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NEW YORK, SATURDAY, AUGUST 30, 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.

EXPRESS TRAINS OF THE FUTURE.

That the express train of the near future will not necessarily be hauled by electric locomotives is evidently the belief of the German Society of Mechanical Engineers, who have offered a series of prizes for the best-designed high-speed express train capable of carrying 100 passengers and their baggage, with every modern convenience of travel, at an average speed of 75 miles an hour for a continuous run of three hours' duration. There is no question that this competition was prompted by the disappointing results of the experiments in high-speed electrical traction, carried out last year on the stretch of military railway between Berlin and Zossen. It will be remembered that the failure of these trials, or rather their somewhat sudden termination, was due, not to the inability of the electrical equipment to drive the train at the high speeds contemplated, but to the unexpected weakness displayed by the track and roadbed, which, under the heavy concentrated and rigid loads of the motor trucks, yielded so seriously as to produce dangerous oscillation of the car. The object of the express train competition is to provide a train suitable for greatly accelerated railway travel, whose steam locomotive shall be able to exert the necessary power without imposing greater strains than the comparatively light track of the present state railways of Russia can endure. The Berlin-Zossen trials proved that the track of the state railways, as at present laid, is altogether too light for high-speed electric travel, and the German Society of Mechanical Engineers believe that it is possible to design a high-speed, steam locomotive train that would accomplish the desired result without damage to the track and roadbed. The trials demonstrated practically the fact, which might very well have been foreseen, that the steam locomotive with its high center of gravity and its spring-supported load, is far less severe upon a track than the electric locomotive with its low center of gravity, and its large proportion of non-spring-supported load. The effect of a low center of gravity is felt in rounding curves, and when the engine or cars begin to oscillate laterally from one rail to the other. With a high center of gravity the lateral blow against the rail is considerably cushioned and the lower the center of gravity, the more direct and hammer-like is the impact. This is a point that has been well understood by steam locomotive builders and engineers, and when the first of our American express engines with boilers placed above the drivers were introduced, it was found that, despite their great weight, they were actually easier on track, at least as regards lateral displacement, than the old type of locomotive with low boiler and low center of gravity. Of course, in the very nature of things, an electric locomotive carries its weights low, and hence at very high speed loads particular attention will have to be given to the lateral strength of the track and roadbed.

During the electrical experiments of last year an endeavor was made to gather data regarding the air resistance at varying rates of speed, and it was shown that the head-on pressure increased at a much more rapid ratio than the speed, though apparently not as fast as the square of the speed. As a result of the data so gathered, an endeavor is to be made to reduce air resistance by clothing the whole train from pilot of engine to the rear platform of the last car in sheet steel, with suitable sliding joints between the cars to give the necessary flexibility in rounding curves. This sheeting is to finish at the engine in a wedge-shaped front. Our readers will here be reminded of the experimental train designed by Adams and tested in some high-speed runs. The train in question made a good speed record, considering the moderate power of the engine that hauled it; and we think the probabilities are that if good results are secured with the proposed experimental train in Germany not a little of its success will be due to this special feature of its construction. According to the German technical publications, care will be taken in the construction of the locomotive to minimize the racking effect of the engine on the track, by carrying the weight upon a large number of wheels, twelve in all being used. There will be a four-wheeled truck at the front, followed by a pair of coupled drivers and a four-wheeled trailing truck beneath the firebox. The engine will be a three-cylinder compound, with the cranks arranged so as to secure a perfectly even turning movement.

LIGHT ON THE LIQUID FUEL QUESTION.

