Correspondence.

Railway Fatalities.

To the Editor of the SCIENTIFIC AMERICAN:

I beg to call your attention to a serious mistake in the editorial appearing in your issue of Saturday, May 28, entitled "Increasing Railroad Fatalities." In this editorial you locate an accident in which there were 65 fatalities, caused by the train striking some heavy timber which had broken loose from a lumber car on the adjoining track, on the Pennsylvania Railroad. It it well known to the readers of the current news of the day that this accident occurred on the Baltimore & Ohio Railroad, and I think it is due to the Pennsylvania Railroad Company that a statement correcting this inaccuracy should be made. From the well-known reputation of the SCIENTIFIC AMERICAN for accuracy in all things, this misstatement is peculiarly regretful. GEORGE W. BOYD,

General Passenger Agent, Pennsylvania Railroad.

Philadelphia, June 9, 1904.

[The Editor takes pleasure in giving publicity to the literal facts as stated in the above letter. In crediting the disaster to the Pennsylvania system he was governed, no doubt, by the impression common to the "readers of the current news of the day," that the Baltimore & Ohio road is an affiliated road of the Pennsylvania system.—ED.]

The Application of the Water-Plane Principle to High-Speed Water Craft.

To the Editor of the SCIENTIFIC AMERICAN:

The idea of applying the water-plane principle in constructing a practical craft, which would make a radical increase in speed over the heretofore best models, has for many years been in my mind, and I see no logical argument which would negative the conclusion which I have come to, namely, that an arrangement constructed on this principle, and having sufficient power (not necessarily prohibitive), would free itself from its greatest resisting factor—the water—by riding *on* it instead of plowing *through* it. A flat stone when shied across a pond, on the surface of the water, remains *on* the surface, for it cannot sink, owing to the reaction on its under side, caused by its forward movement. The ordinary boat or water craft sinks a certain amount, and this fact is the cause of its having, consequently, to plow *through*, instead of glide *over*, the water. Is not this argument manifestly logical?

A practical water-plane craft, in my mind, would have great beam in proportion to its length; tapering bow, having a small angle with the horizontal; and be perfectly flat-bottomed, with the exception of necessary fin keels to prevent leeway and facilitate steering. The exact form of such a craft would be, of course, determined by experiment; also the nature and mode of propulsion could be a matter of trial; but I see no reason why a craft constructed with this idea in mind should not surpass any formerly devised marine contrivance in speed.

If such an arrangement, with dimensions of, say, 50 feet length and 30 feet beam, was supplied with power sufficient to drive a boat of equal displacement (whatever that might be) at, say, 25 or 30 knots per hour, I claim that it would run out on top of the surface of the water, and make, to say the least, a decidedly increased speed over and above any heretofore constructed apparatus designed for high speed on water.

The initial power and speed might have to be great; but I can see no reason why such an arrangement should not prove entirely practicable. Once out of the water, the craft would be free from its greatest hindrance to high speed and would be capable of being driven at a hitherto undreamed-of rate—*over the surface of, not through, the water.*

Any one can see the advantages of such a craft, assuming my claims are true, without my enumerating them. I wonder at the fact that this principle has not been given attention in applying it as I have suggested.

ARTHUR E. HAGARTY.

[Some experiments along this line have recently been made in France, in which a 19½-foot long by 9¾-foot broad flat-bottomed boat, fitted on its bottom with adjustable transverse hydroplanes, attained a speed of 17½ miles an hour when driven by a 14-horse-power de Dion motor. An ordinary launch of this size and power will only go 8 or 9 miles an hour. We hope in the near future to illustrate this new type of boat and give further details.—ED.]

Submarine Boat "Protector" Sent to Japan.

Confirmation of the report that the Norwegian steamship "Fortuna," carrying the submarine boat "Protector," of Bridgeport, Ct., was on her way to Japan was brought to New York by Capt. Dannemann, of the North German Lloyd steamer "Prinzess Irene." His vessel, which came from Mediterranean ports, passed the "Fortuna," on whose deck was the "Protector." Capt. Dannemann recognized the "Protector" from descriptions of her which he had read recently and cuts which he had seen in the SCIENTIFIC AMERICAN.

