

**SIMPLE SECTION LINER.**

This device consists simply of an irregular, octagon shaped block, to be used in connection with an ordinary draughtsman's triangle. It is slightly thicker than the triangle for which it is intended, and it is formed with reference to the triangle with which it is to be used.

The block is first cut square and a little larger than the inside opening of the triangle, as shown in the engraving. The corners are then cut down to such a distance that when the sides, a, b, of the block exactly coincide with the inside edges, A and B, of the triangle, the faces, c, of the block and C of the triangle will be the same distance apart as the lines in the required section. As there are four corners, four different distances may be obtained.

To use this device, the triangle is placed against the T-square in the regular way, and the block is placed in the center opening of the triangle. After drawing a line, the block is pushed back with the little finger while the triangle is being held with the other hand; then, by resting the little finger on the block, it may be held firmly while the other hand pushes the triangle back. Then the next line is drawn and the operation repeated for each succeeding line.

EDWIN J. NEWTON.

**Vestadium.**

Vestadium is the name of a recently discovered white metallic alloy of a beautiful appearance and great strength, says the Werkstatt. It seems to meet with as quick and general an acceptance as was the case with aluminum. It is said to be firmer and much more practical than any other known metal of equal specific gravity. It is claimed to be composed chiefly of an aluminum alloy, and only weighs one-third as much as aluminum of the same size. Furthermore, it is said not to rust, to withstand sulphuric acid, to take a fine polish, never to tarnish, and once polished, never to require cleaning.—Deutsche Maler Zeitung.

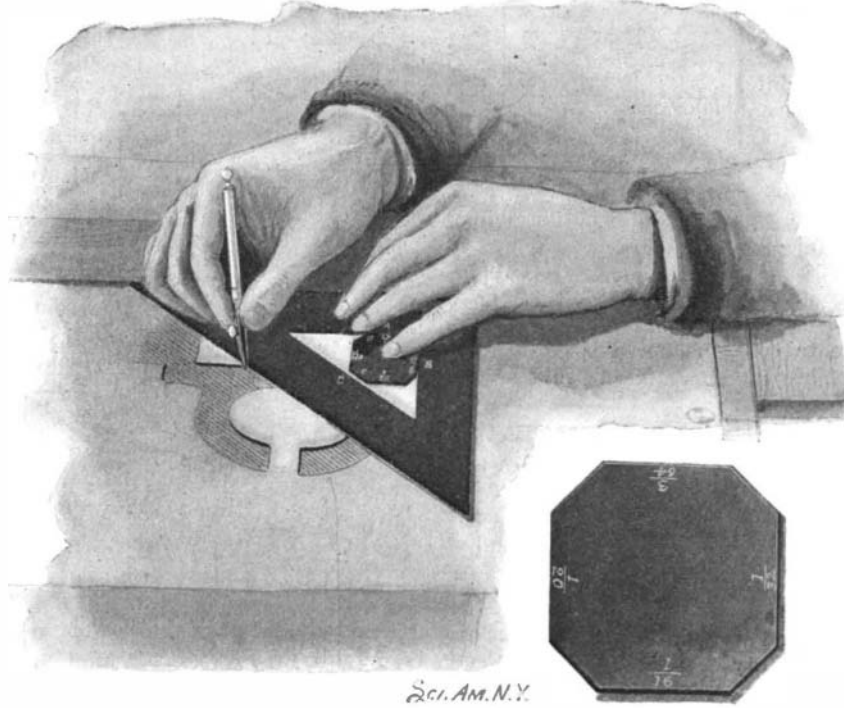
**Groundless Fear of Lightning.**

A current news item gives the result of an investigation carried out by Dr. G. Stanley Hall, president of Clark University, on the things that most excite fear in people. Of the 298 classes of objects of fear to which 1,707 persons confessed, thunder and lightning lead all the rest, although in certain localities, as, for instance, those subject to cyclones, etc., the fear of the latter predominates. It may be accepted as probably true that thunderstorms constitute the most pronounced source of fear with the majority of people, due, no doubt, to the always impressive and not infrequently overpowering nature of the phenomenon. But is there any justification in fact for this fear so far as fatal results are concerned?

We believe there is not, but, on the contrary, that many other causes which barely have a place in Dr. Hall's list are infinitely more entitled to the distinction as fear producers than lightning. As proof of this we may cite statistics of the United States Weather Bureau. These show that for the four years 1890-93 the deaths from lightning numbered 784, or an average of 196 a year. Again, H. F. Kretzer, of St. Louis, found from the record of nearly 200 newspapers that for the five years 1883-88 there were 1,030 deaths caused by lightning, or an average of 206 a year. We doubt whether, of the number of deaths classed as "accidental" in the whole United States, any one group can show so small a number. In New York city alone over 200 people are drowned every year, while nearly 150 are burned or scalded to death, and close on to 500 persons meet their end by falls of one kind or another. Comparing the record of 200 lightning fatalities for the whole country with the above records for New York city, with its total of nearly 1,500 accidental deaths for every year,

it will be seen how groundless is the popular fear of lightning. It is a survival, an inherited superstition.

