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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.

CONCRETE AND CRUSHED ROCK.

Evidence of the rapid increase in the use of concrete in engineering and architectural work is to be found in the great demand for, and increasing value of, what used to be known as "broken stone" and is now known as "crushed rock." There was a time, and not so very long ago, when the hand hammer or the portable crushing machine of moderate capacity were equal to supplying the demand; but of late years the call for this material has been so extensive as to warrant the construction of large plants equipped with machinery of special design and large power, capable of turning out several hundred tons of crushed rock per hour from each machine. In fact, it is likely that the production of crushed rock will become a specialized industry, with plants located conveniently to suitable quarries, and within reach of rail or water transportation.

The important effect which the growing use of concrete is having upon certain allied interests is shown by the fact that the sanitary district of Chicago has been negotiating for the sale of the enormous quantities of rock which were excavated during the construction of the Chicago drainage canal. This rock at present lies in huge banks, which extend for many miles parallel with the canal between Lockport and Lemont, Ill. The estimated amount of material suitable for crushed rock now lying in these spoil banks is 22,000,000 cubic yards, and the whole of it, of course, lies conveniently for transportation through the canal to Chicago. An offer of 10½ cents per cubic yard has been made for the rock as it lies in place, with the return of a certain percentage of the net profits from the sale of the rock after it has been crushed. Extensive as is the use of concrete, whether in the plain or in the armored or reinforced condition, we are to-day witnessing but the beginning of what may be termed the concrete age. This ever-broadening application of concrete is to be welcomed, provided care is taken to guard against careless construction or the introduction of cheap and fraudulent methods of work. If the day ever comes when concrete construction is carried on in the shoddy manner which characterizes much brick and stone construction of the present day, we shall be leaving a heritage of trouble and disaster to posterity, the measure of which it would be hard to foretell.

ELEVATION OF OUTER RAIL ON CURVES.

The elevation or, as railroad engineers call it, the super-elevation of the outside rail on curves is more important and demands more careful thought and attention than the maintenance-of-way engineer, the roadmaster, and the section boss are in the habit of giving to it. The danger of derailment due to the centrifugal force exerted by a train against the outer rail on curves may be greatly reduced by elevating the outer above the inner rail. Indeed, there is a degree of super-elevation corresponding to a given rate of speed which will theoretically relieve the outer rail of any side thrust, and cause the engine and cars to travel round the curve without any tendency to bear more heavily upon one rail than the other. If all trains were run at the same speed over a given track, it would be possible to put in this theoretical amount of super-elevation. As a matter of fact some trains would run slower than those for which the track was adjusted, and the slower trains would bear heavily against the inner rail. It is for this reason that engineers are in the habit of adopting a compromise super-elevation, too low for the fast train and too high for the slow train. We believe, however, that it would be better to put in the full super-elevation required for the fast trains, and this for the reason that the risk of derailment on the inside of a curve is a remote one, as is proved by the rarity of an accident of this kind.

On some of the roads of this country, where a fast schedule has to be maintained over tortuous track, the outer rail on some curves is super-elevated as much as 8 inches, and the riding on such track is wonderfully smooth and comfortable. It is, in fact, impossible to tell by the sensations of the body whether the train is running on tangents or on curves. On the majority of our roads, however, the track is not sufficiently adjusted to the higher speeds at which our fast trains are run, and we believe that to this cause, largely, are to be attributed the many derailments which occur. In this connection it is interesting to note the conditions on the curve at Salisbury, England, on which so many Americans recently lost their lives. According to information given at the coroner's inquest, the curve was an exceedingly sharp one, the radius being only of eight chains, or 528 feet. This would represent a curve of no less than 11 degrees, which is one degree greater than the maximum curvature which twenty years ago was considered to be the extreme limit even on our western railroads. That an 11-degree curve should have been allowed to remain in the main line of a road on which some of the fastest expresses in the world are run is to American eyes a very surprising fact. It is also surprising to learn that, although express trains were permitted to run without stopping, though at supposedly reduced speed, through Salisbury station and over this curve, the super-elevation of the outer rail was only 3 1-3 inches. It is not sufficient to urge as an excuse that the curve commenced at the station platform, and that a greater super-elevation was impossible. What was needed, and what is needed to-day at this point, is such a relocation of the line as will eliminate the curve, or at least reduce it to safe proportions.

The evidence of the guard and other employees shows that the train ran from Wilton, a few miles away, to Salisbury at a speed of 68.5 miles per hour, and there is no clear evidence to show that the speed was much reduced through the station. In fact, the guard stated that when the disaster occurred he was doing his best to attract the attention of the engineer. With a 50-ton engine running at that speed on an 11-degree curve, the centrifugal force was equivalent to about 25 tons applied at the center of gravity of the engine, which was about 5 feet above the rail. As the half width of the track was only 2 feet 4¼ inches, it is evident that the resultant of gravity and centrifugal force must have passed just about through the point where the wheel flanges bore upon the corner of the outside rail. The instant this resultant passed outside the rail, which might easily occur when the engine lurched against the rail, there would be nothing to prevent the whole mass from turning bodily over; and this was probably what occurred.

BRITISH MERCHANT MARINE AND THE COMMERCE DESTROYER.

