or providing a strong and constant current for other purposes of illustration or experiment, at times showing nearly a one horse power energy.

The motors displayed by this company showed themselves particularly adapted for the transmission of power from a distance, which from present appearances would seem to be one of the great problems of the future.

Perhaps the most important feature of the Thomson-Houston exhibit was the little mechanism inclosed in a small box by which the electric current can be transferred from arc lights, and made to feed incandescent lights of from twelve to sixteen candle power. It is called the Thomson-Rice incandescent distributor. Heretofore little has been done in this direction; either arc or incandescent lights being exclusively distributed, because it was found that the cracking of one or more incandescent lamps usually led to the breaking of many more in the same group. By the device exhibited, however, an arc light can be turned out, and a group of eight incandescent lights be made to glow instead. Furthermore, all the lamps or any particular number of these in one circuit can be turned on or off with the same facility as gas jets can be operated, and without danger to other lights in the circuit. The little mechanism acts automatically and electrically, and is at no time subject to accident by reason of careless handling. As a whole, the Thomson-Houston system shows, as exhibited, that it is founded upon a correct interpretation of natural laws, and that its workings are directed by men who are conversant with the theory as well as the practice of electrical engineering.

The National Academy of Sciences.

A session of this society was held at Newport, R. I., Oct. 14 to 18. The National Academy was incorporated by Congress in 1863, to "consist of not more than fifty ordinary members," and the custom has been that these shall be selected specialists such as will best represent every department of knowledge. We believe there are now about one hundred members of the Academy, but it is nevertheless a very select organization as compared with that much larger body, the American Association for the Advancement of Science, and many papers read at its meetings are such as would be of little interest to other than specialists in the subjects treated of.

Among the papers read was one by Prof. E. D. Cope to show the evolution of certain bones of the ear in *Pelicosauria*, involving a study in comparative anatomy as well as evolution.

Prof. Fairman Rogers, of the University of Pennsylvania, described experiments on the motion of animals, as depicted by instantaneous photography. In some experiments conducted last summer at Fairmount Park, Philadelphia, forty cameras were placed in a row, and so adjusted as to be successively opened by the motion of an animal passing in front of them. These experiments will throw light on the mechanism of animals, and, it is suggested, may give valuable application in machinery. For instance, marine engineers do not agree on the best form of steamer screws, and it is intimated that an exhaustive study of the fish's propeller would throw light on this. There will probably be no difficulty in arranging a glass tank through which fish can be made to swim, and be photographed in transit. The motion of dogs, horses—especially racers—deers, and other animals, in running, were described; and interesting and prolonged discussion ensued. Professor Rogers stated an interesting point to be the flexure of the long pastern. When a horse gallops, he moves in a horizontal line. His body keeps almost a uniform direction, notwithstanding that his feet rise and fall. He bends his pastern to keep level. In race horses it touches the track. He cited as an instance a celebrated race horse, which used to make eight marks on the ground, four for the pasterns as well as the four foot tracks.

Professor Tylor, of Oxford, England, the eminent anthropologist, considered at great length the "Civilization of the American Races," particularly the Zuni, Navajo, Mojave, and Wallopi tribes, among which he had traveled.

Among those present at this meeting of the Academy were President O. C. Marsh, Professor of Paleontology of Yale; Home Secretary Asaph Hall, Astronomer of the National Observatory; Treasurer J. H. C. Coffin, United States Navy; W. H. Brewer, Professor of Agriculture, Yale; G. J. Brush, Professor of Metallurgy, Yale; Josiah P. Cooke, Professor of Mineralogy, Harvard; Edward S. Dana, Professor of Physics at Yale; Walcott Gibbs, Professor of Chemistry at Harvard; Julius Hilgard, Superintendent of the Coast Survey; Samuel P. Langley, astronomer in charge of the Allegheny Observatory; J. S. Packard, Professor of Zoology at Brown University; Edward C. Pickering, director of the United States Geological Survey; Samuel H. Scudder, editor of *Science*, of Cambridge Mass.; William P. Trowbridge, Professor of Mechanics at Columbia College; and Francis A. Walker, President of the Massachusetts Institute of Technology.