But there is another point in connection with this matter which ought to be particularly comforting to city dwellers, albeit country dwellers may not be affected in like manner, and that is, that statistics show that the risk of lightning is five times greater in the country than in the city. The cause of this im-



NEWTON'S SECTION LINER.

munity for city dwellers is not far to seek. It is doubtless due to the predominance of metal roofs, the well grounded water pipes in houses, and probably as much as anything to the protective network of overhead electric wires of all kinds. The popular belief that a stroke of lightning is invariably fatal is also not borne out by facts. Indeed, one record specially devoted to this feature shows that of 212 persons struck, only 74 were killed. Taking it all in all, there seems to be no more groundless popular fear than that of lightning. Indeed, if one can go by statistics, the risk of meeting death by a horse kick in New York is over 50 per cent greater than that of death by lightning.

Yet with all the weight of statistics against its deadliness, lightning will probably continue to scare people as heretofore. Perhaps, after all, there may be a more direct cause than the mere psychological one usually ascribed to it, and that is the fact that many people of nervous temperament are affected hours before the approach of a thunderstorm and thus rendered particularly powerless to stand the strain which more or less affects the most phlegmatic natures during a disturbance in the heavens.

**Rats and the Plague in India.**

The evidence for the part played by the rat in the propagation of plague is gradually accumulating. At Karachi it has been a comparatively common observation for the occurrence of a case of plague to be preceded a few days by the finding of dead rats; this

ful. The conveyance of infection by infected rats in grain-bags is much more probable, as dead rats have been found among the piles of imported bags. As nearly every house in an Indian town is honeycombed by rat runs, and as the disease is very virulent in this species of animal, it is reasonable to assume that it is by their means that the disease is extensively if not chiefly spread. It is very certain that contagion from the sick to the healthy only accounts for a small proportion of cases. There is some evidence to show, however, that the so-called pneumonic form is more infectious than any other.

The number of cases reported in Calcutta is gradually increasing, but the great exodus of people and perhaps the hot season may have combined to postpone its spread; the people are now beginning to get over their fright and are said to be returning, and are also learning to see that the sanitary measures adopted when a case of plague is discovered are not so dreadful as they supposed. In Bombay the plague is almost extinguished and the average weekly mortality is nearly reached. In Karachi it is also very rapidly diminishing, the majority of the cases which are now occurring being found in the outlying camps. There is very little elsewhere.—The Lancet (London).

**Coronium in the Earth.**

Prof. Nasini, of Padua, Italy, has communicated to the French Academy the results of his investigation of gases issuing from the earth in volcanic districts.

Among these gases he found coronium, which has hitherto only been known hypothetically as a constituent of the sun. Coronium seems to have a vapor density far smaller than that of hydrogen. Prof. Nasini's investigations suggest the probability of the presence of other new elements.

Prof. Schuster, from an examination of the spectrum of "metargon," is inclined to doubt that it is a new element. He thinks it is a mixture of the components of the atmosphere which solidifies at the temperature at which air liquefies.

