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
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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 "

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MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, JULY 27, 1907.

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.

IS A REVISION OF GATUN DAM NECESSARY?

When the discussion of the great earth dam at Gatun was at its height, much mention was made of a certain large dike which had been built across a depression in the contour of the Wachusett Reservoir. This dike was constructed of earth, and was of the general type to which the proposed Gatun Dam will belong. If we remember rightly, the slope of the Wachusett dike, which was some 60 feet high, was made at the natural angle assumed by an earth fill. It was considered by the engineer who is responsible for the design, that when the inner slope had been properly riprapped with rock, it would maintain its stability after the reservoir was filled with water. The behavior of the dike, after the water had been impounded, appeared at first to vindicate the plan upon which it was built; but a few weeks ago, a huge section of the inshore slope went out, suddenly and slid into the body of the reservoir. Fortunately, the slide did not extend far enough back into the body of the dam to allow the water to break through; otherwise, practically the whole of the lake would have been lost.

The importance of this accident (which came very near being a disaster) as affecting the proposed Gatun Dam, lies in the fact that the larger structure (the Gatun Dam will be 130 feet in height) has been designed upon the same principles as those followed in the Wachusett dike; and the plan shows that the inner slope, facing the water, is the same as that which has recently proved unstable at Wachusett. It has been suggested, and we think with good reason, that the slope of the Gatun Dam should be made easier (less steep) than that called for in the present plan. If any considerable change be made, it will of course involve a large increase in the cost of the structure, for the Gatun Dam is from 7,000 to 8,000 feet in length, and the extra yardage involved in extending the slope will entail an extra cost of no small amount. In view of the fact, however, that the security of the whole canal depends upon the dam, it will surely be agreed that, with the Wachusett failure in mind, the proposed change should be given very careful consideration.

BATTLESHIP "GEORGIA" DISASTER.

Another ghastly turret disaster has been added to the already too long list of similar accidents on the new ships of our navy. The recurrence of these disasters brings home the uncomfortable conclusion that there must be something radically wrong either with the materials or the methods adopted in carrying on target practice with the big guns of our navy. This conclusion is forced upon us by the undeniable fact that, while accidents in target practice are not unknown in other navies, they have not been so frequent and fatal as those which have occurred upon our own ships within the past few years. Indeed, we doubt if the statistics of gunnery accidents for all the other navies combined would equal the total number of fatalities which have occurred under the same conditions in the United States navy since the beginning of the year 1903. First, there was the "Massachusetts" disaster, in which nine men were killed; then came the loss of five men on the "Iowa," followed by the death of thirty-two men on the "Missouri," seven on the "Kearsarge," and ten, and possibly more, on the "Georgia." This makes a total of sixty-three officers and men killed in the turrets of our battleships in the past five years!

This latest disaster, which happened on one of our finest ships which had only recently gone in commission, renders it imperative upon the Navy Department to make a searching investigation of the conditions which have made such wholesale slaughter of officers and men in time of peace possible. The indifference to the sanctity of human life which prevails in what the officers of our navy broadly term "civilian" life is bad enough, Heaven knows; but it becomes doubly shocking when it finds its way into a service which is supposed to represent, and we believe does represent, the highest ideals of attitude and conduct. When turret accidents, due to the premature ignition of smokeless powder, occur with such persistent regularity in our own navy, as compared with their comparative infrequency in other navies, it is certain that there must be some clearly-ascertainable, predisposing causes, which can be known and removed, if thorough investigation be made and the proper remedies applied. What these causes are it is for the board of investigation, which will be appointed, to determine. We know that in previous accidents the causes have been various. On the "Missouri" it was a "flare-back"; on the "Kearsarge," the dropping of fused metal from a short-circuit of the electric apparatus; on the "Iowa" it was the using of smokeless powder in guns which had never been designed to withstand the high pressures along the chase due to these powders; and now, in the "Georgia," it is suggested that a spark from the smokestacks of the ship may have fallen through the open grating in the roof of the turret.

It has been our opinion for some years past that, while the direct causes of these accidents may vary, the fundamental cause is to be found in the tendency, during the excitement of target practice, to neglect certain rules of caution, in order to acquire that speed of loading which is essential to rapidity of fire and the scoring of the highest possible number of hits in a given time on the target. Every precaution tending to protect the powder charge from ignition, from the time it is taken out of the ammunition rooms to the instant at which it is fired in the gun, calls for more or less delay. It is natural that, in the enthusiasm of a target contest and with that contempt of danger which is bred of familiarity with high explosives, the men should omit this or that time-consuming precaution, and expose the powder to just such accidental ignition as has caused the majority of the accidents.

LATEST RESULTS WITH MARINE TURBINES.