A New Pavement in Berlin.

A new form of paving has been in use in Berlin since last year. Layers of bricks are put down impregnated with asphalt. After a time they absorb from 15 to 20 per cent of the bituminous matter, becoming remarkably elastic and capable of resisting pressure and damp. This new paving, it is said, lasts much longer than any of the other kinds, and it offers a sure foothold to horses. It is a very popular pavement in the capital of Prussia.

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 460,

For the Week ending October 25, 1884.

Price 10 cents For sale by all newsdealers

A PRIZE FOR INVENTORS.—NEED OF PASSENGER AND FREIGHT CAR BRAKES.

Railroad officials seem to have arrived at the settled conviction that no essential improvements can be made in passenger car brakes; that the air or vacuum brakes, with all their faults and deficiencies, are as nearly perfect as can be, and that it is useless to seek further. And as practically all the roads have adopted these brakes for their passenger traffic, they naturally oppose the introduction of any improvements that would depreciate their costly investments.

For the present, then, the passenger car brake question may be considered settled, but it is not so with the freight car brake.

It may be asked why the air or vacuum brake is not as well adapted to freight traffic as to passenger traffic. In reply the roads say that the cost of the air or vacuum brake is greater than the freight service will bear; that the air or vacuum brake must, to be effective, be continuous, or connected for all the cars in a train; that this necessary continuity or connection of all the brakes in a train can, without much trouble, be assured in passenger traffic, wherein the interchange and mixing of cars rarely occurs, but that the conditions obtaining in freight traffic are such that each car must be equipped with a brake that will act independently of any other in the train.

On all the principal lines of railroads the majority of the freight trains are partly made up of "wild" cars (cars from other roads) and these cars are necessarily distributed throughout the train in the order of their arrival, so that one "wild" car without the air or vacuum brake in a train equipped with the air or vacuum brake might render all the brakes on the train ineffective.

Another objection which the roads make to the air or vacuum brakes for freight traffic is that the brake nose connections deteriorate from exposure, and that the couplings offer irresistible temptation to thieves.

If in spite of special care and watch in the yards the nose connections often give out and the brass couplings are almost daily stolen, what, they say, would become of the brake on freight cars which are run off and held on sidings all along the road for days and weeks, waiting to be loaded or unloaded?

There are other minor objections to the air or vacuum brake for freight traffic, but these mentioned appear to be inseparable from this class of brakes.

Not only, then, are the lists open to a suitable freight brake, but the roads are united in seeking for it.

This is one of the broadest fields for inventors, and will yield most abundant reward to the successful ones.

Great fortunes have been made from the air or vacuum passenger car brakes, and yet the whole number of passenger cars in this country are less than one-thirtieth of the number of freight and coal cars, which are all in want of their special brake.

Freight trains are still operated by the common hand brake, and though many other kinds have been proposed, the roads prefer to hold to their old friend until something in all respects superior shall be produced.

It is true that the hand brake requires a crew of two or three brakemen to a train, while a suitable brake would require no brakemen; it is true that it cannot quickly control a train running at high speed, and consequently that for safety the trains must be run slowly; and it is true that its persistent use daily brings death or injury to one or more poor railroad employes; but nothing yet devised for the purpose possesses all its virtues and fewer faults and is, at the same time, cheap enough.

For the benefit of inventors we have given this brake problem long and careful study, in which we have been aided by a number of prominent experts in railroad matters.

We can say, then, that a brake which shall fulfill all the requirements of freight train service must be cheap, simple, and durable, and require no special skill to repair or keep it in order, and it must possess the following functions and advantages:

1. It must be thoroughly automatic, and entirely under the control of the engineer.

2. It must adjust itself automatically, to suit either direction in which the car is pulled.

3. It must operate at any and all rates of speed.

4. It must be complete in itself on the car to which it is attached, and independent of the action of other brakes in the train, so that "wild" cars will not interfere with its action.