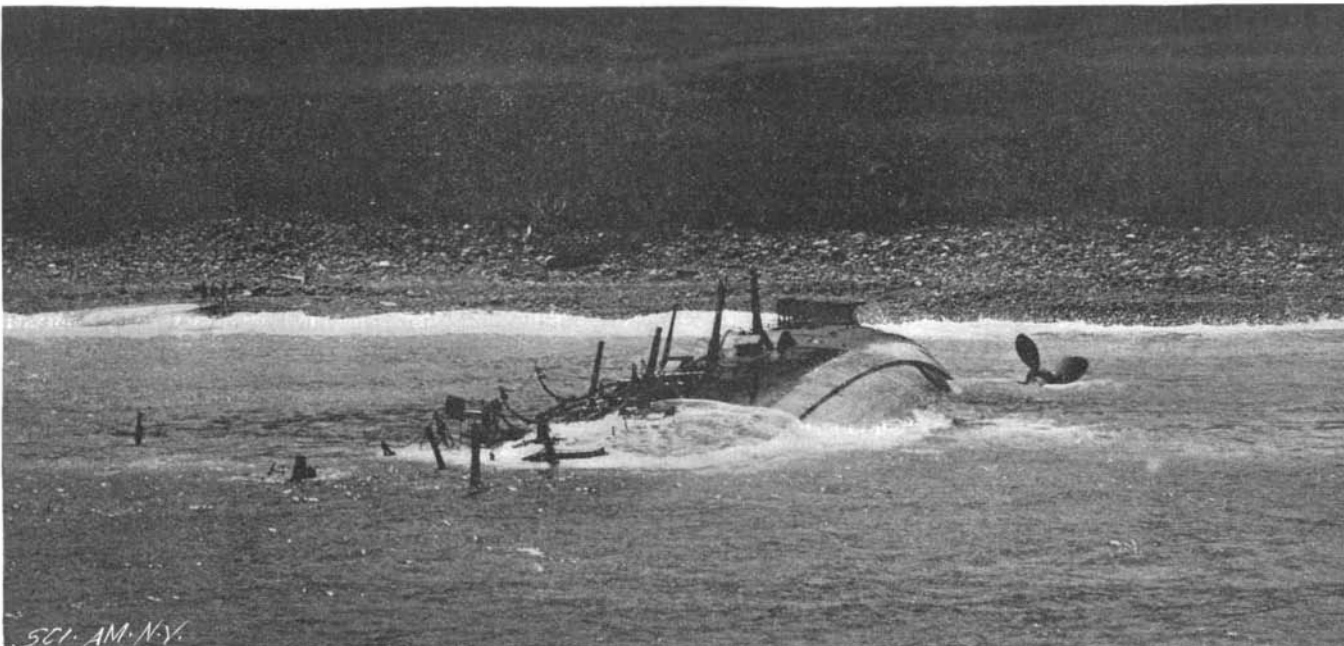
**THE REMAINS OF CERVERA'S FLEET.**

Now that the smoke has cleared away from the naval battle off Santiago, the official report of the action by Admiral Sampson is being impatiently awaited.

Besides the torpedo boat destroyers "Furor" and "Pluton," Admiral Cervera's fleet was made up of four swift armored cruisers of modern design, viz., the "Almirante Oquendo," "Infanta Maria Theresa," "Vizcaya," and "Cristobal Colon." The first three are "sister ships," launched at Bilbao in 1890 and 1891. The "Colon" was built in Italy in 1896, and prior to her purchase by the Spanish government was known as the "Giuseppe Garibaldi II."

The "Oquendo," "Maria Theresa," and "Vizcaya" were known as 7,000-ton ships; were 340 feet over all, 65 feet beam, 21.5 draught, 13,000 horse power, and supposed to be capable of a 20-knot speed. They were alike protected by steel waterline armor belts 5.5 feet wide and 10 to 12 inches thick, and each also carried two turrets of 10.5-inch steel; the gun mounts of the broadside armament were protected by 5.5-inch steel, and the deck platforms by 3 inches of iron. Also heavy armaments were carried, each mounting two 11-inch breech-loading rifles in turrets, besides small batteries, and ten 5.5-inch broadside Hontoria guns—these latter, in the "Vizcaya," had been replaced by rapid-firers. Each vessel was also provided with six torpedo tubes.

The "Cristobal Colon" is 328 feet long, 59.75 beam, 24 feet draught, 14,000 horse power, and, it is said, has made a speed of 20 knots. She is accredited with two 10-inch breech-loading rifles mounted in turrets, ten 6-inch rapid-firers, six 4.7-inch, ten 2.2-inch, ten 1.4-inch, and two machine guns, besides four torpedo tubes; and her armor consists of a 6-inch waterline belt of Harvey-



Photographed by J. C. Hemment.

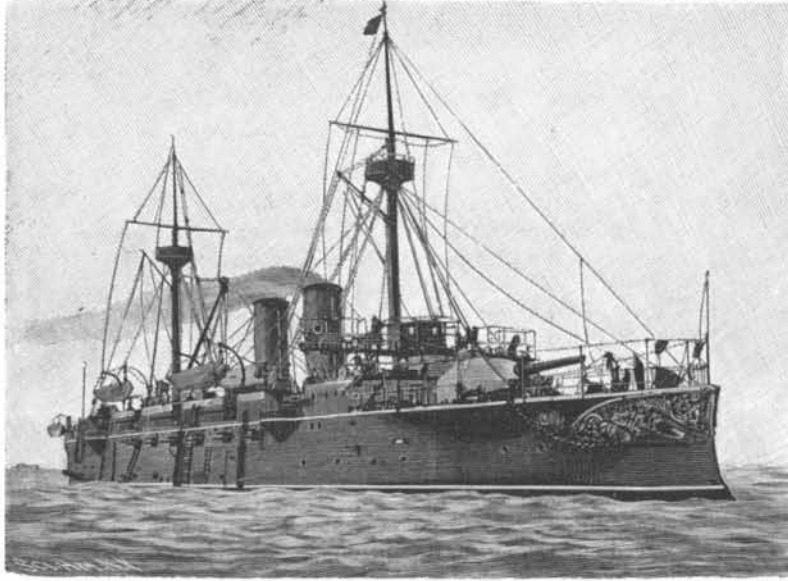
"CRISTOBAL COLON" ON HER STARBOARD BEAMS-END.

