Correspondence.

Theatre Isolation.

To the Editor of the Scientific American:

In the various communications that have appeared both in the columns of your valued paper and in other technical journals regarding the terrible loss of life in the Iroquois fire, sufficient stress has not been laid upon the subject of theatre isolation. If theatres were constructed as detached buildings, the fear of panic would be reduced to a minimum. Every theatre should be built entirely isolated, and also it should be used for no other purpose; as often built we find stores and offices occupying the front part of the theatre where a fire might gain considerable headway before it was noticed, and where the audience would have to escape by passing the flames. If separated by a distance of, say, thirty feet from all other buildings and surrounded on three sides by outside galleries or balconies at least seven feet wide, projecting from the face of the wall and supported on cantilevers, a place of refuge would be afforded the audience in case of fire, and the audience would gain a feeling of safety which would greatly reduce the danger of panic. There should be broad windows, glazed with common glass, opening on the different galleries, which would make them readily accessible at all times; windows would be preferable to doors, as the glass could readily be broken, even if the windows were locked. The government, in the case of its post-offices, enforces a rule to the effect that a space of forty feet must intervene between its buildings and the nearest adjoining structure. Our municipalities should certainly be able to enforce a similar regulation, and it would certainly greatly reduce the danger from panics. Many of our cities rule that a certain specified space must separate theatres from other buildings, but the trouble is often that they are not enforced. We make good rules, but the enforcement of them is too often neglected. Violations of theatre ordinances would be very infrequent, instead of the reverse as at present, if a heavy penalty were inflicted. An ordinance without a penalty is almost useless, as experience proves that the theatre managers and building inspectors will become careless as long as the general public do not care whether the rules are enforced or not. John A. Walls.

Los Angeles, Cal.

Boiler Scale.

To the Editor of the Scientific American:

I was surprised to see in the last issue of your paper an article on "Boiler Scale Detection" in which the statement was made that "The reason for the presence of boiler scale has never been explained satisfactorily, although a great deal of time has been spent by scientific men in an endeavor to solve not only the mystery of its origin, but to arrive at some means of preventing the deposit."

Allow me to say that I think this is very inaccurate; since the presence of scale *has* been satisfactorily explained, its origin is *not* a mystery and there *are* adequate means of preventing the deposit.

The explanation of the presence of boiler scale is very simple and familiar to almost every chemist. In the first place, nearly all natural waters contain among other things, a certain quantity of salts dissolved in them, the amounts of these constituents varying in different waters. For instance, water is said to be "hard" when it contains an excess of calcium or magnesium carbonate dissolved in it in the form of bicarbonate. Likewise calcium sulphate (gypsum) is found in nearly all water. These substances of course all come from the erosion of the rocks and minerals with which the water comes in contact. But the problem is not so much how they come into the water as how to dispose of them after they are there. It has been found by chemical analysis that Croton water, which is fairly pure, contains the carbonates of calcium and magnesium to the extent of about 4 grains per gallon and over 1-10 of a grain of calcium sulphate. While these figures seem insignificant at first, when we consider that there are 58,318 grains in a gallon, it must be remembered that millions of gallons of water are used in a boiler. Assume, for example, that a million gallons are used; the 4 grains becomes 4,000,000 grains (150 pounds avoirdupois) and the 1-10 grain becomes 100,000, or 14¼ pounds.

The principal constituent of boiler incrustations is gypsum, which upon the evaporation of the water holding it in solution, deposits upon the sides and in the tubes of the boiler as a refractory, largely insoluble, and intensely adherent coating. This by contact with the red-hot iron of the boiler becomes baked as hard as stone and acts as an insulator to the inside of the boiler, preventing the heat from reaching the water. Hence it is necessary to make a hotter fire, thereby wasting fuel and injuring the boiler, which was not constructed to stand this treatment and which will blister or flake off as oxide of iron.