5. It must be capable of bringing a train to a "full stop," and, if on a descending grade, of "holding it."

6. It must admit of a train being moved a short distance at slow speed, and yet be operative to stop it again.

7. It must not interfere with the backing of a train, nor in any way with the handling of a train in yards.

8. It must provide for the stopping of the rear portion of a train when broken loose.

9. It must never cause sliding of the wheels.

10. It must never interfere with the use of the hand brake staff.

11. It must be easily rendered inoperative.

12. It must operate with slight motion of the drawbar, and not be injuriously affected by excessive motion thereof.

It should be applied in place without removing car truck or axle.

And finally, it should be so constructed that but one truck on a car need be equipped with it.

It is well understood that these functions and advantages can probably be combined only in a momentum brake; but no one has yet been able to construct a brake embracing them all.

But several so called automatic momentum brakes, however, have been invented, some of which are noteworthy for their ingenuity, though lacking in some one or more essential features.

None, we believe, are constructed and arranged to stop the rear portion of a train when the train breaks apart. When it is considered that about 40 per cent of the accidents to freight trains occur from the breaking apart of the trains and the subsequent collision of the two portions, it is not easy to overestimate the value of a brake that will prevent such accidents, and at the same time possess all other requisites.

Did the limits assigned to this article permit, we could easily advance many reasons why a brake such as we have described would also be superior for passenger traffic, but that ground is perhaps too well occupied for present advance upon it.

Here, then, is an opportunity for the exercise of inventive talent; upward of a million of cars in this country alone are lacking the equipment of a perfect automatic momentum brake, and the railroad companies are all demanding it.

Who will carry off the prize?

THE HEAVY GUN QUESTION.

Now that Congress has made something like an effort toward protecting the coast, those officers of both military arms who have made a specialty of heavy gun manufacture are doing their best, as might have been expected, to see that this effort is not misdirected. A committee of officers was, it is true, appointed, at the suggestion of the last Congress, to determine the very weighty questions as to national and private foundries and the quality of guns to be made therein. But, as is well known, only a few of the many experts to be found in the general service could be accommodated on the committee, and, precisely because the subjects to be considered are so weighty, suggestions by those who have been over the ground are at once timely and welcome.

Among those officers whose suggestions may fairly claim the serious attention of the committee, is Captain O. E. Michaelis, U.S.A. In a recent paper read before the American Society of Civil Engineers, Captain Michaelis goes into a careful and detailed consideration of the subject, contenting himself with presenting the recent experience in gun manufacture rather than attem pting to determine the method or to formulate the policy from which the best results may be expected. Now that there is a disposition on the part of Congress to properly protect the coast, and new and costly foundries are to be established, we are confronted with what seems to be a very serious question, viz., who shall own or control these plants—the government or private parties, or both conjointly? The evidence as gathered by Captain Michaelis shows that each system has serious defects.

Up to the Franco Prussian war the French foundries were owned and maintained by the government; a board of officers, having charge of the work of gun making, met only in secret session, and resisted the introduction of new processes or public criticism of the old ones. The German system of relying upon a single private company for arming the country has also little to commend it; the company in order to maintain itself must needs look for large foreign contracts, and when the decisive moment comes are either seriously hampered or in a position to take advantage of the state's necessities, and demand exorbitant prices. Nor has a partnership between the State and private parties proved altogether satisfactory.

One of the evils of this system is shown by Captain Michaelis by a recent experience of the British government, which, in addition to being charged exorbitant prices for war material, was forced to pay £65,000 to close an agreement, while the company, besides its profits on manufacture, came into possession of a complete working plant at a mere nominal valuation.

Curiously enough, Captain Michaelis, after setting up the dummy that a copartnership between the State and private parties leaves the latter free at times to take advantage of the State's necessities, as shown by the evidence adduced by him, he proceeds to knock it down by expressed approval of a similar project as contained in a letter of General Benet, of the Ordnance, to Commodore Simpson. In this Gen. Benet suggests that the government shall provide a private corporation "with some of the more costly plant, such as new furnaces, steam hammers, large lathes, cranes, etc., the foundry to reimburse the government by paying a certain percentage on all work performed with said plant until the whole cost is repaid."