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ized steel, 6 inches of steel on the gun positions, and a 1.5-inch steel deck.

The accompanying illustrations, from photographs made hastily with a large sized camera held in the hands by Mr. John C. Hemment on the morning of July 4, less than twenty-four hours after the conflict, show very vividly the effect of the heat caused by the fires started by the explosion of shells and ammunition on the decks. Each of the vessels was painted black, yet it is noticeable after the battle the ironwork above the protected main deck is white, with irregular shaped spots here and there, while below the main deck just above the water the original black color is preserved. This is accounted for by the great heat blistering or burning off the second coat of black paint on the thin metal composing the upper works, leaving the primary coat intact. But the thick armor below this deck prevented the heat from radiating so quickly, therefore there was no burning of the paint. The different views show the similar positions of the wrecked ships.

The "Infanta Maria Theresa," which led the line in the attempt to escape from Santiago, is stranded some five miles west of the entrance to the harbor. Though her hull is practically intact, all superstructure and woodwork on the main deck have been swept away by fire or shot; she was struck thirty-three times above the waterline. The very first projectile practically disabled her, as it destroyed the fire mains, making it impossible to extinguish the flames in the after part of the ship, that were started by the explosion of a second shot in the admiral's cabin. A third projectile cut the main steam pipe on the port side, thereby rendering the port engines useless; and the steam killed all who were in this room. A mass of blackened, battered, twisted ironwork, one military mast cut down



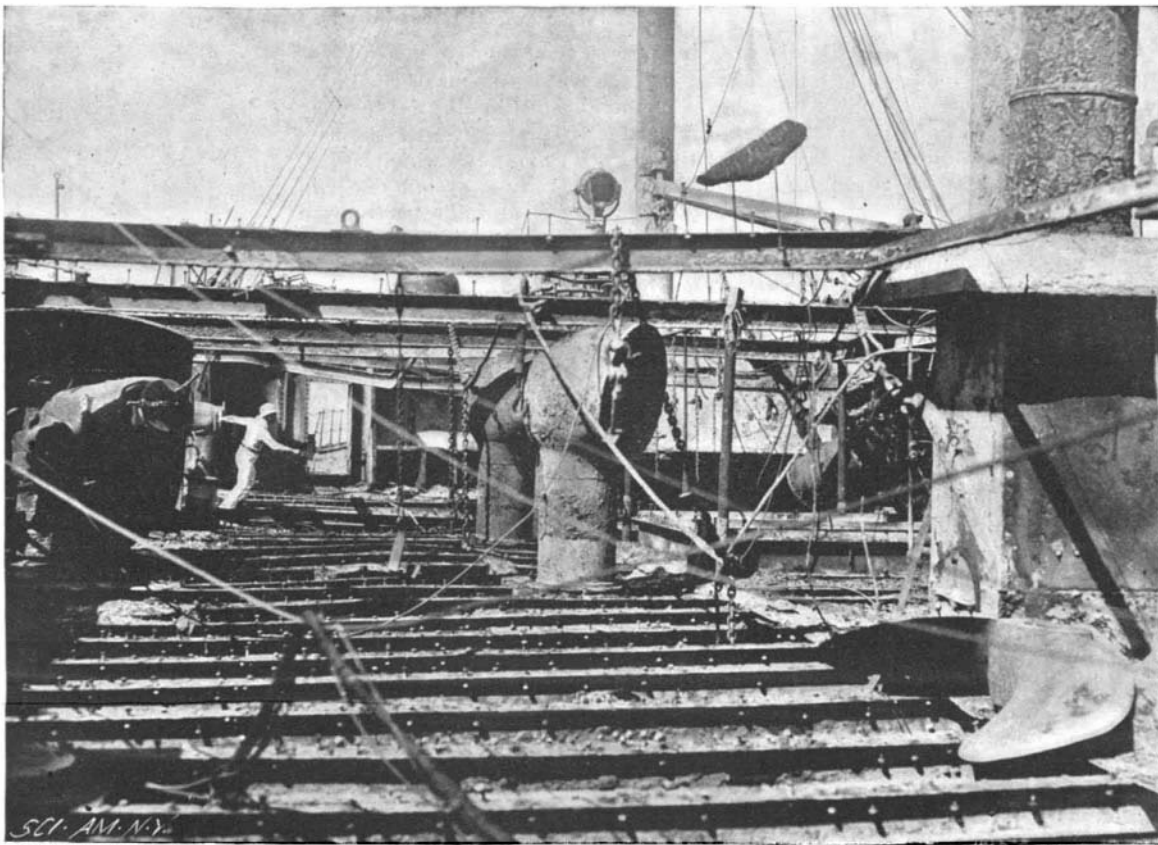
THE "VIZCAYA" (ALSO "OQUENDO" AND "MARIA THERESA") BEFORE THE ENGAGEMENT.

