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NEW YORK, SATURDAY, MAY 31, 1902.

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

FIREPROOF MAIL CARS

The Editor has received from a California correspondent a clipping from a recent Washington, D. C., paper, which states the Post Office Department has been informed that in a recent railroad wreck in Arizona, the entire mail, which came from southern and central Californian points, was destroyed. Our correspondent reminds us that on several occasions in recent years the heavy overland mail from the Pacific Coast on its way eastward was entirely destroyed by fire. He asks whether we are not very much behind the times in the matter of the safe transportation of the United States mail, and whether the postal cars, on the overland routes at least, should not be made of steel, or constructed by some method that will be fire and collision-proof.

We think that the point is well made, and that the postal authorities would be justified in offering inducements to the various railroads, and particularly to the transcontinental systems, to improve on the present mail cars along the lines suggested by our correspondent. Such an inducement might reasonably take the form of a slightly higher mail subsidy where such cars are used. As to what form of car would afford the most complete protection against injury by collision and subsequent fire, we have little doubt that an all-steel construction would be better than an attempt to secure fire protection by the use of any so-called fireproofed wood. A mail car with the floor and framing built up of channel-iron and angles, and with sides and roof of sheet steel, would not only be proof against absolute loss by collision, but would of course be completely fireproof. If practical evidence be needed upon this point, we have but to refer to the many photographs which have been published in the last few years showing the extraordinary resisting qualities of pressed-steel cars, when they are subjected to the terrific impacts of colliding freight trains. They retain their general form, and frequently come out of such collisions practically uninjured, while the wooden cars adjoining them have been smashed into the proverbial kindling wood. The effects of collision upon the cars of a passenger train are, of course, nothing like as heavy as those in a freight train weighing three or four times as much; and we venture to say that all-steel mail cars would pass through a collision and preserve their contents practically intact. We commend the suggestion of our western correspondent to the serious consideration of the postal authorities.

EARLY USE OF THE WATER-TUBE LOCOMOTIVE BOILER.

The increased attention that is just now being directed to the water-tube boiler for locomotive service is a significant fact in the development of locomotive engineering. We recently illustrated in the SCIENTIFIC AMERICAN a very successful type, which is now in service on the Southwestern Railway, England; and we have reason to believe that before long there will be other attempts, both in this country and in England, to secure in locomotive service the superior advantages which the water-tube boiler has shown itself to possess for certain classes of work at sea and in stationary practice. Those of our readers who believe that the water-tube boiler locomotive is an entirely modern improvement, will be surprised to know that in the early days of steam railroads and, indeed, only a little less than a half a century ago, the Dimpfel locomotive was built with a boiler which was strictly of the water-tube type, and that this boiler gave most excellent results both in firing and steaming. The boiler contained a square firebox and a single, horizontal flue. A large number of small-diameter iron tubes led down through the crown sheet of the firebox, and were curved around to pass horizontally through the flue. The engine steamed remarkably well, the circulation being very thorough; moreover, the combustion was more perfect than with many modern fire-tube boilers, the large amount of air space between the flues allowing a perfect combustion of the gases. Although its firing and steaming qualities were so good, the boiler was not a practical one, for the reason that to get out a defective tube that might be in the center of the nest, it was necessary to tear the whole system of tubes to pieces.

In a later attempt to design a water-tube locomotive boiler in this country, the main central flue through the barrel was made hexagonal in cross section, and the tubes ran athwart the flue between opposite faces. This also proved to be an excellent steamer, but like its predecessor, was exceedingly troublesome in repairs, it being necessary, if a defective tube had to be repaired, either to remove the main flue altogether, or drill through the outer shell of the boiler, remove the tube and plug up the hole. The invariably excellent results obtained with the water-tube system should stimulate engineers to give persistent attention to this problem until a thoroughly practical boiler of this type has been produced.

DANGERS OF PEDDLED ICE CREAM.

The ice cream season is at hand, and the street vendor is doing a thriving business among school children and street urchins. Few people realize what a menace to health is found in the sale of this delicacy. Medical authorities are beginning to realize that it is an important factor in the spread of disease. A number of cases have recently been observed in which symptoms of irritant poisoning and even death were the result of eating ice cream bought of street peddlers. A coroner's inquest held in London not long ago attributed the death of a six-year-old boy to unwholesome ice cream. The British Medical Journal in an article on this case recalls a bacteriological investigation of Dr. Klein's, in which some ice cream and the water used for rinsing the glasses containing it were found to be swarming with thousands of microorganisms. The article refers also to a recent case of poisoning in Antwerp, where twenty persons were made ill from the use of ice cream, and it goes on to describe the causes of the danger. Contamination of the cream arises from the habitual filthiness of the Italian vendors. The commonest and stalest materials are used in its manufacture, and at night it is usually stored under the merchant's bed in his dirty tenement lodgings. The next morning, no matter how far gone in decomposition the unsold cream may be, it is rehashed and frozen for the day's business. The public at large seems to have the impression that bacteria are destroyed by the freezing process. This is not, however, the case, for the activity of the bacteria is only temporarily retarded by the cold, and during the nightly respite they thrive vigorously. In addition to all this, every opportunity is afforded for transference of diseases between the customers, for the glasses and spoons are never washed, but are merely rinsed in water that accumulates the filth of the entire day.