There is an objection to such a plan, which is, perhaps, even more serious than the threatened danger of extortionate charges in the hour of extremity. Even the great gun manufactory of Herr Krupp, at Essen, has not enough gun making to keep all hands employed the year round, and must needs take large contracts for material in no way connected with armament or war. In this latter employment, Herr Krupp has many competitors in Germany, but if his plant had been supplied by the government at a nominal figure and upon easy payments, it is not unreasonable to suppose that no German firm could compete with Krupp, even in the manufacture of those mechanisms which are not allied to the art of war, and hence the imperial government would be but assisting Krupp to force other manufacturers out of the business.

In our own country, the spirit if not the letter of the Constitution is opposed to the State entering the market as a competitor with private parties, and such an arrangement as that suggested by Gen. Benet, and supported by Capt. Michaelis, smacks strongly of this. It would enable a private firm or company to come into the immediate possession of a costly plant, which, when not employed in gun manufacture, could be used in turning out other kinds of work in vast quantities, to the great disadvantage of all other private concerns engaged in a similar manufacture.

The system now in use in France has been accepted by the board of officers appointed at the instigation of Congress as the proper standard for imitation, and is commended by Capt. Michaelis in his paper. This system contains, perhaps, fewer objectionable features than any other that has been suggested during the long controversy now happily ended. In this system the government maintains the gun manufactories itself wherein the parts are machined and assembled. For foundry work, on the other hand, the private companies or corporations are depended upon. None of these are supplied with plant nor in any way assisted in preventing competition, this being the rather encouraged, and in France some of the foundries have been induced, on their own motion, to establish gun factories to supplement the government shops.

Concerning the quality and character of the guns that are to be, Capt. Michaelis brings together much and varied information.

Though the exact cost of solid cast-steel guns has not yet been ascertained, he believes that it will be found to be about one-third the cost of hammered steel guns. It has, he says, the range of tensile strength from 50 to 30 tons per square inch, and the corresponding elongation of 7 to 28 per cent, and is therefore destined to replace not only iron castings, but iron and steel forgings, which are very much more expensive and no stronger.

In regard to castings, a conviction has prevailed in some quarters that we had no open hearth plants equal to those at Terre-Noire, in France, where the manufacture of large castings is a specialty, and the best methods of annealing and tempering to be applied to the metal, in order to give it all the mechanical properties corresponding to its chemical action a study. Yet Captain Michaelis says that we have open hearth plants fully equal, if not superior, to those at Terre-Noire, and that the tensile strength of ordinary castings in this country, now sixty thousand pounds, may, with careful manipulation and special methods of casting, possibly under compression, be doubled. Indeed, Mr. S. T. Wellman, of the Otis Iron and Steel Company, whom he quotes, says he is very sure that we can produce a metal good enough for heavy guns without pressure; but with pressure we could do as well as Whitworth, who, so far, has beaten the world.

It is not so many years ago that our great guns, our machine guns, and breech-loading rifles had no equals in Europe, but now, on our own models, vast improvements have been made, and, says an author quoted by Capt. Michaelis: "If we don't soon begin to manufacture ourselves, everything American will be brought back to us with a foreign name. Our mammoth powder will become 'pebble,' and perforated cake be known as 'prismatic,' our pressure gauge as a 'crusher gauge,' and the Hotchkiss case shot be credited to Col. Boxer. Prof. Treadwell's system of gun construction of 1840 is known as Armstrong's of 1856, but no one has seen Armstrong's patent for it; Krupp has appropriated the Broadwell system bodily, and Eastman's slotted-screw breech plug is known as the French breech loading gun. Mr. S. B. Dean invented a method of mandreling bronze guns by which strength and hardness are greatly increased, and two years after his patents were taken in Austria, his gun was brought out there as the Uchatius gun, and a vast achievement. Their whole artillery is armed with it. The Russian government built a great foundry at Perm to carry out Rodman's design on a large scale, and took his powder and his experience along. Mr. Hotchkiss has established a large factory near Paris, where he has very extensive orders, and has become in his line the main reliance of the French government."

Surely, a nation like ours, which has through the genius of its sons furnished the bases for all great gun manufacture now in use abroad, should be able to at least equal in efficiency the improvements founded originally upon its own designs.