In a paper recently read by Mr. Edwin L. Orde before the Institution of Mechanical Engineers, at Newcastle-on-Tyne, on the subject of liquid fuel, the author stated that close examination of the literature which has appeared on the subject, seems to show that from some cause or another, many undoubted advantages which liquid fuel offers have either not been fully appreciated, or if appreciated, not pursued with sufficient determination to insure their realization in actual practice. In explanation it has been suggested that the reason why liquid fuel has a higher calorific value than solid fuel of the same chemical composition is, that some of the heat has been rendered latent in passing it from the solid to the liquid form; but the author points out on the other hand that experiments fail to show the existence of this latent heat, quoting as an authority Dr. Paul, who holds that the best results that can be obtained from liquid fuel are an evaporation of 16 pounds of water at 212 deg. F., which is about 50 per cent more than any good coal will give in an efficient boiler. The most important point made in the paper was the explanation as to why liquid fuel does not give evaporative results in actual practice corresponding to those obtained in laboratory tests. Mr. Orde attributes the difference to the fact that crude oil exclusively is used in boiler furnaces, and that this oil contains a great amount of water. Ten per cent is the proportion quoted in the paper, although, as a matter of fact, many oils contain a higher percentage than this. The presence of this water destroys the conditions necessary for perfect combustion. Its first effect is to reduce the temperature of the flames and increase their length, thus moving the point of highest combustion further into the furnace, with the result, first, that a large portion of the heating surface of the furnace is rendered useless; secondly, that the temperature of the combustion chamber may be raised to a higher point than is good for its material; and thirdly, that the last stage of combustion takes place in the smoke-box and uptake. The existence of a low furnace temperature is suggested, furthermore, by the fact that in cases where no smoke was being formed and the air supply was not more than 20 per cent above the amount that was chemically necessary for the combustion of the fuel, the evaporative work of the boiler was poor.

In commenting editorially upon Mr. Orde's paper The Engineer states that it has authentic evidence of oil being shipped from oil wells which contained as high as 40 per cent of water, this large amount having been added, not fraudulently, but having flowed naturally into the wells, which are usually driven through water-bearing strata. As crude oil is nearly as heavy as water, and only separates from the latter after a long rest in the tanks, it follows that on shipboard, where the bunkers are in constant motion, separation is impossible and the water is carried with the oil into the furnaces. In concluding his paper Mr. Orde quotes actual results obtained by successful installations of burning apparatus on the steamers of three different companies, which show the difference in consumption of liquid fuel as compared with coal. In the case of the four steamers quoted, there is an advantage in favor of liquid fuel of 27 per cent, 28.6 per cent, 35.5 per cent and 36 per cent. The conclusion arrived at is that except in the case of steamers which are engaged in carrying oil as cargo, or those which are employed in the oil-producing region, liquid fuel cannot show sufficient pecuniary advantage over coal to render its entire adoption advisable.

THE RECENT "BELLEISLE" EXPERIMENTS.

In a characteristic discussion of the recent "Belleisle" experiments, Mr. F. T. Jane, the well-known author of "All the World's Fighting Ships," sums up the experiments as having two main objects: First, to ascertain the effect of lyddite on a conning tower, and, second, to ascertain the effect of shells on torpedo nets. After a careful analysis of the results, he points out the main lessons that are to be learned and presents his own suggestions as to how far they should modify future battleship design. The whole article as given in The Engineer will be found in full in the current issue of the SUPPLEMENT, and it will be sufficient to give here a brief review of Mr. Jane's analysis of this interesting trial. It is pointed out that in the first case the experiment was invalid because the conning tower of the "Belleisle" was not of a modern pattern, being entered from below instead of, as is now the practice, from the rear. Attention is drawn to the fact that the gas from the exploding lyddite shells was only able to act upon the top of the tower, whereas in the modern type of conning tower, which has a doorway through the rear wall with a curved screen to partially cover it, the blast of an exploding shell would be able, if the latter came from a wide arc on either beam, to enter between the screen and tower and find its way, with deadly impact, throughout the whole of the interior of the tower. In the "Belleisle" tower the gas could only enter through the peep-hole slot at the top, and hence there would be something of an air-cushion effect before the pressure reached the floor of the conning tower, on which, before the firing, a live rat had been placed to test the effect upon a living being. As we take it, Mr. Jane's argument is that though the modern conning tower with open rear entrance and so-called protecting screens may keep out shells, it will not prevent destruction of the inmates by the shock of the shell gases. He suggests the construction of a double-deck conning tower, to accommodate a steersman in the upper compartment, and a reserve steersman below. He would place the commander of the ship on the roof of the turret, this roof to be extended to form a wide, circular platform, around which platform would be hung a wall of splinter nets, the idea of this arrangement being that the splinter nets would catch the lighter flying fragments, but would not present sufficient resistance to burst the storm of explosive shells, to which the captain himself would offer but a small target. He suggests that the best position for the captain in the heat of action would be prone upon this upper roof with his mouth above the speaking tubes, etc., which would lead down into the conning tower below. The suggestion that the captain should fight his ship practically in the open is warranted by the fact that in the Spanish-American war the commanders of our vessels preferred, like Admiral Dewey, to carry on the action from the bridge, where they could obtain a clear view, rather than be cooped up within the restricted outlook of the conning tower.