There are several ways to prevent the formation of boiler incrustations, the best being the use of distilled water with the employment of a condenser. This plan has been adopted on board large steamships and has not only the advantage that no crust forms, but is economical, since the same water may be used successively for an indefinite period. If, however, distilled water is objected to as too expensive, there are several makeshifts of considerable practical utility. For example, a preparation of barium chloride, ammonium chloride and logwood sawdust will prevent cake from forming on the inside of boilers. The reason for this is that the barium chloride reacts with calcium carbonate and sulphate to form barium carbonate and barium sulphate, which are not adherent and readily settle round the sawdust as a nucleus. The ammonium chloride prevents the precipitation of the magnesium as a carbonate. Perhaps the most important step in connection with the use of this crust preventive is the drawing off of the water after using the boiler for a time and thus removing the accumulated precipitate contained in it. If these precautions be observed, there is really no reason why any large quantity of caked gypsum or other deposit should form upon a boiler.

I hope that you will not allow the erroneous impression to remain, that boiler scale is a necessary evil, foreordained by the gods as the everlasting companion of all boilers, good, bad or indifferent.

Dudley H. Morris.

[Our contributor's statement of the difficulty of ascertaining the origin of boiler scale should not be taken too literally. The article alluded to concerned itself chiefly with the detection of boiler scale and described an ingenious instrument for measuring the actual amount of such incrustation.—Ed.]

The Carrier Pigeon for Newspaper Service.

To the Editor of the Scientific American:

In a recent number of the Scientific American I note the record you give the reporter of the Newark Times for pigeon service from the yacht races. Now, with the exception of the developing of the picture on the press boat, the record made by the Times has been beaten several times by my old paper, the Milwaukee Journal.

The Journal was the first western paper to use carrier pigeons, and it has made excellent use of them in reporting steamer excursions, State and county fairs, athletic contests, and other events within a radius of seventy miles of the office. The best time record was made at the State fair of 1901. At that fair, as well as at three others, I had charge of the reporting work, and dispatched five to seven columns of copy a day by bird. At that fair, at 2 o'clock in the afternoon, the dog show judge awarded the first prize in the terrier class, and Mr. W. W. Rowland of the staff obtained a mounted photograph of the winner a few minutes afterward. We stripped it from the mount, rolled it in a carrying cylinder, and dispatched a bird with the print and the news of the event. It left the fair ground at 2:20 P. M., and flew the seven miles to the coop at the office. The print was detached and sent to the cut shop, and at 4 P. M. the paper with the news and the cut was on the street. We sent plain news, machine set, so as to have it on the street thirty minutes after being dispatched.

We frequently had news dispatched from thirty miles away on the street in ninety minutes. The best long-distance record was made in October, 1900, when we took a large number of birds to Chicago to report a steamer excursion. This event will be remembered by many of your readers, as it was the annual excursion of the National Wholesale Druggists' and Proprietary associations. We left Chicago at 9 A. M., and dispatched birds every hour from twenty miles off-shore, the first from off Fort Sheridan, the last about two miles off the Milwaukee harbor piers. When the steamer landed at the dock in Milwaukee, about an hour afterward, the newsboys were on the dock with the paper containing the complete record of the trip.

We made many other good records with the birds, beating the telegraph or telephone on the amount of copy used. Charles W. Lamb.

Menasha, Wis.

The Meaning of the Word "Torque."