Great Britain more than any other nation is dependent upon the existence and uninterrupted movement of her great merchant marine. In itself, and as the indispensable medium for carrying her vast commerce, the shipping fleet of the island empire is its most valuable asset. Therefore, it has been generally regarded as the most vulnerable point upon which to concentrate attack in time of war. So largely does Great Britain depend upon her over-sea commerce for food stuffs, that there would be no surer way of bringing that proud empire to its knees as a supplicant for peace than to capture, destroy, or drive from the high seas the ships that carry her food stuffs and the raw materials and finished products of her factories.

The recent naval maneuvers, in which practically the whole strength of the British navy was concerned, were planned with a view to determine just how great this peril might be, and to this end an "enemy's fleet" was organized which, though not large in numbers, was mainly distinguished by its combination of great gun power and high speed. Among the battleships were included the five new vessels of the "King Edward VII." class, and among the cruisers was the Atlantic squadron, which, under the command of Prince Louis of Battenberg, visited this country in the fall of last year. Although the commerce destroyer, as represented by our own "Minneapolis" and "Columbia," has ceased to be built, its place has been taken by the modern armored cruiser, which has all the speed of the commerce destroyer, in addition to good armor protection and a heavy battery of long-range guns. The Atlantic cruiser squadron, for instance, consists of ships, the slowest of which is of 23 knots maximum speed, while the fastest, the "Drake," made 24 to 25 knots for short distances when in chase of the enemy.

The "defending fleet" included twenty battleships of the Channel and Mediterranean fleets, besides several squadrons of cruisers, and the plan of the maneuvers was to dispatch a large number of merchant ships across the zone of war under convoy, the vessels being sent off in groups along one of several routes between Falmouth or Milford Haven and Gibraltar. The ships, whether their course lay northward or southward, converged off Cape Finisterre, which, of course, became the central point of defense. The method of defense was for the fleet to move in sections respectively to the south and to the north, each preceded by a wide screen of scouts and cruisers, the widely-separated ships of each screen being kept in touch by wireless telegraphy.

The nine battleships and cruisers of the enemy rendezvoused off Cape St. Vincent, where the vessels were formed in three great lines reaching east and west, with 30 miles between the individual ships of each line. The battleships formed the center line, while a line of cruisers was placed 120 miles to the north, and another line 120 miles to the south, the whole of this great network being kept in touch by wireless telegraph. The defending force, moving from Gibraltar and from Falmouth, quickly broke through the meshes of this net, two of the enemy's battleships and some of his slower cruisers being subsequently put out of action by the fleet from the south; the defending fleet from the north accounted for a third battleship and another large cruiser, while the "Magnificent," the last remaining of the slower battleships of the enemy, escaped by taking to the Atlantic. The enemy was left with five fast battleships of the "King Edward VII." class, and the enormous value of a homogeneous squadron of uniform high speed was shown by the fact that these vessels were able to break through the theoretically overwhelming force of the enemy, and steam up the channel with the defending fleet in hopeless pursuit.

The enemy's cruisers, forming the southern edge of the net, fought an important engagement with the defending cruisers off St. Vincent, in which all of the ships on both sides were severely handled and some vessels were practically destroyed. It is significant that most of the engagement took place at 6,000 yards range, at which the 6-inch gun is practically ineffective, and that the maneuvering was carried out at the high speed of 21 knots an hour. The value of speed in armored cruisers was shown when the enemy's squadron sighted the outer fringe of 25-knot scouts (a new type recently built) and gave chase. In this case the flagship "Drake" was able to raise her speed to 24.8 knots, with the result that she ultimately brought the destroyers within range, and they were ruled out of action. It is claimed, and very justly so, that the maneuvers have emphasized the value of an efficient engineering staff and have proved, once more, that upon the efficiency of the staff, and not upon the mere trial records of the ships, depends their final value when put to the supreme test of war.

On the other hand, too much importance must not be placed upon the escape of the attacking fleet and its ability to raid the maritime cities along the coast, and capture and destroy merchant vessels. Such damage would be local and temporary. Only by meeting and defeating the defending fleet in a pitched battle, a feat of which the enemy was quite incapable, could any decisive result have been achieved. Although the swift cruisers of the raiding fleet succeeded in doing considerable damage to the country's commerce, they were driven from the trade route which was selected for attack, and as a fleet were badly damaged and widely scattered. Altogether, the contention of the leading naval authorities that Great Britain's commerce can never be so absolutely crippled as to decisively affect the issues of war, would seem to be strengthened by the events of this summer's maneuvers.

THE EFFECT OF THE SEA UPON CLIMATE.

The enormous area of the sea has a great effect upon climate, but not so much in the direct way formerly believed. While a mass of warm or cold water off a coast must to some extent modify temperature, a greater direct cause is the winds, which, however, are in many parts the effect of the distribution of warm and cold water in the ocean perhaps thousands of miles away. Take the United Kingdom, notoriously warm and damp for its position in latitude. This is due mainly to the prevalence of westerly winds. These winds, again, are part of cyclonic systems principally engendered off the coasts of eastern North America and Newfoundland, where hot and cold sea currents, impinging on one another, give rise to great variations of temperature and movements of the atmosphere which start cyclonic systems traveling eastward.

The center of the majority of these systems passes north of Great Britain. Hence the warm and damp parts of them strike the country with westerly winds which have also pushed the warm water left by the dying-out current of the Gulf Stream off Newfoundland across the Atlantic, and raise the temperature of the sea off Britain.

When the cyclonic systems pass south of England, as they occasionally do, cold northeast and north winds are the result, chilling the country despite the warm water surrounding the islands.

It requires only a rearrangement of the direction of the main Atlantic currents wholly to change the cli-