Early in the action the bridge of the "Belleisle" was struck and completely wrecked, the mass of wreckage being swept away and carried overboard. From this it is argued that it would be folly to support the conning tower or fighting position on a bridge. The tower should carry its full diameter well down into the body of the vessel, and have its base thoroughly protected by the side armor. There can be no question as to the necessity, as above pointed out, for giving most thorough protection both to the steersman and the reserve steersman; for should the former be killed or disabled at a critical moment in battle it is easily conceivable that the delay in sending for a "replace-man" might have most serious consequences, and, possibly, be fatal to the ship. By building the conning tower in two stories, and having the "replace-man" in the story below, the risk of the ship running wild is reduced to a minimum.

The awful destruction wrought by the lyddite shells and the dense clouds of dust and fragments produced by the explosion indicate that there are two other most important accessories that demand attention; the first, the important matter of placing the range-finder, and the second, signaling. Ordinarily the range-finder is carried on the bridge, but the short work made of this structure on the "Belleisle" shows that some other position must be found, and the writer suggests that the range-finder tripod should be carried on a light grating, upon which the operator would lie prone and communicate the ranges by a transmitter. As to signaling, the "Belleisle" experiment confirms the experience gained at the battle of the Yalu, where the signal halyards were entirely swept away; for the bombardment gave little promise of the survival of even the light masts. There are two methods of signaling suggested, one a small captive balloon carrying flags which may be hoisted and cut away and sacrificed when done with, and the other suggestion is the use of colored shell for simple signals.

When the writer comes to the question of the effect of high-explosive shell fire on the personnel of the ship, we think that he is dealing with what, after all, is the most vulnerable point of attack in the modern warship. We are satisfied that in a battle carried out at moderate ranges between ships whose crews are fairly proficient marksmen the fight will be determined by the decimation of the crews, rather than by the destruction of the ships. Unquestionably many will be placed hors de combat by mere concussion, whether by the impact of shells on the outside of the turrets and casemates, or by the atmospheric shock and asphyxiation due to the bursting of high-explosive shells within the inclosed spaces of the ships. It is true, as Mr. Jane points out, that the actual effects of gun fire on the personnel is a matter of conjecture, and unless volunteers can be found who will place themselves within such a vessel as the

"Belleisle" when she is under fire, and secure the enormously valuable data which can only be obtained in this way, we shall remain in comparative ignorance of the actual destructibility of modern gun fire. At the same time it is probable that public sentiment would array itself strongly against the proposal to risk the sacrifice of human life in such an experiment.

GEORGE M. HOPKINS.

It is with most profound sorrow that we record the decease on the 17th inst. at Cheshire, Mass., of Mr. George M. Hopkins, so long identified with the SCIENTIFIC AMERICAN as Associate Editor.

