SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO. - - Editors and Proprietors

Published Weekly at
No. 361 Broadway, New York

CHARLES ALLEN MUNN, *President*,
361 Broadway, New York.
FREDERICK CONVERSE BEACH, *Sec'y and Treas.*
361 Broadway, New York.

TERMS TO SUBSCRIBERS.

One copy, one year, for the United States or Mexico $3.00
One copy, one year, for Canada 3.75
One copy, one year, to any foreign country, postage prepaid, 18s. 6d. 4.50

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (established 1845). ..... $3.00 a year
Scientific American Supplement (established 1876)..... 5.00 "
American Homes and Gardens ..... 3.00 "
Scientific American Export Edition (established 1878). ..... 3.00 "

The combined subscription rates and rates to foreign countries, including Canada, will be furnished upon application.

Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, FEBRUARY 6, 1909.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

LESSONS OF THE "REPUBLIC" DISASTER.

To the mind of the naval architect and the steamship official, the most alarming feature of the sinking of the "Republic" is the fact that, although but one compartment was penetrated, her bulkhead subdivision failed to keep the ship afloat. Does this mean that the much-vaunted cellular and compartmental construction of modern steamships is inadequate; or does it mean that, although the theory is correct, it has been carried out in practice with too nice a regard for economy of construction; and that watertight bulkheads that are watertight exist only upon the drafting board of the designer and in the carefully-written advertising literature of the steamship companies?

The SCIENTIFIC AMERICAN would be the last to play the part of alarmist, except upon the most profound conviction that danger existed. But we are free to confess that there are conditions attending the loss of this ship which render the disaster extremely disquieting, and serve to shake our faith in the watertight qualities of the bulkheads, upon which we rely for the safety of the modern transatlantic liner. Had the "Republic" been an old ship, or had she been built for a company that was hampered by a shortage of funds, and built by a firm that was notorious for the construction of cheap and flimsy vessels, the case would not wear such an ominous aspect. But the "Republic," like all the ships of the famous White Star Line, was built under a system of contracts which is peculiarly favorable to first-class construction. Messrs. Harland & Wolff have an arrangement with the White Star Line, by which they receive, as compensation, a certain percentage on the cost of the completed ship. The vessels turned out by the famous Belfast yard are credited with being equal, if not somewhat superior, to those built by the other leading British yards. Hence, it is reasonable to assume that, in her construction, she represented the most approved methods of steamship construction.

When she started from New York on her fatal trip, she was considered to be practically unsinkable by collision. So numerous were her compartments, so staunchly were her subdividing bulkheads built, that any qualified expert would have confidently asserted that two of her compartments might be flooded without sending the ship to the bottom. And yet the "Republic," as the result of the penetration of a single one of her compartments, now lies in 250 feet of water.

By piecing together the accounts of the disaster given by the officers and crew of the ship, it would appear that the watertight doors leading into the wrecked engine room were all securely closed immediately after it was penetrated by the bow of the "Florida." The engine room was speedily flooded, and probably was soon filled with water to a depth of 35 to 40 feet above the inner bottom. Under such a head of water the pressure against the stretch of bulkhead dividing the engine room from the boiler room would be over a ton to the square foot at the floor level, and over the whole area of the bulkhead for a height of 20 feet above the engine-room floor, the total pressure tending to burst in the bulkhead would be about 1,200 tons. It will be understood that, under such a load, the tensile stresses tending to tear the wall open at the seams would reach a high figure. Such evidence as has come to hand indicates that it was the bulkhead astern of the engine room that failed, the settling of the ship by the stern pointing to a gradual invasion of the after portion of the vessel by the inflowing water. If this be the case, it is not unlikely that the bulkhead failed by a starting of the seams; for in this case the inflow of water would be gradual; a fact which would account for the long period of time that the ship remained afloat.

It has long been our impression, that if there were a weak point in the construction of modern steamships, it was to be found in insufficient riveting and in the inadequate amount of stiffening worked into the bulkheads. The ordinary construction is to use a ⅜ or 7/16-inch plate, stiffened by 3 x 3 or 3½ x 7-inch angles, according to the size of the ship. We do not know what weight of plating and reinforcement was used in the "Republic," but it is certain that such construction as we have indicated above would never be used by a hydraulic engineer, if he were building a dam or a lock gate, or flat-sided tank, to withstand a head of 40 feet of water or more. It should furthermore be borne in mind that the "Republic" was favored by a practically calm sea. Had the ship been rolling and scending in a heavy Atlantic gale, the strain upon the bulkheads would have been correspondingly greater; and it must be regarded as one of the most fortunate features of this disaster, that it happened in such quiet weather.

If the loss of this noble ship leads, as in our opinion it should, to the creation of expert commissions to investigate the question of bulkhead construction, and draw up standard specifications for the same, the loss of the "Republic" will be, after all, but a small price to pay for the restoration of that sense of security in transatlantic travel which the sinking of this thoroughly up-to-date ship has unquestionably shaken.

In closing this article, we wish to add our tribute to the splendid discipline and devoted attention to duty which marked the conduct of the officers and crews, both of the stricken vessel and of the ships which were summoned by wireless telegraphy to their assistance. Capt. Sealby and his officers and crew lived up to the best traditions of the transatlantic service. In serving as the direct means of the rescue of the thousands of souls concerned in this mishap, wireless telegraphy has added greatly to its prestige. It should be made compulsory by law upon every passenger steamer that travels the frequented routes of the Atlantic Ocean.

FRANCE AND THE AEROPLANE.