Because of the vast amount of experience which has been gained by the Parsons Company, as the pioneers and largest manufacturers of marine turbines, any statement made by the Hon. Charles Parsons as to the actual results obtained with this new form of marine engine, is necessarily of great value. In a recent paper read by the inventor before the Institution of Civil Engineers, he has summarized results and answered several questions as to present efficiency and probable future developments of the marine turbine, which cannot fail to command widespread interest. The turbines at present in use may be comprised under three principal types: First, the compound type, which was first commercially applied in 1884, and comprises the Parsons, Rateau, and Zoelly. All of these adopt a line of flow of the steam generally parallel to the shaft. Mr. Parsons states that one chief object in his type of turbine has been to minimize the skin friction, by reducing to a minimum the extent of moving surface in contact with the steam; another object has been to reduce the percentage of leakage by the adoption of a shaft of large diameter and great rigidity, so as to secure small working clearances over the tops of the blades. The second, or single-wheel type, of which the De Laval is the chief representative, has been used extensively on land for small and moderate powers; but, because of its high angular speed and the necessity of reduction gear on the screw shaft, it has received but little application for marine propulsion. The third, or sinuous-flow type, of which the Curtis turbine is the chief representative, ranks second to the Parsons in the extent of its use for marine purposes. It may be generally described as semi-compound, with a few stages of expansion, at each of which the De Laval expanding-jet principle is used. According to Mr. Parsons, the skin friction in the blades themselves, owing to the sinuous course at high velocity, is greater than in any of the varieties of the compound type.

The figures given of the total amount of horsepower installed in marine turbines show that the Parsons type has an almost exclusive command of the field, the total power at present in service being divided as follows: In pleasure steamers, 18,200; cross-channel steamers, 149,900; yachts, 18,100; ocean-going steamers, 91,900; and war vessels, 106,900; making a total of 385,000 horse-power. The total power of marine turbines of the Curtis, Rateau, and other types, completed, is about 16,000 horse-power.

On the important question of consumption of coal in turbine vessels, Mr. Parsons states that, in fast pleasure steamers and cross-channel boats, the economy has been found to be from 5 to 15 per cent superior to that of similar vessels equipped with triple-expansion reciprocating engines, and about 25 per cent superior to that of vessels propelled with compound paddle engines. To this advantage must be added others, such as the saving in cubical space, reduced consumption of oils and stores, and reduced work for the engine-room staff. It is well known that there is a critical speed of ship, below which the economical advantage of the turbine disappears. We are informed in this paper that for speeds down to about 16 knots, turbines have been found equal or superior in economy to reciprocating engines; and in some cases, where large and comparatively costly turbines have been fitted, as in the case of yachts, this advantage is maintained down to speeds of about 12 to 15 knots.

A noteworthy admission by Mr. Parsons is that the solution of the problem for slow vessels lies in a combination of reciprocating engines and turbines; the reciprocating engines dealing with the high pressure of the expansion, and the turbines with the low pressure. He estimates that a combination of this kind, used in an intermediate liner of 15 knots speed, will effect the saving of 12 per cent in fuel over the best quadruple-expansion engines, and that there will be a reduction of total weights. In a large vessel of 10 to 12 knots speed the dual motive power would show a saving of 15 to 20 per cent in fuel over the best triple-expansion reciprocating engines; and, although in some cases the first cost will be greater, it is estimated that, because of the increased earning power of the vessel, the excess will be recovered in less than three years. In the larger vessels, however, there will be little or no increase in the capital cost.

OPENING OF THE NEW HAVEN RAILROAD ELECTRIC SERVICE.

The inauguration of the electric service of the New York, New Haven & Hartford Company, by the operation of all trains between New Rochelle and the Grand Central station, must be regarded as one of the epoch-making events in the history of electric traction in this country. It is true that this opening was antedated by six months in the commencement of electric operation on the lines of the New York Central Railroad Company; but the interest in the New Haven equipment lies in the fact, that it is the first time a large section of the main line of an important steam railroad has been operated by an alternating-current system. The electrified line consists of a 22-mile stretch of four-track road, extending from Stamford on the main line to Woodlawn, where the road makes connection with the four-track road of the Harlem branch of the New York Central system. Power is supplied by a turbo-generator plant located on the water side at Cos Cob station, about three miles from Stamford. Current is delivered to the line at the high pressure of 11,000 volts. The overhead system is used, and the design and construction of these lines is of particular interest. It consists of a series of lattice-work bridges, spanning the four tracks at 100-yard intervals. Each of the four overhead lines is built up in the form of a catenary, consisting of two half-inch steel cable "messenger" lines, from which is suspended by a series of triangles the copper trolley wire. The two "messenger" suspension lines are "cradled," being about 6 feet apart where they cross the bridges, and 6 inches apart at the center, the triangular suspenders decreasing from 6 feet on the side at the bridges to 6 inches on the side of the center of each span. This gives a suspension system of considerable vertical and lateral rigidity, and makes it possible to hold the copper wire in fairly good alignment and level.

The use of the alternating current has the double advantage of dispensing with sub-stations and reducing the amount of copper in feeders. The stepping down of the current is done in transformers, which are carried upon the locomotives. Each locomotive has a nominal horse-power of 1,000, and weighs about 95 tons. Unlike the New York Central Company, which is making use of the multiple-unit system for its suburban service, the New Haven Company will operate its electrical zone entirely by electric locomotives, of which thirty-four have been delivered. The opening of this service is to be progressive. For the present, the change of locomotives from steam to electric will be made at New Rochelle, from which point all trains will be taken into the Grand Central station by electric power; and from this time on the notorious Park Avenue tunnel will be entirely free from the steam and gases and fierce heat, which have made travel through the tunnel so insufferable in past years. It is expected that by August 1 the electric service will be extended to Port Chester, and a month later to the terminus of the electric zone at Stamford.