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NEW YORK, SATURDAY, JANUARY 9, 1904.

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.

A CALL FOR STRONGER PASSENGER CARS.

The Pullman Company recently made the very significant statement that, during the year ending September 1, 1903, not a single passenger was killed or injured on a Pullman car in the State of New York. They also announced that although in the past three years the company had carried in all parts of the United States a total of 32,639,341 passengers, only six persons were killed (in two disastrous wrecks) and only four persons were seriously injured.

Compare these figures with the official statistics of railroad accidents in any given year, say for the year 1902, when 345 passengers were killed and 6,683 were injured. Of the thirty-two and a half million passengers that were carried in the three years in Pullman cars, only one in every three and a quarter million was killed or injured; but of the 640,000,000 passengers carried during the year 1902 in ordinary cars, over 7,000 passengers, or about one in every 92,000, were killed or injured. In other words, of two passengers who board a train together, he who enters a Pullman car has thirty-six chances of reaching the end of his journey in safety against one chance of his fellow passenger who enters an ordinary day coach.

Those of us who read between the lines in the accounts of railroad disasters, that appear with such shocking frequency in the columns of the morning papers, will not be at all surprised at these figures. The story of the smash-up, if it be a collision, may vary in details; but the general features will have a marked similarity. Thus the mail clerks will be killed outright, and the occupants of the smoker and first day coach, which in all probability will telescope into each other, will divide up the list of casualties pretty evenly between killed and injured; unless, indeed, a broken steam pipe is accountable for the parboiling of the whole mass of unfortunates; while incidentally the account will mention that the Pullman cars, after expending their momentum in crushing up the lighter first-class coaches, smokers, baggage cars, etc., came to rest, without any serious injury, and more often than not without even leaving the rails. Should they leave the rails and roll down an embankment, the passengers are pretty sure to escape with the conventional "bad shaking up."

Now, what do these results teach us? Just this—that if we cannot make railway travel safe by installing the very best signal systems, and by the careful selection of enginemen and train hands, switchmen, and operators; if we must forever go on having railway smashes, we can at least save the limb and the life of the passenger by building cars on the lines of the Pullman and rendering them practically accident-proof.

The strength of the Pullman car lies in its very massive underframe, the heavy steel angles and plating that are worked into the vestibule ends, and the massive vertical vestibule frames, which prevent the platforms from riding one upon another and shearing their way through the structure of the adjoining car. There is no question that it would be possible greatly to increase the safety of ordinary passenger travel, by constructing all railroad cars on the vestibule principle and building into the platforms that steel framing, which is largely answerable for the immunity from destruction in bad railroad wrecks of the present Pullman car. The railroad companies will naturally raise the objection that to give to all cars the strength of Pullman construction would so greatly increase the weight of trains, that the engines would be unable to cope with the service. But it is a fact that the strength and indestructibility of the Pullman car could be imparted to the ordinary first-class coach without any serious increase in the weight of the latter. The Pullman car is loaded down with a lot of unnecessary weight both in its structure and in its embellishments, which could be got rid of in the proposed type of car. A considerable saving of weight might be made by building the underframe, the sides below the sills, the platforms, and the vestibules, entirely of steel. This, indeed, has been done by the Illinois Central Railroad, to which too great credit cannot be given for the advance that has been made in its new steel passenger cars.

The steel passenger car is not by any means a novelty. In fact, between thirty and forty years ago, one of this type was constructed in this country and formed the subject of illustration in the columns of the SCIENTIFIC AMERICAN, while in Europe not only are the underframes of all cars built of steel, but there is a large number of freight cars of various types of metal construction that have proved their durable qualities by nearly half a century of service. In a railway collision it is always the weakest element that gives way. When telescoping occurs, it is the oldest car that is sliced in half by the platform of the adjoining car. With trains built entirely of steel cars, or cars with steel underframes, the injuries of a collision would be confined very largely to bruises and some broken limbs, due to the passengers being hurled violently forward under their own momentum. But the horrible dismemberment, the wholesale crushing out of life, now due to the telescoping of cars, would be of very rare occurrence. Indeed, with steel cars it is questionable whether telescoping would extend, even in the most severe collisions, much beyond the first eight or ten feet in the car.

In view of the shameful slaughter that has lately been going on upon our railroads in a series of accidents that is nothing short of a national disgrace, it becomes the duty of legislation to stipulate that for all new passenger cars, a certain minimum standard strength and excellence of construction shall be specified. By the mandate of the government we have the automatic coupler and the train brake; the time has now come for the government to demand for every passenger on the railroad the same immunity from maiming and death as is shown by the Pullman Company, in their statement of only ten persons killed or wounded out of thirty-two and a half million passengers.