The word "torque" is so frequently used nowadays, that it may not be out of place to give here a brief explanation of its meaning. To those who are familiar with electric motors the term is clear enough, but to many amateurs it may not be without interest to know just what the word means. The best explanation which we have seen is the following from Railway and Locomotive Engineering:

The word "torque" comes from a Latin word meaning to twist, and it may be defined as the twisting or turning effort imparted to a shaft carrying the revolving armature of an electric motor. The torque of a motor such as is used to drive a street car or to run a machine tool in a railway repair shop may be found by experiment. A lever tightly clamped to the shaft is of such length that its free end may be supported upon the platform of weigh scales, exactly one foot from the center of the shaft. As soon as the current is turned on, the end of this one-foot lever resting on the scales will press down a certain amount and register what is equivalent to a weight. For the sake of example, suppose the scale registered 4,000 pounds under the circumstances. The torque of this motor would therefore be 4,000 foot-pounds because the pressure exerted by the lever had been measured one foot from the center of the shaft. Continuing the experiment, let us suppose that the lever has been removed and that a pulley has been keyed on the end of the shaft in its place, and further suppose the radius of this pulley to be 12 inches, and that it carries a belt which gives rotation to some other pulley. The torque of the motor remaining the same with given current it follows that the pull on the belt, like the weight registered on the weigh scales, will be 4,000 pounds. Torque is, however, always expressed as foot-pounds. The pulley we have been considering had a radius of 12 inches, or in other words, its diameter was 2 feet. Now, if a pulley 4 feet in diameter was to replace the smaller one, we would have this new condition. The torque being constant with constant current, the pull on the belt would now be 2,000 pounds.

As the torque is found by multiplying the radius of the pulley in feet by the belt pull in pounds, it rests with the designer to make the pulley or car wheel, as the case may be, the size best suited to the work to be done. Torque is practically equivalent to the tractive effort of the motor if mounted on wheels 2 feet in diameter.

When the speed of the motor is considered, the horse power may be determined. As the motor revolves a certain number of times in a minute it follows that a definite number of foot-pounds of work must be delivered in that time. If the speed be such that the belt pull would be equivalent to the raising of 33,000 pounds one foot high in a minute, the motor would, under those circumstances, be developing 1 horse power.

Improved Car Fender.

During the fifteen years that the electric street railways of the country have been increasing in size and number there have been many attempts to produce a car fender the front edge of which would always remain close to the track under all conditions of load. Particularly is this true when the added requirements of effectiveness, cheapness, durability, and simplicity had to be met. So great has been the dissatisfaction in regard to fenders that one writer proposed the doing away with the single-truck cars and proposed the use of the large double-truck cars, which, it was thought, would hold the fender in a much better position; but this conception was probably caused by the fact that the large double-truck car bodies move up and down much more slowly than car bodies on single trucks, so that the motion is not so noticeable. The fact is that both the large or double-truck cars and the small or single-truck cars need a self-adjusting device so as to keep the fender in a proper position however the car body may rock or be tipped by an uneven load.

Alexander Otis Lamson, of Bridgeport, Conn., has recently received a patent on such a fender. The adjusting mechanism is located between the car body and front and rear journal boxes and is so proportioned that when the car body is tilted endwise the fender automatically adjusts itself to meet an increase or decrease in the load at either or both ends of the car. As there is but little motion to the mechanism the durability is correspondingly great. Each end of the front edge of the fender may be automatically adjusted by separate devices on each side of the car so as to keep it level and at a fixed height when the car is tipped sidewise, provided the fender be flexible.

Two New Japanese Battleships.

The Japanese government has placed contracts for the construction of two battleships with the English shipbuilding firms Vickers, Sons & Maxim and Sir W. C. Armstrong, Whitworth & Co., respectively, to be built and completed for war service. These vessels when completed will be the most powerful fighting ships extant. They will have a displacement of 16,400 tons, and steam about 19 knots. Their main armament will comprise four 12-inch guns in the two main barbettes, and they will have heavier secondary guns than have ever been adopted before in warships. The machine guns will also be more numerous. From the main artillery each vessel will be able to discharge eleven tons of projectiles per minute. The system of armor distribution will follow the lines introduced in the previous ship built for Japan at Barrow, the "Mikasa," the whole broadside of the citadel being armor-clad. Each vessel will cost about $6,250,000 and is to be ready for service within eighteen months, the shortest period that has ever been allowed for the construction of a war vessel of such dimensions.