It was while enjoying a vacation trolley outing with his wife in this beautiful locality among the Berkshire Mountains that Mr. Hopkins became suddenly ill on the 15th, and despite the best medical treatment, never recovered. His sudden demise will be a great shock to his intimate associates in the SCIENTIFIC AMERICAN.

Mr. George M. Hopkins was born in Oakfield, Genesee county, New York, November 21, 1842, and while a lad went with his father and family to Albion, Orleans county, New York, where he received the usual public school education. He early displayed a liking for mechanics, having a natural ability to discover the reason of things in a mechanical way as they were studied. His father encouraged him to pursue matters to his liking by having him obtain practical information in the workshops at Albion.

On May 10, 1864, he was married to Helen M. Mills, daughter of Dr. A. B. Mills, of Albion, N. Y. Later, in 1866, we find he was granted his first patent for an apparatus for turning leaves of music, after which followed some forty-three other patents; among them, in 1871, was an electro-magnetic sewing machine, and from 1880 to 1885 he was granted two patents for telegraph relays, five patents on telephone transmitters and two patents on telephone receivers. His telephone transmitter patents were acquired by the People's Telephone Company at that time and their utility was well demonstrated. He was also interested in gas engine construction and secured several patents in that line, showing that his activity as an inventor never failed him in whatever branch he applied his mind.

He early made the acquaintance of Thomas A. Edison, in whose laboratory he worked, and the friendship continued throughout the epoch of the telephone and electric light development, and to the present time.

On May 10, 1876, he became connected with the SCIENTIFIC AMERICAN, beginning his work as an attorney in the Patent Department; it was soon noticed that he evinced a fondness for experimenting in matters connected with physics, especially in a more simple and direct way than was customary. He was encouraged in this work and from time to time the results were published in the SCIENTIFIC AMERICAN. The experiments were so simple and clear that any boy could understand them. The value of the published experiments was that they were based on actual manufacture of the apparatus and trial before publication. It is needless to add that these many different publications formed the nucleus of Mr. Hopkins' popular book, "Experimental Science," which has been of such assistance to many thousands of students of physics.

Some months ago Mr. Hopkins undertook a thorough revision of the book, with a view to bringing it up to date, that many of the remarkable discoveries of the last few years might be included.

It is a great gratification to feel that this work was entirely completed, and that the proofs had been thoroughly revised and read by Mr. Hopkins before he started on his vacation several weeks ago. The popularity of the work is shown by the fact that the twenty-third edition has just been published. Our illustration is from a recent photograph and is regarded as an excellent likeness of Mr. Hopkins.

Of late years he gave particular attention to literary work, editing the special department of "Notes and Queries," and contributing to our columns a series of scientific articles which were marked by the clearness and brevity by which his work is easily recognized. Mr. Hopkins possessed in a marked degree the literary qualifications of a scientific writer. To his simplicity and clearness of style, no doubt, was largely due the great popularity of his writings, which attracted and held the interest of the widely diversified classes of readers who were interested in the subjects he discussed and subscribed for his published works. It is certain, moreover, that his directness and purity of style were one expression of the character of the man himself; for our late associate was possessed of sterling traits that won for him the invariable respect and admiration of all those with whom he had business relations.

His disposition was most kindly, amiable and attractive. He was ever ready to render assistance and freely impart such knowledge as he possessed.

Mr. Hopkins occupied his leisure hours with the practice of photography as a stepping stone for the study of art. He enjoyed painting small pictures as a pastime, using his photographs as a guide. He was fond of broad effects. On another page we give his method of producing them.