CAN THE THEATER FIRE BE PREVENTED?

The panic and horror of collision at sea, with the terrible roar of the engulfing water, is only exceeded by that most pitiful of calamities—the theater fire. The very idea of the house of mirth being turned into a holocaust must appeal most strongly to even the hardest heart. The painful accident at the Iroquois Theater, Chicago, on the afternoon of December 30, when over 600 people were killed and some hundreds injured, is so very recent in the minds of all that it is unnecessary to dwell on the harrowing incidents of that awful scene. Suffice it to say that the fire is the third worst on record, the Ring Theater in Vienna, where 875 lives were lost, being the worst. The Brooklyn Theater fire in 1876, when 297 persons lost their lives, was brought home closer to us than any other.

The question of theater fires has received exhaustive treatment abroad. Out of 516 theater fires of which we have record, 460 were burned in the hundred years 1777 to 1877. These figures would now be considerably increased. The average life of an American theater at this period was only eleven to thirteen years, but fireproof construction has certainly doubled the life of the structures. Strange to say, the danger is only doubled during the performances, owing to the great watchfulness displayed while the audience is in its seats. Mr. W. Paul Gerhard, C. E., writing in the SCIENTIFIC AMERICAN SUPPLEMENT, says:

"The lives of people in theaters, whether spectators, actors, musicians, chorus singers, ballet girls or stage hands, are, therefore, endangered:

"1. By smoke, fire gases, heat, asphyxia, exhaustion.

"2. By fire burns.

"3. By jams, knocking over, falling down stairs, trampling, crush.

"4. By direct shock or fright.

"5. By accidents, such as the falling of the central chandelier.

"The long list of theaters destroyed by fires breaking out during a performance, and the numerous instances of fires breaking out during these hours, but which are put out before spreading, are proof sufficient that the dangers spoken of are constantly threatening the theater-going public."

The third cause is quite as likely to result in death as the second, and seems wholly unnecessary if proper means are provided for a quick and orderly exit. Mr. Gerhard further says:

"If only plenty of exits are provided, so that, under all circumstances, the whole audience, even when frightened and suddenly thrown into a state of high mental excitement, can leave the building inside of two or three minutes, the fire-resisting qualities of the building are of less consequence, as regards the safety of the persons in the theater. In fact, a theater inferior in point of construction, but having exits as above described, would be safer than one built thoroughly fireproof, but otherwise not well arranged and not provided with sufficient stairs and exits, and where, therefore, in case of a false or real alarm of fire, or a panic from any cause, the people would be necessarily in grave peril."

In nearly all cities the regulation of the building of theaters is under the building department, but the fire department should have a voice as well. After construction, the theater is under the jurisdiction of the fire and police departments, who jointly look out for the safety of the public, the police at the front of the house and the firemen behind the curtain. We might give endless rules for the construction of safe playhouses, but our hand is stayed when we consider that apparently every safeguard known to modern science had been lavished on this theater, which had been opened less than five weeks. It is credibly stated that large sums had been spent to render the house immune from the very enemy which destroyed it. Still, the fact remains that one of the worst tragedies of modern times, involving a greater loss than the Spanish-American war, occurred in a "fireproof" building in broad daylight. Whatever may be the verdict which fixes responsibility, one thing is certain—the fire curtain must be so stiffened that no draught can belly it out so that it can bind or leave its groove. It must be arranged so that it can be tripped from the stage or the auditorium by purely mechanical means, very strongly and reliably constructed. The mechanism should be designed so that in case of any breakdown the curtain at once falls to the danger position. Possibly a steel girder spanning the proscenium and working vertically in well-oiled metal channels would be sufficient to carry a reinforced curtain, whose edges are anchored to the channels at regular intervals by steel guides. The fireproof wall should be extended up to meet the girder at the stage. Possibly two curtains would minimize the danger. Wood should be excluded absolutely from the stage, except where required by the scenery, and then it should be fireproofed. It is imperative that fireproof paint be used, and that all gauzes and scenes (drop and borders) be impregnated with chemicals. Asbestos can be freely used in properties, and wire rope should be substituted for ordinary ropes wherever possible. Accumulations of scenery should be avoided, and dressing rooms and all workshops and paint shops should be located in adjacent buildings connected by one fire door. The most modern fire appliances, such as sprinklers, should be provided; and lastly the inspection should be eternal. Even then, would there be any guarantee of immunity from loss of life by panic or fire? No; there is not; but we could at least feel that every human resource had been exhausted.