If the record of the past year is a safe criterion, France is about to take as prominent a part in the development of the aeroplane as she did in the improvement of the automobile. Although the invention of the automobile is by no means to be ascribed to the French alone, no one will grudge them the credit of having been the first to develop the machine to a point of speed and reliability at which its rapid commercial success was assured. Similarly, we may expect that the great enthusiasm and liberality with which they have taken up the problem of mechanical flight will result in the production of an aeroplane, which, in reliability, speed, and range of action, will be as perfect as those automobiles in which the French astonished the world a few years ago by winning 300-mile road races at speeds of over 50 miles an hour. We say this without any disparagement of the good work that is being done, on a much more limited scale, in this country; indeed, we must ever remember that the most brilliant flights of the past year were achieved by an American-built machine of a purely American design. The strong position held by the French people lies in the widespread enthusiasm with which they have taken up this new form of locomotion, the large number of intelligent men who are building and trying out various types of aeroplanes, and lastly, the great liberality with which the art is being stimulated by the offering of attractive prizes.

Speaking of Wright's successes, it might be mentioned here that the official account of his longest flight, made on the last day of the year, which has recently come to hand, shows that the closed circuit over which the flight was made was marked out by three flags which formed an isosceles triangle, the two long sides measuring 1,000 meters each and the base 200 meters. The circuit thus formed measured a little over 1 1/3 miles. The total official distance, measured exactly on the sides of the triangle, and allowing nothing for the turns, was 76.5 miles, which was traversed in 2 hours, 18 minutes, 33 3/5 seconds, at a speed of 30.95 miles per hour. But it should be borne in mind that, in order to make the turns, Wright was obliged to keep well outside the triangle; and it is fair to assume that the 168 turns served to bring up the total distance covered to fully 90 miles, and the average speed to over 35 miles per hour.

Evidence of the great hold which the new sport has taken upon the French people is afforded by the fact that the French company which bought the Wright patents has in hand orders for the construction of thirty-three machines. The Voisin brothers, builders of the type of aeroplane used by Farman and Delagrange, and also M. Pelterie, have several orders on hand, and outside of these three firms there are other less well-known builders, to say nothing of the private individuals, who are constructing machines ready for the forthcoming season.

It is estimated that altogether some $300,000 will be offered for contests during the coming year. One of the latest is a single prize of $2,000 which has been placed at the disposal of the Aero Club of France. It is to be open to all types of flying machines, and to dirigibles not exceeding 1,200 cubic meters capacity. The prize will be won by covering a 105-mile course. The most notable aeronautic meeting of the year will be held at Brescia next September, when prizes to the amount of $20,000 will be offered. The leading event will be a trial for a distance of 93.2 miles over a quadrangular circuit, to be laid out on a plain comparatively free from villages, trees, or other obstructions. It is also announced that the abandonment of the Grand Prix race for automobiles has rather encouraged than otherwise the promoters of the Anjou Flight Cup, the contest for which is to take place from Angers to Saumur and back, a total distance of 80 miles. It has even been suggested that the place of the motor car Grand Prix be taken by a big aeronautic meeting to be held some time in September.

Finally, the offer by the Daily Mail of a $2,500 prize for the first crossing of the English Channel during the year 1908 by an aeroplane has been extended by that journal to the present year, and the amount of the prize has been increased to $5,000. In view of the fact that Wilbur Wright has covered in a single flight a distance between three and four times as great as that which separates the French and the English shores, there is no question of his ability to win this prize, should he be willing to take the risks involved. The chief, and practically the only risk, would be that of the stopping of the motor; and the danger of alighting on the sea might be eliminated by fastening a couple of light racing shells to the runners below the planes, and choosing a perfectly calm day for the attempt.

THE "TRUST" SYSTEM AS APPLIED TO SCIENTIFIC RESEARCH.

An interesting development in modern scientific investigation and research is the general tendency to apply the principles of efficiency and concentration and organization used so effectively in American manufacturing industries. The fundamental methods which the great corporations or trusts have developed for the successful conduct of their businesses, seem equally applicable to scientific work. The benefits of adequate capital and a well-organized plant, together with a spirit of co-operation rather than competition, can be seen in a number of important scientific institutions in the United States.

With adequate equipment in the way of laboratories, observatories, apparatus, and instruments thus made possible, there comes the bringing together of men working in the same or allied fields, so that they cooperate harmoniously without waste of effort or inadequate treatment of any individual features of an investigation, due to the limitations of a single worker. The investigation when completed stands as the united and matured thought of a great institution. While every individual receives due credit for his share, it is as a part of a large and most useful whole. The tendency, therefore, is not to destroy individualism or initiative in scientific work, but to raise its standard, and to insist that the finished product shall represent everything that modern science can contribute to the particular subject. The result is that to-day all the greater, and especially many of the newer scientific institutions, are able to point with pardonable pride to valuable discoveries and investigations by members of their staffs, which even when measured from the utilitarian standpoint show a direct and important return for the capital invested.

Thus the recent study of the sun spots at the Mt. Wilson Observatory of the Carnegie Institution, made possible only by a special astronomical observatory and magnificent instrumental equipment, has brought more to our knowledge of this department of solar physics than has been gained by all previous observations. The explorations and studies of the American Museum of Natural History have produced results in the way of collections and scientific information more than commensurate with the scale of the expeditions; while such a great discovery as the anti-serum treatment for cerebro-spinal meningitis, developed at the well-equipped Rockefeller Institute for Medical Research, is but one indication of the usefulness of this institution. Indeed, it is most interesting to realize that the best scientific men have been only too anxious to apply modern business methods to their work, and without the sacrifice of scientific ideals in their search, to meet the tests of a practical and utilitarian age.

Modern scientific institutions of the type mentioned are a source of inspiration to the individual worker, because they are able to provide him with means for the adequate development of some investigation which can be shown worthy of support and encouragement.