"The 'Fortuna' is apparently bound for the Suez Canal," said Capt. Dannemann. "We came from Gibraltar, and the 'Fortuna' was going in an opposite direction. She was so close to us that we could read her name without the aid of a glass, and the submarine on her deck was plainly visible."

High-Speed Steam-Locomotive Tests in Germany.

In the several reports during the past two years describing the conditions and results of the elaborate experiments in high-speed electrical traction which have been conducted on a section of carefully prepared track between Marienfelde and Zossen, near Berlin, repeated reference has been made to the fact that an equally thorough and interesting series of tests would in due course be made with several specially constructed steam locomotives, in order to secure a basis for conclusive comparisons between the two forms of power for high-speed traffic over long distances. The question to be decided by these deliberate and carefully prepared trials was whether, with the existing conditions of climate, distances between large cities, grades, curves, and the present standard of track and bridge construction in Germany, the speed of express passenger trains could be safely and economically increased to 70 or 80 miles per hour, and, if so, whether steam or electricity would prove preferable as a motive power. Would the German "Blitzzug" of the future be hauled by an electric motor or a steam engine so enlarged and improved as to meet the highest requirements of modern railway practice?

The electric motor trials were completed, as will be remembered, during the autumn of last year, with the net result that the two motor cars obtained speeds of 117.32 miles per hour—or nearly 2 miles per minute—without injury to the car or motor, without undue strain upon the track or discomfort to passengers. This upon a straight, nearly level track 14.5 miles long, and of the heaviest and most solid and careful construction, with inside guard rails to minimize the effect of lateral motion at high velocities. But as the railways of Germany involve all the usual variations of grade and frequent curves of a radius as low as 520 yards, any such pace as 117 miles an hour was and must long remain outside the limits of actual practice. It remained for the new locomotives to demonstrate the efficiency of steam up to 80 or 85 miles an hour, the apparent limit of speed development under existing conditions.

The track having been carefully examined and the deteriorating effects of the electric-motor-car trials noted and repaired, the experiments with steam locomotives began about the end of February and were continued until a few days ago. The tests included engines of four different types, each built by a different German firm, or company. In order to make the conditions as nearly as possible those of actual service, the load consisted of six vestibule cars, weighing about 30 tons each, one of which had been equipped with instruments to measure and record speed, oscillation, and the pull exerted by the engine at each part of the run. Each engine was first tested with the full train, then half of it was detached, and another series of trials made with three cars only. This latter series was in compliance with a scheme by which it was proposed to divide the fast long-distance passenger-train service into units of three cars each, capable of carrying 100 passengers with all facilities for their comfort by day or night.

The first trials were those of a locomotive built by the Egestorf Machinery Company, at Hanover. It is of the same general model as the "Atlantic" type in the United States—that is, carried on ten wheels, viz., the four-wheeled forward truck, then the two pairs of coupled drivers, and a pair of trail wheels under the cab to sustain the after portion of the boiler, which is of extraordinary size and large heating surface. This machine, with a train of six cars, attained an average speed of 111 kilometers (68.97 miles) per hour throughout the run, and with three cars a pace of 79.41 miles an hour.

The second machine of Grafenstadt construction is a compound locomotive, likewise of the Atlantic type, in which the cylinders are placed far back and the piston head geared by a short connecting rod to the crank pin of the rear driving wheel. This engine made with the full train a run of 118 kilometers (73.32 miles) and with three cars 76.42 miles an hour, and showed good results as to fuel and steam consumption.

The third contesting machine was an eight-wheeled compound engine equipped with Schmidt's device for superheating steam. It was designed by Baurath Garbe and built by A. Borsig. This engine was not built specially for these trials, but is one of a number of the same type which have been constructed and supplied for service to the royal Prussian railway administration. The driving wheels are 78 inches in diameter; heating surface, 963 square feet; surface of superheater, 288 square feet; normal working pressure, 12 atmospheres (176.4 pounds) to the inch; and weight, when ready for service, 120,051 pounds avoirdupois. This engine attained with the full train 128 kilometers (79.53 miles) and with three cars a speed of 84.5 miles an hour, the energy developed being about 2,000 horse-power.