and lying athwartships, the last vestiges of woodwork consumed, this once handsome ship looks like a rough, battered, empty shell of iron.

Her frame and deck beams and most of the plates of the hull are left intact, however, and it is hoped she will be saved to become an ornament to our navy. Her after military mast, which still stands, is the only mast in the fleet that survived the battle. A glance at the illustration evidences how completely the fire did its deadly work, even the deck having been eaten away as the fire progressed.

A mile west of the "Maria Theresa" lies the "Almirante Oquendo" with broken back and a fearfully battered hull. Being the second to leave the harbor, she was much exposed, which accounts for her serious punishment; she was hulled above the waterline no less than 66 times. Our illustration exhibits her starboard quarter and the destruction by fire of everything combustible, leaving a mass of

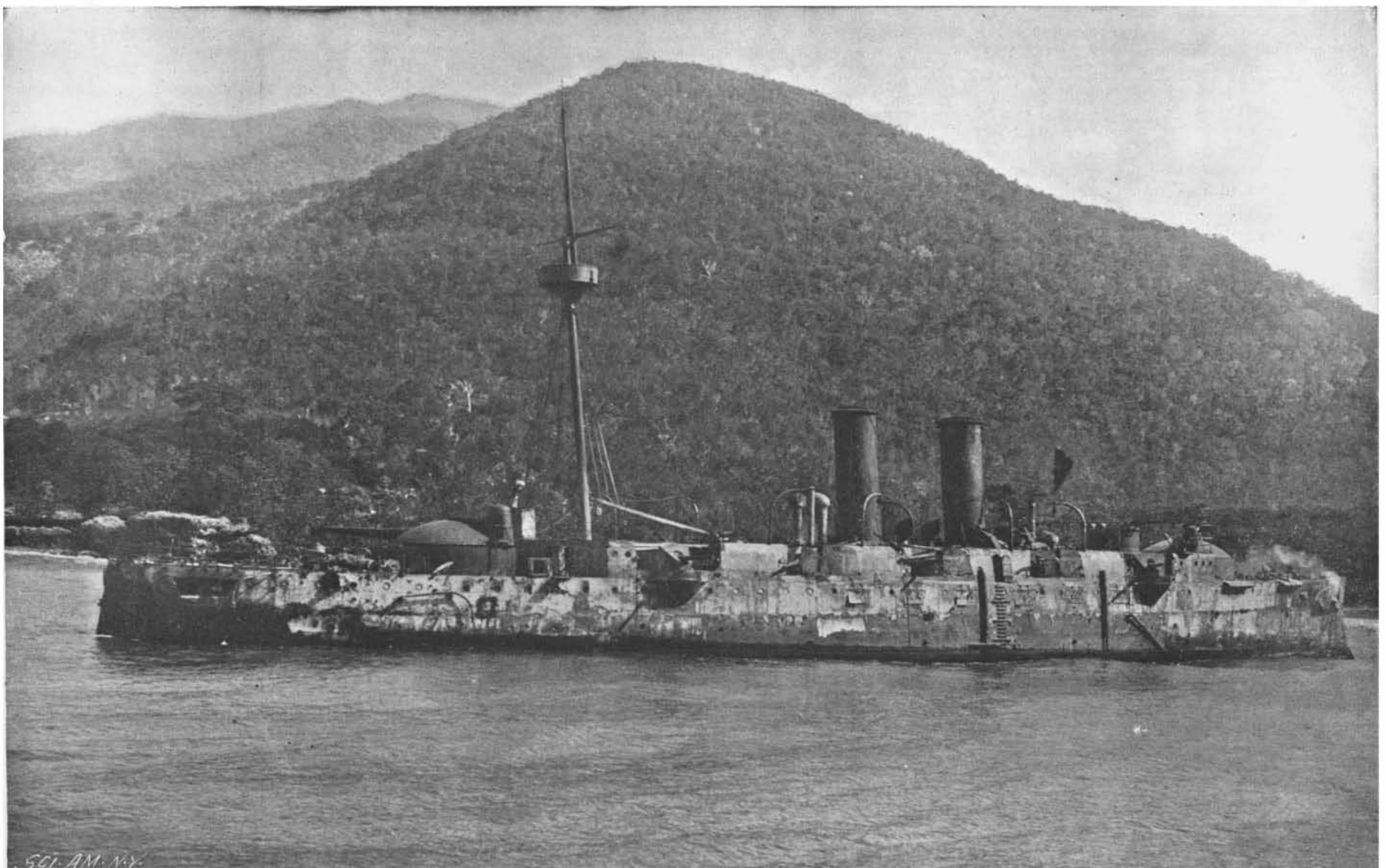
whitish-gray ashes all over the blistered sides and armored deck. One of the first shots that struck exploded the torpedo compartment and set the ship on fire; and as she headed toward the beach, shell after shell swept clear through her. One big hole amidships was caused by a 13-inch shell fired by the "Texas;" and near this is another notable injury, in that a projectile ranged downward from the gun deck, penetrating several bulkheads, exploding only when arrested by the armor belt at the starboard side. One can look clear through the ship along its course. There is abundant evidence that several other large shells exploded within the hull, causing great devastation; and presumably an armor-piercing shot struck one of the Hontoria guns, as it exhibits a groove an inch deep cut cleanly along its length. At the time this photograph was taken the fire was still raging at the