A NEW STUDY OF BIRD LIFE.

The myriads of migratory birds on their way south at this season of the year will be the subject of special scientific study on the part of the various ornithological societies and the experts of the Department of Agriculture. To the average person only indifferently interested in bird life there may seem little in the migration of the summer birds to furnish data for scientific deductions; but the modern student of our native birds sees in these annual flights material for reflection and observation of the greatest importance. The constant relationship existing between our agricultural crops and the migratory birds is a fact that has only in recent years been fully comprehended, and each season new data for study are collected by the expert observers. The problem of weed destruction is, for instance, intimately wrapped up in the migratory habits of the millions of our summer birds. Many of our most noxious garden and field weeds produce in a single season as many as one hundred thousand seeds, and in three seasons a single one of these plants would give birth to ten billion weeds.

There is only one effective agency that keeps in check these prolific weeds. When the seeds of the weeds ripen in the late summer and fall the millions of migratory birds begin their journey southward, devouring the weed seeds at the most critical stage of their lives. A few of the birds eat a number of seeds throughout the whole summer, but the vast majority eat them in the early autumn and early spring, a few staying North with us to pick up the seeds which fall on the ground when covered with snow. They gorge themselves with the weed seeds until their stomachs are distended to three times their normal size. All of our common song and plumage birds are great seed destroyers, and the blackbirds, meadow larks, sparrows, goldfinches, doves, quails, siskins, grosbeaks, and grass birds will eat all the way from one hundred to one thousand seeds of weeds at a single meal. They begin their annual campaign against the weed seeds in the far North as early as late August, and they move southward as the season advances and the seeds ripen in the lower part of the New England and Middle

States. Their migration is consequently due to a large extent to the maturing of the weed seeds, and they move southward only so fast as they devour their favorite seeds in each section. Fortunately, different species of birds choose different kinds of seeds as their favorite food, and very few weeds escape.

Thus the blackbirds make their first raid upon the seeds of the common smartweed or bindweed, and the field sparrows select the seeds of crab grass. Nuttall's sparrow shows a particular penchant for the seeds of the wild amaranth and lamb's-quarters. Tree sparrows are found most frequently hunting seeds of pigeon grass, while the obnoxious pigweed attracts the snowflakes and goldfinches. It is becoming evident to the students of birds that they are influenced almost solely in their migratory habits by the harvest of weed seeds, and not by the climate. We have always supposed that the birds started southward as soon as the chill of autumn approached, but cold, frosty weather might come in August, and the birds would not begin to migrate. They are not weather prophets at all, but simply hungry little creatures following in the footsteps of ripening seeds.

It is quite evident to bird students that many of our birds could be induced to stay North all winter if they could be supplied with an abundance of choice seeds. Some seasons they linger with us so late in the season that wonder is expressed by the casual observer, but the reason for it is that the seeds of some choice weeds have been late in ripening, or the birds have found an unexpected harvest of them in the vicinity. As a visible proof of this constant relationship existing between the migration of birds and the supply of food, it is only necessary to refer to the fact that more birds, and a greater variety, winter in our city parks than can be found in the cold, bleak woods or fields. It has been supposed that these birds have been induced to stay with us because of the greater or less protection they receive in the heart of a city from the cold weather; but the chief reason of their sojourn in the North through the winter is the greater abundance of food found in the city parks. In a thousand ways food is supplied to them in the parks which they could not get in the wild woods and fields. In most of our parks the visitors and school children feed the birds and squirrels, and in late years the department of parks has essayed to supply the winter birds with all the food they could eat. As a direct result of this policy the winter bird inhabitants of our city parks are steadily increasing.

In the new study of bird life, it is becoming evident to those most interested in the subject that it is possible to make our winter birds more numerous by simply feeding them and providing them with winter protection. Bird houses should be more generally constructed. These should be built for the purpose of sheltering the birds from cold snowstorms and wintry winds and rain. They should be built with the north and west side made wind and rain-proof, and the south and east sides with openings and wide verandas where the birds can sun themselves and dry their plumage after a rain. There should be an inner and outward compartment, where the birds can retire in very cold weather. The inner compartment should be supplied with plenty of soft cotton, hay, and woolen rags. To reach the inner compartment it should be necessary for the birds to pass through the first, and then down a long passage to a door which opens at the opposite end. In this way the bird house is made suitable for all weather. The walls of the inner compartment should be made double, with felt lining between them. Then in the coldest weather, our most sensitive birds can find ample protection from snow and wind. To introduce them to their new winter quarters, choice seeds and food should be scattered all through the house, and they will gradually follow this, and become enamored of their new home. The cost of constructing such a bird house for winter habitation need be very little. The outside architectural features will of course increase the expense to any sum one may wish to put in the house. With thousands of these built all over the country, our winter population of plumage, and even song birds, would rapidly increase.