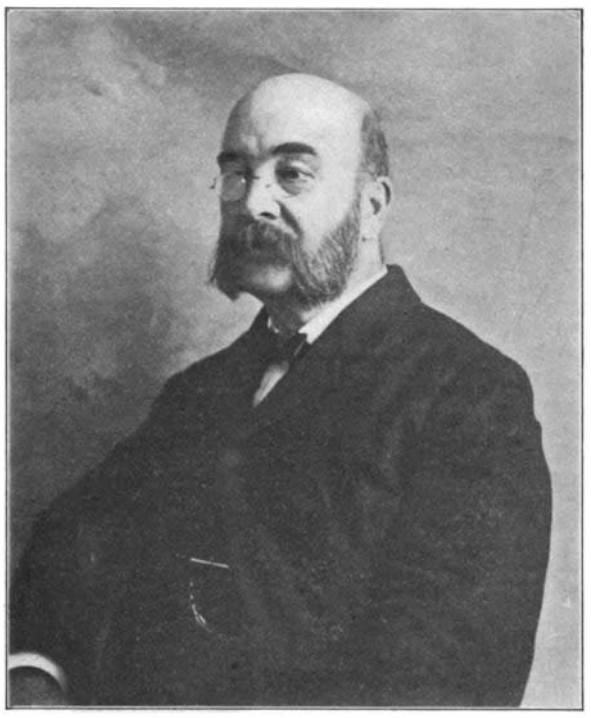
He was a member of a number of societies. His residence was in Brooklyn, New York, where, we are informed, he left a most remarkable collection of scientific apparatus, which exceeds in interest the equipment of many institutions of learning.

He leaves a wife and one son, Mr. Albert A. Hopkins, who was formerly with the SCIENTIFIC AMERICAN for several years and is author of "Magic" and "The Scientific American Cyclopedia of Receipts, Notes and Queries." One brother, Mr. I. N. Hopkins, also survives him.

Mr. George M. Hopkins was greatly beloved in the church he attended in Brooklyn and was held in high esteem by all who knew him. We shall miss him and we know our numerous readers will, but we believe the work of his life, "Experimental Science," will live and the memory of his name will endure with it as one who knew how to teach science with rare simplicity.

THE LAYING OF A PACIFIC CABLE.

The President has consented to authorize the Pacific Commercial Cable Company to lay a cable across the Pacific to the Philippines, thus ending the fight which has been waged for fifteen years by rival firms. The Mackay-Bennett Company will probably soon begin work. The route to be followed extends from San Francisco to Guam and thence to Manila. The estimated time of laying the cable is fourteen months from the beginning of the work. Heretofore all messages have been sent to the Philippines over an English line from Hong Kong. The owners of this line have a franchise monopoly granted by the Chinese government. Under the favored nation clause of the



GEORGE M. HOPKINS.

treaty between the United States and China the American government has the right to claim a similar franchise for an American cable company. It is expected that advantage will be taken of this treaty relation, for by getting a terminal in China the cable company will obtain 700 miles of new cable lines. The Pacific cable will then connect with the Atlantic cable lines in China so that messages can be sent to all parts of the world by American cables.

ELECTRIFIED HOUSES.

An instance of non-familiarity with simple scientific facts is illustrated by an article that goes the rounds of the press once or twice annually, namely, the story of the electrified house. The article usually states that some one has discovered that everything he touches in his house, the radiators, picture frames, banquet lamps, etc., give him an electric shock. Hence, he fears there is some connection between the arc-light wires and the water pipes near his residence. The electric light inspector is, therefore, summoned, and reports that the wires of his company are intact and that e electricity must come from some other sourc does not dawn on any of the people consulte the discoverer of the phenomenon is unconsci erforming one of the simplest and oldest of e. atic experiments, the shuffling of his shoes ov dry carpet raising the potential of his body eral thousand volts, which discharge at every op y. One may even get electric discharges from ckles to the brass lock of a hand-bag which he be carrying while walking on a stone pavement cold, dry weather. But, dismissing newspaper it is somewhat astonishing, in view of the ways in which in cold, dry countries electricit nintentionally developed and manifested by sparking, that the first knowledge concerning this phenomenon did not come to the ancients in this way rather than by the attraction of light substances by amber. The explanation of this, however, may be that the scientists of bygone days did not reside in cold, dry countries.—Cassier's Magazine.