Photograph by J. C. Hemment.

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STARBOARD DECK OF "MARIA THERESA" (MIDSHIP) SHOWING TOTAL DESTRUCTION OF WOODWORK.



Photograph by J. C. Hemment.

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THE "MARIA THERESA" WITH MILITARY MAST STANDING AND SMOKE ISSUING FROM BOW.

bow, as will be seen from the great cloud of smoke rising therefrom.

The "Vizcaya" managed to get considerably further to the westward than the "Theresa" or "Oquendo," as she lies beached about fifteen miles from Morro; and though only hulled twenty-four times, she is, nevertheless, a complete wreck. The illustration exhibits a starboard broadside view, and the large hole in the bow was caused by a shell striking from the port side and exploding the torpedoes in the forward torpedo compartment; the effect is hardly appreciable when the injury is viewed from the exterior, since no idea can be had of the broken and shattered forefoot beneath the waterline, or of the explosive force that extended so far aft as to blow the forward military mast out of the ship. The rolling back of the hull plates proves conclusively the outward character of the explosion, so different from that of the "Maine," which was upward. It strengthens the belief that the latter was certainly wrecked by external mines.

One 13-inch shell struck the port armor nearly amidships, tearing out half the side; and another shot of lesser size entered well aft in the cabin, and passed through, tearing off plates on the starboard quarter. These wounds do not show in the photograph, as they are located on the port side.

The "Cristobal Colon," owing perhaps to better management and greater speed, and the fact that she was shielded by other vessels of the fleet, was struck only eight times, and succeeded in running forty-eight miles down the coast before she was beached, the purpose then being manifestly to keep her from falling into the hands of the foe. She lies on her starboard beam ends, her port battery pointing to the zenith, and before grounding all her sea-cocks and Kingston valves were opened, dead-lights smashed, ports and torpedo tubes cleared—in fact, every effort was made to afford ready ingress to water. Fortunately she lies in only four fathoms of water, and there is some hope that she will ultimately be raised. Evidently she largely escaped the havoc wrought in other ships owing to her belt of Harveyized steel armor, which kept out the shots from small and secondary batteries. Only two serious hits are apparent, one from a 13-inch, the other from a 9-inch shell. A second 13 inch missile exploded on her armor without material injury, and the nose of a smaller projectile is lodged in her bow armor. Our view of her was taken some distance away, but it will be observed that her stern swung around toward the shore as she sank, leaving her battle or port side upward (her secondary battery guns pointing upward) and her port propeller out of water. The shore all along is quite precipitous, which accounts for her strange proximity thereto.

As soon as official information, following careful examination by experts, is received, it is hoped that some definite knowledge may be reached bearing on that all-important question of armor plate and the destructive force of the modern projectile.

The great destruction wrought by fire, not only in this engagement, but in the action of the Yalu, emphasizes more than ever the imperative necessity of stripping our warships of all inflammable material. As we saw in last week's issue, this has been carried out to some extent in the reconstructed "Newark" and "Chicago," by removing wooden partitions and substituting corrugated iron between the staterooms, and by removing all woodwork from proximity to the guns.

We shall take up the lessons taught by the engagement at greater length in an early issue.