There is one feature of bird migration which scientists have made special studies of in the last few years, and which is intimately associated with the food question. It was supposed formerly that migrating birds traveled very rapidly, some covering the distance between the Southern and Northern States in an incredibly short time. Some were even said to fly at the rate of fifty and sixty miles an hour, and to keep this up for eight and ten hours a day, as if anxious to get back to their winter or summer haunts. The very contrary has been found to be the case. The migration journey is a period of harvest-time joy and celebration for the birds, and they are happy and joyful throughout. It is a period of feasting, of gluttony, and oftentimes of song. The birds move slowly, if the food is abundant, lingering in one place for days and weeks where the harvest is particularly good. **Instead of traveling rapidly in their great migration,** they frequently, in the autumn of the year, move only at the rate of a few miles a day, and not infrequently only a few miles a week. They pass over barren and unproductive places with considerable swiftness, flying in large flocks to some better feeding ground. Observations of their flight at such points may naturally have led some to infer that they move rapidly north and south.

In the northward journey in the spring, they move on an average much faster than in the autumn, for it is then the desire for nesting that urges them onward, while the supply of food is much more limited. The insectivorous birds are most inclined to linger in the newly-plowed fields, but the typical seed-eating birds hurry to their favorite haunts to build their spring home. In selecting this, the food question influences every couple. Scatter daily plenty of food in an orchard, and year by year the number of birds nesting there will increase. This food should be spread out very early in spring, so that the earliest comers will find it. This will encourage them to return earlier another season.

G. E. W.

THE DEATH OF JEREMIAH M. ALLEN.

On December 29, Mr. Jeremiah M. Allen, known to every engineer in the United States as the president of the Hartford Steam Boiler Inspection and Insurance Company, died at his home in Hartford, Conn. For thirty-three years he had been president of the company, during which time he had devoted himself with untiring energy to his chosen work.

Mr. Allen was born on May 18, 1833, in Enfield, Conn. Hartford will ever remember him as the first president of her board of trade, organized in 1888, and also for the work which he did while a member and president of the board of trustees of the Hartford Theological Seminary. There is hardly an institution, financial or industrial, of the city of Hartford with which he had not been directly or indirectly connected. Mr. Allen was a member of many scientific societies, among them the American Society of Mechanical Engineers, American Society of Naval Engineers, the American Association for the Advancement of Science, the American Historical Society, and the Connecticut Historical Society.

Mr. Allen for a number of years had been a lecturer on insurance topics at Sibley College, Cornell University, and at the Worcester Polytechnic Institute. This year he was to deliver a course of lectures at Yale.

Mr. Allen was a descendant of Samuel Allen, who settled in Cambridge, Mass., in 1632, and who was an ancestor of Ethan Allen, of Revolutionary fame. The history of the Allen family has been the history of men who have had a bent for mechanics and science. One of the earlier Allens was the first man in the country to make telescopes and microscopes; another was an astronomer.

As a business man Mr. Allen's abilities were amply shown in the wonderful development of the Hartford Steam Boiler Inspection and Insurance Company under his presidency. Its capital increased to over two and a half million dollars. He started a magazine called the "Locomotive," which treats in a bright and entertaining way engineering topics of interest to insurance engineers.

THE NEW BRITISH SHIPBUILDING PROGRAMME.

BY H. C. FYFE.

The British Admiralty have just published the particulars of the new warships which are to be laid down early in the present year. These vessels were provided for in the estimates 1903-1904; but the designs have only just been published.

Three Battleships, "King Edward VII." Class.

Name.	Displacement. Tons.	I. H. P	Speed. Knots.
"Britannia" "Africa" "Hibernia"	16,350	18,000	18½

Four Cruisers, "Duke of Edinburgh" Class.

"Warrior" "Natal" "Cochran" "Achilles"	13,550	23,500	22½

Four Scouts, 25 Knots.

"Skirmisher"	2,900	17,000
"Foresight"	2,545	16,000
"Attentive"	2,750	16,000
"Patrol"	2,610	16,000

Fifteen Torpedo-boat Destroyers.

Length, 220 feet; beam, 20½ feet; speed, 25½ knots.

Ten Submarines. To be built by Vickers' Sons & Maxim.

