  | 14,000           | 6   | 6                      | 1½     |     |     | Two 10-in.; ten 6-in. Q. F.; six 4.7-in.; ten 2.2-in.; ten 1.4-in.; two machine guns.      | 4     | 20             | 1,000  | 450                 |             |
| Furor.....                | "                 | 380           | 230     | 22  | 5     | 6   | 6,000            |     |                        |        |     |     | Two 12-pdr.; two 6-pdr.; two 37-mm. automatic.   | 2     | 28             | 100    | 67                  |             |
| Plutón.....               | "                 | 400           | 225     | 22  | 6     | 5   | 7,500            |     |                        |        |     |     | Two 12-pdr.; two 6-pdr.; two 1-pdr.  | 2     | 30             | 100    | 70                  |             |
| Reina Mercedes.....       | "                 | 3,090         | 278     | 10  | 42    | 7   | 16               | 5   | 3,700                  |        |     |     | Six 6.2-in.; two 2.7-in.; three 2.2-in. Q. F.; two 1.5-in.; six 1.4-in.; two machine guns. | 5     | 17             | 5      | 600                 | 375         |
| Alfonso XII.....          | "                 | 3,090         | 278     | 10  | 42    | 7   | 16               | 5   | 4,800                  |        |     |     | Six 6.2-in.; two 2.7-in.; six 6-pdr. Q. F.; four 3-pdr.; five machine guns.                | 5     | 17             | 5      | 600                 | 300         |
| Jorge Juan.....           | Wood              | 935           | 243     | 5   | 29    | 6   | 12               | 2   | 1,100                  |        |     |     | Three 4.7-in.; two 2.8-in.; two machine guns.  | 13    |                | 130    | 146                 |             |
| Reina Christina.....      | Steel.            | 3,520         | 282     | 2   | 42    | 7   | 16               | 5   | 3,970                  |        |     |     | Six 6.2-in.; two 2.7-in.; three 2.2-in. Q. F.; two 1.5-in.; six 6-pdr.; two machine guns.  | 5     | 17             | 5      | 600                 | 370         |
| Velasco.....              | Iron.             | 1,152         | 209     | 11  | 29    | 3   | 12               | 5   | 1,500                  |        |     |     | Three 5.9-in.; two 2.7-in.; two machine guns.  | 14    | 3              | 220    | 173                 |             |
| Don Antonio de Ulloa..... | "                 | 1,130         | 210     | 32  | 12    | 6   | 1,600            |     |                        |        |     |     | Four 4.7-in.; two 2.7-in.; two Q. F.; five machine guns.                                   | 2     | 14             | 210    | 130                 |             |
| Don Juan de Austria.....  | "                 | 1,130         | 210     | 32  | 12    | 6   | 1,600            |     |                        |        |     |     | Four 4.7-in.; three 2.2-in. Q. F.; two 1.5-in.; five machine guns.                         | 3     | 14             | 210    | 130                 |             |
| Isla de Cuba.....         | Steel.            | 1,030         | 185     | 30  | 11    | 6   | 2,200            |     |                        |        |     |     | Four 4.7-in.; four 6-pdr. Q. F.; two 3-pdr.; two machine guns.                             | 3     | 16             | 160    | 160                 |             |
| Isla de Luzón.....        | "                 | 1,030         | 185     | 30  | 11    | 6   | 2,200            |     |                        |        |     |     | Four 4.7-in.; four 6-pdr. Q. F.; two 3-pdr.; two machine guns.                             | 3     | 16             | 160    | 160                 |             |
| Marqués del Duero.....    | Iron.             | 500           | 157     | 5   | 25    | 7   | 8                | 5   | 550                    |        |     |     | One 6.2-in.; two 4.7-in. smooth bores; one machine gun.                                    | 10    |                | 90     | 98                  |             |
| General Lezo.....         | "                 | 524           | 157     | 5   | 25    | 7   | 8                | 6   | 600                    |        |     |     | Two 4.7-in.; one 3.5-in.; two Q. F.; one machine gun.                                      | 2     | 11             | 80     | 97                  |             |
| Elcano.....               | "                 | 524           | 157     | 5   | 25    | 7   | 8                | 6   | 600                    |        |     |     | Three 4.7-in.; two Q. F.; two machine guns.  | 1     | 11             | 5      | 80                  | 116         |