#### The Current Supplement.

The current SUPPLEMENT, No. 1178, contains a number of articles of great interest. "The Opposing Leaders in the Philippines" is illustrated by a group showing Aguinaldo and the chiefs of the revolt in these islands. "Porto Rico: Its Natural History and Products," is a timely article in view of the expedition which is now being made to conquer it. "The Preparation of Meat Extracts" is an important article on a subject of which there is little literature. "The Art of Taxidermy: Mounting Large Animals," is an illustrated review of Mr. John Rowley's new book. "The 'Telectroscope' and the Problem of Electrical Vision" describes an alleged invention for transmitting visual images invented by Szczepanik. There are many other articles of considerable interest which will be found listed in the Table of Contents on page 66.

LYNDE BRADLEY, of Milwaukee, has devised plans for the use of the X-ray on board of war vessels and on the field. Mr. Bradley says that while it would be a simple matter to bring the X-ray into use on a warship, considerable difficulty would be attached to the introduction of the apparatus on the field. A small outfit would have to be mounted on wheels for field use. The apparatus would, however, be much lighter and more portable than may be imagined, and his field apparatus could be finished in a week. The great help that the X-ray would be to surgeons lies in the quick method of locating a bullet or splinter in a man's body, a fracture, or other serious injury.—West. Elect.

#### The Trans-Siberian Railway and Siberian Colonization.

The director of that stupendous enterprise, the Trans-Siberian Railway, announces the whole line will be opened to traffic early in 1904. It will then be possible for the "globe trotter" to circle the earth in thirty days or less. At present the great bridge, which, when completed, will be one of the most notable in the world, and more than seven miles long, across the Yenisei, is well under construction. Next month, it is expected, trains will run through from Moscow to Irkutsk, when a big scheme of colonization, already fully arranged for, will be begun. Two hundred thousand families, or, approximately, one million individuals, will be transported by the Russian government, free of all expense, from the famine districts in European Russia to the fertile valleys of the Angara, Vitim, and Upper Lena, and the districts about Lake Baikal, where each head of a household will receive a grant of about fifty acres of land along with the necessary seed and agricultural implements; also the means of sustenance, housing, and clothing for one year. This undoubtedly is the greatest colonization scheme the world has ever known.

#### Railways and the Telegraph in Spain.

Both the railway and telegraph systems of Spain are in a very unsatisfactory condition and give rise to many complaints, especially among foreigners, and they are both examples of the pernicious methods which run all through Spanish affairs. The railway system of Spain comprises about 7,500 miles of road, built partly from private capital and partly from the proceeds of government subsidies, which, up to the present time, amount to more than \$200,000,000. Most of the roads were constructed under the supervision of the French and English engineers and the securities have been very gradually absorbed by French investors.

The speed of the trains is very low. The express trains run on only a few of the lines and even the "trains de luxe," which run only first class carriages, with the fares raised by 50 per cent, seldom run faster than twenty-five miles an hour, while the ordinary trains never attain a speed of more than fifteen miles an hour and are often behind time, specially in the southern part of Spain. Tourists usually select the first class carriages, which are fitted up like those in France, but they are by no means as comfortable and clean as they should be, and on the main roads they are often overcrowded. The number of seats is six or eight, and some of these are often occupied by the conductors of the train and even railway laborers, who scramble into the train between stations, much to the disgust of the passengers. Every train is supposed to have a first class compartment reserved for ladies and another for those who do not smoke, but the latter injunction is seldom heeded by the Spanish travelers; but this is an evil which is by no means limited to Spain, for in Holland it is almost impossible to prevent travelers from smoking in every compartment. The second class carriages on the Spanish railways have narrow and uncomfortable seats for ten persons and are generally dirty and neglected. The third class carriages are, of course, impossible for foreigners, and they have sometimes seats on the roof which are used exclusively by the lower classes.

In winter the carriages are heated by foot warmers. At nearly all railway junctions there are restaurants, but those who prefer to eat in a more leisurely manner may provide themselves with food to consume in the railway carriage, but in this case the Spanish custom demands the formality of asking your fellow passenger to share the meal with you.

At the larger stations the luggage office closes a quarter of an hour before the departure of the train; so this necessitates the traveler being on hand much before the proper time. In some cases there are no waiting rooms, and where there are, passengers are not allowed to enter either the waiting rooms or platforms unless they have their railway tickets. The railway officials have not seen fit to pay much attention to issuing return tickets, which are such a source of revenue in Italy and other countries. Such tickets are only available for one or two days and are issued on a few lines only, and the reduction in the fare is generally insignificant. Circular tour tickets are not unknown, but these tickets for combined tours in France and Spain have been discontinued, owing to the instability of Spanish currency.