The three new battleships are to be built in the royal dockyards. They are to be named "Hibernia," "Britannia," and "Africa." They will resemble in most details the five battleships of the "King Edward VII." class now under construction, viz., "King Edward VII.," "Commonwealth," "Dominion," "Hindustan," and "New Zealand." They will carry four 12-inch and four 9.2-inch guns in six turrets; ten 6-inch rapid-fire guns in battery; forty smaller guns; four submerged torpedo tubes. The three new battleships will, however, be an improvement on the "King Edward" in certain particulars.

The four new first-class armored cruisers will be of the "Duke of Edinburgh" class, including the two vessels "Duke of Edinburgh" and "Black Prince." They will carry six 9.2 inch, 50 caliber guns in turrets, and ten 6-inch rapid-fire guns in battery, besides twenty-eight smaller rapid-firers.

The four "Scouts" are all of different design, the preparation of the plans having been left to the builders. They are all bigger and more powerful vessels than the four previous "Scouts" now building, viz., "Sentinel," "Forward," "Adventure," and "Pathfinder," whose displacement is 1,600 tons, and armament consists of ten 3-inch guns.

The fifteen torpedo-boat destroyers are to be stronger vessels than the 30-knot type.

SCIENCE NOTES.

It is stated that a mixture of salol and antipyrine is employed to give a fictitious melting point of 20 deg. C. to oil of geranium; and that the mixture is largely used to sophisticate otto of rose.—Jour. Pharm. d'Anvers.

Maryland has now the best magnetic survey of any country except Holland, and it needs it, since Washington is near a very pronounced disturbance. The magnetic survey of the United States is being reorganized, and by 1910, it is planned, there will be one magnetic station to every 25 or 30 square miles; at present Holland has one to every 40 square miles, and England one to every 139 square miles. Canada, it is hoped, will join in this, as in the other meteorological work of the United States. Five magnetic observatories are contemplated.

Dr. Bauer, of the United States Coast and Geodetic Survey, has calculated the earth's magnetic energy. Calculating the total energy of the magnetic field outside the earth's surface in spherical harmonics, Dr. Bauer finds that there has been a loss of three per cent in the total energy between the years 1838 and 1884. That would indicate that the earth's magnetism is dying out. But the results are too uncertain. It is curious that we should be more certain about the earth's potential of fifty years ago than about the present potential.

Colors of Autumn Leaves.—The bright colors assumed by maple, sumacs, and ampelopsis during the autumn months are the result of the oxidizing of the color compounds, or color generators, of the leaf cells. Long-protracted cool weather is most favorable to the production of autumn tints, and slight frosts that are not severe enough to kill the cells hasten the display of beauty by producing an enzyme that brings forth the bright purples, oranges, and reds. Leaves containing much tannic acid never give bright autumn tints, while those containing sugar give the very prettiest.

In the course of some digging operations in a garden at Haslemere, Surrey, England, a gardener unearthed a number of ancient vessels of peculiar shape, together with a quantity of calcined human bones, at a depth of about two feet below the surface. The British Museum authorities who have examined the discovery pronounce the vessels to belong to the late Celtic (early iron) age, about B. C. 150. E. W. Swanton, the conservator of Dr. Jonathan Hutchinson's Educational Museum, carefully examined the fragments, and only three or four vessels were found in a perfect condition. He computed that twenty-two urns and pots were originally interred at the spot.

Dr. Charles H. Herty, an expert on the subject of forestry and an *attaché* of the United States Bureau of Forestry, is the inventor of a new method of gathering turpentine which will revolutionize the methods now in vogue, and be the means of saving an immense amount of money to the South, where the turpentine industry thrives. Heretofore the crude turpentine has been gathered by cutting a kind of "box" or pocket in the base of the tree, and into this the product found its way from the scarified sides of the tree. The method was not only wasteful, but also damaged the tree to such an extent that its life of usefulness was considerably shortened. It is said that two million acres of virgin forest are "boxed" annually in this way. Dr. Herty is a Southerner, and foreseeing the eventual ruin of a great industry, set about to arrive at some other means of extracting the resin, which he has succeeded in doing in a manner which meets all the demands of the case and increases the production by about seventy-five per cent, by the recovery of that which was formerly wasted and the improved quality of that gathered. The apparatus made use of by Dr. Herty is simple and inexpensive, consisting as it does of an earthenware cup with a nail hole near the top, a six-penny wire nail to hold it in place, and a pair of galvanized iron troughs to divert the flow of resin into the cup. Dr. Herty has not attempted to enrich himself by a monopoly of what is a patentable article, but has announced that the use of the process is public property. As the turpentine industry of the South is a very important one, this gift represents a money valuation of considerable size.