The fourth competitor was an engine of a wholly original type, designed by Chief Engineer Wittfeld, of the Prussian railway administration, and built by Messrs. Henschel & Sons, of Cassel. The engine has been described in these columns. Before being brought to Berlin it was tested on one of the State lines near Göttingen, and since the trials were finished it has been dismantled and shipped for exhibition at the World's Fair in St. Louis. Its most striking peculiarities are that it is so built that the engineer stands in front within a glazed cab like the motorman of an electric car, and both engine and tender are covered with a sheathing of sheet iron with glazed windows and so arranged as to provide a covered passage from front to rear. The engine is carried on twelve wheels, viz., a four-wheel bogie in front and rear and between them the two pairs of drivers, coupled in the usual manner. This arrangement is for the purpose of securing steadiness of motion despite curves or irregularities of track surface. The engine is of the compound type, the high-pressure cylinder being located midway between the side frames, where its piston connects with an inside crank on the forward driving shaft. The low-pressure cylinders, of which there are two of equal diameter, are external and drive two outside cranks set parallel to each other and on the same side of the axle 90 deg. from the inside crank that connects with the high-pressure cylinder. This secures an even balance between the reciprocating parts, from which important results have been expected. The boiler is, from the European standpoint, enormous, having 2,766 square feet of heating surface, and it is calculated that, with a coal consumption of 2.5 pounds per horse-power, it will develop about 1,775 horse-power. It weighs 76.8 tons and cost $23,800. The tender weighs 47 tons and carries 7 tons of coal and 4,400 gallons of water, which it is equipped to take up at speed, as is done on some lines in the United States. At the recent tests this engine slightly surpassed all its competitors, attaining a speed of 128 kilometers (79.53 miles) per hour with six cars and 85.12 miles with half that number. While, therefore, its speed with the full train was the same as that of the Borsig superheater, the Cassel machine did 1 kilometer (0.62 mile) better with the light load, a difference so slight that it might easily have been influenced by varying conditions of wind.

This in substance is what is now publicly known concerning the results of these most interesting trials. The comparative advantages of all the contesting engines—their relative consumptions of fuel and steam, their general efficiency at high velocities, and their smoothness of movement on curves of different radius—will be known only to the government experts until the whole mass of notes and records made during the experiments and subsequently on other portions of the line shall have been formulated and published.

Among the incidental demonstrations made by the tests was the fact that with the pneumatic brakes now in use on German vestibule cars it required a full minute and a distance of 1,093 yards to stop a train of six cars running at 85 miles an hour. German first-class trains are equipped for a maximum speed of 85 kilometers (52.8 miles) an hour, and their brakes are capable of stopping a train running at that speed on level track within a distance of about 433 yards. If, therefore, any approach to the higher speeds which will be made possible by these new types of locomotives should be adopted, the change will involve important modifications in brakes and signal systems, which are based on present limitations of speed and braking power.

Pending the preparation and issue of the official report on which the ultimate conclusions will be based, a Berlin engineer, Dr. Reichel, has given some interesting comparisons of cost between steam and electric traction from the standpoint of German practice and illustrated by the recent experiments with both motive forces. A steam train of five cars and a standard locomotive weighs 330 tons, seats 168 passengers, and uses at full speed 1,400 horse-power. The electric train of one motor car and four trail cars weighs 260 tons, seats 180 passengers, and utilizes 1,000 horse-power. Each train and engine costs for initial construction about $100,000. The operating cost of the steam train is fixed by Dr. Reichel at 12½ cents per 100 seat kilometers, and 11½ cents, or 1 cent cheaper, for the electric train. FRANK H. MASON.

It is reported that a test well on the island of Tcheleken has encountered oil at a depth of 1,067 feet, showing the existence of a new oil-bearing stratum below that now exploited. When first struck the oil spouted to a height of 200 feet, and contained no water.