THE EXPANSION OF OUR FOREIGN COMMERCE.

In the course of an address recently delivered by the Chief of the Bureau of Statistics, before the Manufacturers' Club of Philadelphia, Mr. Austin gave a very luminous explanation of the causes and extent of the expansion of our foreign trade, an expansion which in suddenness and magnitude has never been approached in the history of any other country. This phenomenal growth is the natural consequence of the rapid expansion of production which followed the great development in railway construction in the closing quarter of the nineteenth century. Following the construction of the transcontinental line which was completed in 1869, came the extension of other lines through the great Mississippi Valley and the South, and this resulted in the opening of the great agricultural, forest and mineral areas, whose natural supplies have made this the greatest producing country of the world; while the multiplication of railways facilitated the assembling of these natural products for use in manufacturing. As a result, agricultural production has doubled, while the output of coal, pig iron, and particularly of steel, has increased many fold. The result of all this is that the United States has become the greatest exporting nation in the world, having risen from fourth place in 1870 to first place in 1901. The value of our exports during that time has practically quadrupled, while imports have scarcely doubled.

The causes of this wonderful development in exports, in Mr. Austin's opinion, are to be found in the fact that the United States is the world's largest producer of the great articles required by man for his daily life, viz., food, clothing, heat, light, and manufactures. The principal articles of food are breadstuffs and meat, and of wheat and meat the United States produces more than any other country, while we raise more corn than all other countries combined. For clothing the article of largest requirement is cotton, and of this the United States produces more than three-fourths of the world's supply. For heat, coal is the greatest requirement, and of this the United States is now the world's largest producer, and our supply exceeds that of any other country; while for light our production of petroleum furnishes a larger quantity of refined illuminating oil than that of any other nation. Our manufactures also are nearly double those of the United Kingdom, and nearly equal to those of France, Germany and Russia combined.

This commanding position in the world's commerce is, in Mr. Austin's opinion, likely to be retained by the United States. The power of production shows no signs of abatement, while we may reasonably expect that the development of science and invention and the application of American energy will still further reduce the cost of production and transportation. This high standing of the United States as an exporting nation will, Mr. Austin said, be welcomed by the commercial world rather than antagonized, as has been intimated and feared in certain quarters. The world buys the products of our fields and factories because it requires them for daily use, and because it can obtain them more readily and cheaply from the United States than from any other part of the world. Suggestions of the exclusion of American products of the field or factory seem scarcely likely, in Mr. Austin's opinion, to be realized. The effect of the refusal of Europe to purchase from the United States any of the great articles of which we furnish so large a proportion of the world's supply would be to cause an advance in the price of those articles in other parts of the world. The United States supplies one-fifth of the wheat entering into international commerce, three-fourths of the cotton, and practically all of the corn; while our proportion in the meat supplies of Europe is also large. To thus eliminate our production from the world's supply of these great articles of daily requirement would be to cause an advance in the prices of the limited supplies which could be obtained from other parts of the world. Hence, in these natural products, it may be expected that the demand will continue indefinitely, while the fact that the United States in 1901 sold to Europe alone more manufactures than she had ever sold to the entire world in any year prior to 1895 shows the progress that American manufacturers are making in Europe, the great manufacturing center of the world.

THE IMPERFECT DEFINITION OF THE PHOTOGRAPHIC IMAGE ON DRY PLATES.

Messrs. Lumiere and Perrigot have been studying the question of obtaining the maximum degree of sharpness in photographic images. When examined by the microscope, the optical image given by a good objective is found to be incomparably sharper than that of the negative which is obtained under the same conditions. In fact the photographic plate registers an image which seems sufficiently sharp when viewed by the eye alone, but cannot support an enlargement by the microscope. In examining the causes of this lack of sharpness, the experimenters were led to find a method for obtaining negatives under the best conditions. One of the principal causes is the influence of grain in the sensitive film. It is well known that the bromide of silver in the emulsion is in the form of small grains whose dimension varies with the sensitiveness of the emulsion. They made a series of exposures using plates which were prepared by a series of emulsions of very different sensitiveness from the extra-rapid, corresponding to the grains of silver bromide of the maximum dimensions, to the limit of slowness, which is found in the special emulsion used in the Lippmann process of color photography and in which no grains are visible under the microscope, even with the greatest magnifying power. They thus find that it is the granulation of the sensitive layer which is the main cause of the want of precision in the images; the particles of bromide diffuse the light which falls upon them, spreading out the image and diminishing its sharpness in greater proportion as the particles are larger.

Another cause lies in the errors of focusing, even though these may be small. In an ordinary apparatus only an approximate focus is obtained. The use of a simple hand-glass to examine the image, the non-coincidence of the ground glass and the plate, also the want of flatness in the latter are causes which influence the focus. The experimenters fix the limit of movement for obtaining a clear image, and find it to be 1-100th of an inch. The influence of chromatic aberration may be found in the case of inferior objectives which have not been sufficiently corrected, but for the best lenses this is practically nil. Another cause lies in the use of the diaphragm. While in astronomical work and for the opposite extreme, microscopical work, it is desired to increase the opening of the objective, in photography, on the contrary, it is generally admitted that greater precision is obtained by the use of the diaphragm. The experimenters show that this is not always the case. The