SCIENCE NOTES.

The radiations of radium have proved to be of rare value in medicine. It is found that a metallic screen interposed between the eye and a vial containing radium in no way prevents the healthy eye from seeing it. If the retina of a blind person be healthy, it will be effected by radium rays even though the cornea be opaque to light rays. Consequently the radiations from radium can be used to discover whether or not the retina of a blind person is healthy.

The expedition dispatched last summer to Gambia, on the West Coast of Africa, by the Liverpool School of Tropical Medicine has discovered another malaria-spreading animal, the parasite trypanosoma. This parasite resembles a minute worm, and is very similar to the blood parasite which is the cause of the devastating disease prevalent among cattle, horses, etc., and in Africa, India and other tropical countries known as the tsetse fly disease, nagana and surra. In the case of animals it has been proved that these diseases are communicated through the agency of certain biting insects, such as the tsetse fly. The expedition discovered the trypanosoma parasite in the blood of a native child. Since the return of the expedition a special study of the question has been made at the laboratories of the Liverpool school and it has now been resolved to dispatch a further new expedition to the West Coast to investigate the conditions in which the disease occurs in both Europeans and natives and its distribution, and also to ascertain how it is conveyed from man to man; whether by biting insects or by other means.

The fitting out of the Scottish South Pole Expedition, which is to be carried out under the auspices of the Scottish National Antarctic Expedition, is rapidly approaching completion. The expedition is to be under the command of Mr. W. S. Bruce. The Norwegian whaling vessel "Hecla," renamed the "Scotia," purchased to carry the party, is now being reconstructed on the Clyde, at Troon, under the superintendence of Mr. G. L. Watson, the well-known yacht designer. The "Scotia" is a bark-rigged auxiliary screw steamer of about 400 tons register. New deckhouses are being built, a larger one aft and a smaller one forward divided into a laboratory and cook's galley. A second laboratory and a dark-room are being fitted between decks. The ship is being specially fitted to carry on oceanographical research, both physical and biological. Two drums, each containing 6,000 fathoms of cable, for trawling in the deepest parts of the Southern and Antarctic oceans, are being taken. The expedition intends to follow the track of Weddell, and to explore the Ross deep, working eastward from the Falkland Islands.

The Zoological Garden of London has lately received a young animal known as the Panda. This animal, a small mammifer of the Procyonidæ family, constitutes a unique species in the genus Aelurus (*A. fulgus*), and comes from the Himalayas, where it is found at altitudes varying from 6,000 to 11,000 feet. It is also found in the mountains to the north of the Assam as far as the Yuman region. Its ordinary name is "red cat-bear," the name being due to its appearance and its plantigrade walk, also to the reddish color of the fur. The Aelurus genus exists in the fossil state, and one species, that of the *A. Anglicus*, is found in England in the pliocene layers. The Panda is not often seen in Europe. The first specimen which arrived at London was sent in 1869, but its two companions died *en route*. The survivor did not live longer than seven months. It was made the subject of careful observations by zoologists, especially by Sir William Flower and Mr. A. E. Bartlett. It is interesting to note that the Panda now in London often uses his forepaws like arms and hands. Mr. Hodgson, who observed the species in the East Indies, never saw the Panda act in this way and use his anterior members to seize objects. A second Panda was sent to London in 1876. The habits of the animal are nocturnal, and during the day he sleeps almost constantly. He seeks his nourishment in the evening or very early morning, living upon herbs, buds, roots, and will also eat eggs and insects. The character of the animal is rather mild; the large claws with which his fingers are provided are used not for attack or defense, but mainly to climb trees, in which he passes a good part of his time, except in the periods when he seeks his food, this being generally obtained on the ground. He is not timid, but does not like to be touched. When a person extends his hand toward him, he sits down, and agitates his arms as if to strike, but his anger is short lived and he allows himself to be observed without much inquietude.