It is impossible to get accurate figures of the cost of the cruisers which were sunk in the battle of Manila. Many of them were practically worthless, although their first cost may have been very great. The cost of Cervera's fleet is figured by "El Nacional"—and the value of the vessels certainly would not be overestimated by this paper—as follows:

|                      |              |
|----------------------|--------------|
| Vizcaya.....         | \$3,600,000  |
| Oquendo.....         | 3,600,000    |
| Maria Teresa.....    | 3,600,000    |
| Cristóbal Colon..... | 4,400,000    |
| Plutón.....          | 500,000      |
| Furor.....           | 500,000      |
| Artillery.....       | 3,800,000    |
| Total.....           | \$20,000,000 |

That is to say vessels whose value was \$20,000,000 were lost to Spain in less than four hours. These figures check fairly well with those given in Brassey's Naval Annual. To the loss of territory and indemnity which Spain will have to pay should be added the \$35,000,000 worth of vessels sunk or captured, and to this will also have to be added an immense sum for the loss of freight and passengers which would have been carried in Spanish bottoms had it not been for the war. All this is a part of Spain's punishment.

A Unique Map of the Philippines.

A truly magnificent present has been received by the widow of the assassinated Spanish premier Canovas from the friends of her deceased husband in the Philippines. The gift consists of a splendid map of the Philippines made of solid gold, with all the provinces in relief; each city is marked by a ruby, every inscription consists of sapphires, and the dedication of brilliants of the choicest beauty. The map is inclosed in a beautiful frame, likewise composed of gold and precious stones and surmounted by a golden

bust of Canovas. The whole creation rests in a case of the finest wood, which is likewise a work of art. The gift represents a value of 120,000 marks (\$30,000). The Duchess of Canovas intends to exhibit it publicly for the benefit of the national subscription.—Gold und Silberw. Industrie.

Rapid Transit in Paris.

The law authorizing the city of Paris to erect a system of metropolitan railways having been promulgated, the municipality have published the terms of the convention concluded in July last with the General Traction Company, which undertakes to form within six months a special company for working the lines when constructed, with a capital of not less than 25,000,000 francs (\$5,000,000). The total length of the system of lines is forty English miles, but only twenty-five miles will be taken in hand at first, the city undertaking to construct the first portion in eight years.

As this is perhaps the first example of such a considerable work being undertaken by a municipality, details of the working convention may be of interest, says The London Economist. It has already been stated that the amount of the loan to be raised for the execution of the first portion of the lines is 165,000,000 francs (\$33,000,000). The Traction Company, which has obtained the working concession, undertakes to employ only Frenchmen, and to have all its plant and rolling stock made in France. The board of directors of the working company must be exclusively French; the company will be permitted to have its depots and works outside the city, but they must pay the octroi

duties on the materials employed, as if the buildings were within the city walls; the names of the stations must be of a uniform color and must be so placed that they may not be confounded with advertisements; the minimum wages or salary to be paid to any of the company's servants or employes will be 150 francs per month, or for workmen engaged temporarily 5 francs per day; the wages must be paid in full during the period of military instruction; the day's employment must not exceed ten hours, with a whole day or two half day's rest weekly, and ten days' holiday annually without deduction of wages; in case of sickness wages must be paid in full for at least a year; in case of accident, until complete recovery, without prejudice to the indemnity to be paid if permanently disabled, wholly or partially.

The fares are fixed at 25 centimes (5 cents) first class and 15 centimes (3 cents) second class for any distance. Passengers before nine in the morning may have for 20 centimes (4 cents) a return ticket, available at any hour in the day. Children of the municipal schools are to pay a fare of 5 centimes (1 cent) only when traveling collectively, accompanied by a master. The working company will pay to the city for the use of the lines 10 centimes (2 cents) per first class passenger and 5 centimes (1 cent) second class, increased progressively should the number of passengers carried during the year exceed 140,000,000. Children traveling for 5 centimes are not to be taken into account for the payment or the number. The stations and means of access to the platforms to be at the charge of the company, but the platforms are comprised in the work executed by the municipality. The concession is for thirty-five years, but the city reserves a right of purchase from the year 1910.