If the traveler has trouble with the railroads, he will have much more with the telegraph offices. Our conception of a telegram is a message which is sent on at once by wire, but the Spaniards divide their telegrams into two divisions, urgent telegrams, for which are paid thrice the regular rate, and those which are sent in the ordinary way. The smaller railway stations have private telegraph offices and the rates are higher than the regular telegraph offices. The rate for a domestic telegram is one peseta (twenty cents) for fifteen words, and each additional word is charged at one-tenth of this sum. Messages in the same province have lower rates. Telegrams may be sent to foreign countries, but an additional fee is paid on each foreign dispatch, and it

is advisable to take a receipt, which is charged for. Telegrams are paid for with postage stamps, but money is accepted at the railway offices.

#### Typhoid and Ice Cream.

Not in all ice cream, but in some forms of this seductive and frigid congelation, lurks an element of danger—one predisposing to disease and fatality. The fact that cheap ices are continually hawked about the streets by the dirtiest of all dirty itinerants is itself sufficient evidence, aside from the fact that medical practitioners have given voice to frequent and oft-repeated warnings. Boards of health have fulminated against the evil, and then have forgotten it all; charity organizations and societies designed for the protection and uplifting of the more indigent and least cared for of the human race, have decried the iniquitous traffic; nevertheless, it still continues to flourish. Since the revelations of Doctor Campbell Munro in 1893, who traced an extended epidemic of typhoid fever in Renfrewshire, Scotland, directly to the sale of cheap and uncleanly ice creams, not a year has passed without similar epidemics, from like cause, being discovered in America and Great Britain. The report of Doctor Munro shows that the ice cream was prepared on premises where was an unreported case of the disease, the patient being a girl who, for a considerable part of the time she was ill, had been in immediate contact with the business.

Several epidemics due to ices have been reported in Michigan, Wisconsin, Illinois, and seven middle and southwestern States. Mr. Harris, the medical officer of health for Islington District, London, England, caused samples of the ices sold upon the streets to be examined by Doctor Klein, the well known pathologist, who found all were swarming with pathogenic bacteria; and Mr. Harris' own investigations of the premises where the stuff was manufactured were equally startling: He found most of the ice cream vended by cheap peddlers was unfit for use; the methods of manufacture were of the filthiest, including the blowing of eggs, foul utensils employed, utter disregard of any measures looking to cleanliness, storing in evil-smelling rooms (also employed as sleeping apartments) and the use of stale and half-spoiled eggs and milk.

In most of the cities in the United States precisely the same conditions obtain. The itinerant cheap ice cream trade is almost wholly in the hands of the lowest grade of Italians, Polish Hebrews, and Armenians, among whom anything approaching sanitation, or even ordinary cleanliness, is unknown. Doubtless boards of health, in most instances, have the power to deal with this unrighteous traffic, but, either through ignorance or a supposed trivial character, it is generally ignored.

Typhoid is a filth disease, communicated almost always—if not invariably—through the fecal excretion; this should be remembered. But it is not typhoid alone that is to be dreaded, for many of the contagious and infectious diseases may be disseminated in the same way; further, the stale milk and eggs are very provocative of forms of ptomaine poisoning that in its milder forms is assumed to be "bowel complaints" dependent on temperature changes, but in its more virulent phases leads to suspicions of mineral toxics employed for purposes of suicide or assassination. Many puzzling cases, especially among children, leading to fatality, doubtless have their inception in some such cause as this.

Little fear may be had regarding the wares of the reputable confectioner or caterer, however. The very character of his trade, the standing of his customers, etc., are such he cannot afford to conduct his business on any but the most sanitary and cleanly basis.

#### Government Ambulances.

In our last issue we described one type of government ambulance. We now understand that an Indiana firm of carriage and wagon makers has received orders for 500 Rucker ambulances since the outbreak of hostilities, and up to the present time they have shipped 316, and 50 are to be delivered weekly, until the order is filled. Under the front end of the wagon, and extending the full width of it, is a water tank 16 X 19 inches. The inside of the wagon is fitted to accommodate six persons. Two litters are made to fit in the bottom and they may be taken out when not in use. Two litters are also suspended from the top, leaving room for two wounded soldiers to be placed above their companions at the bottom of the ambulance. The ambulances are finished in natural wood. The same company also received orders for 1,000 army wagons: 500 of them have been delivered and the remaining 500 are being made.

#### The Hawaiian Islands as a Trade Center.

Now that the United States has annexed the Hawaiian Islands, intense interest is being manifested in the commerce of these islands. We shall, of course, now reap trade advantages as the result of their union with the United States; but it is a satisfaction to know that last year the people of Hawaii bought nearly \$8,000,000 worth of goods from all parts of the world and over 75 per cent of these goods came from the United States.