TWO REMARKABLE METEORS.

A correspondent in Lafayette, Alabama, gives an interesting account of two meteors observed by him on the night of the 14th of August.

The first meteor was unusually large and brilliant, exploding due west, and vanishing without leaving a trace behind. It was seen about midnight.

The second meteor was seen fifteen or twenty minutes later, was as large as its predecessor, and exploded in a south-southeast direction. After the explosion of the fire ball, a train of light remained visible for eight or ten minutes, at first motionless, and then slowly changing from a straight to a curvilinear form. The moon shone brightly at the time, the atmosphere was clear, and both meteors were sufficiently brilliant to make the shadows of the two observers and the shade trees in their vicinity almost as plain as in sunlight.

Our correspondent thinks that the first phenomenon could not have been a meteor, because it came to a sudden "standstill," and asks, "What was it?"

Both phenomena are probably due to the same origin, the matter that circulates in inter-planetary space, and, according to size, isolation, or constituents, takes form as meteoric stones, fire balls, or shooting stars, all being classed under the head of aerolites, and being merely varieties of the same phenomenon. They vary in weight from the meteoric stone in Brazil estimated to weigh 14,000 pounds to the shooting star weighing a few grains. They vary in brilliancy from meteors shining brightly in the noonday presence of the sun to the tiny falling stars that only sharp sighted observers can discern as a vanishing point of light. They vary in continuance from the fire balls that burst and leave behind, in a few recorded instances, luminous trains shining for an hour after the body disappeared, to those that split into fragments, and leave scarcely a trace of their presence. They vary in the noise they produce from detonations like thunder or the firing of cannon to the slight sounds that only a vigilant ear can detect. They vary in number from the countless myriads that people the meteor zones to the solitary specimens that from time to time show themselves in our sky, and then vanish forever.

They are all due to the same cause. The earth as she moves in her orbit encounters these cosmical atoms in her course. Both bodies are moving with immense velocity, and in opposite directions. The meteors rush headlong against our atmosphere, are ignited by the concussion and fall to the earth as stones, or are crushed into impalpable dust.

The two meteors observed by our correspondent probably belonged to the class known as fire balls. It is not impossible, if the train of the second meteor was yellow in color, and it radiated from the constellation Perseus, that both meteors were members of the August meteor zone, through which the earth was passing about that time.

Meteors belonging to this group have been observed of great size and brilliancy, and with an estimated weight of seven pounds. The observer of the meteors also records a fine show of falling stars on the 10th. As the show often continues for several nights, we are somewhat inclined to this theory, for we have not infrequently seen members of the group as large as the planet Venus exploded with a sound distinctly audible, and leave behind a shining train.

The Prime Meridian Conference.

This body, which assembled in Washington, October 1, included forty members, representing twenty-four governments, as follows:

Austria-Hungary, Brazil, Colombus, Costa Rica, Denmark, France, Germany, Great Britain, Guatemala, Hawaii, Italy, Japan, Mexico, Netherlands, Paraguay, Russia, San Domingo, San Salvador, Spain, Sweden and Norway, Switzerland, Turkey, Venezuela, and the United States. The conference was not as prompt to adopt the general meridian of Greenwich as had been expected, but a resolution to that effect was finally passed, and that meridian recommended to all governments for adoption, the representatives of twenty-one governments voting in favor of it, San Domingo against it, and France and Brazil abstaining from voting.

The conference also resolved that longitude continue to be counted as at present in two directions, up to 180°, instead of in one direction up to 360°, as had been recommended by the Roman conference. Although the Greenwich meridian has long been the standard for four-fifths of the world's navigators and geographers, its adoption by all will be a common benefit. The ancient geographers drew the first meridian through Ferro, the westernmost of the Canary Islands, and this is yet followed to some extent. The French have also used the meridian of Paris, the Spaniards that of Madrid, while we have used both that of Greenwich and Washington. The French representatives appear to have made the principal objection to the adoption of the Greenwich meridian as seeming to be an English standard, but as it extends from north to south through the whole of Western France, they could remedy this by setting up an observatory on that line, and styling the reckoning accordingly.

Henry T. Anthony.

Mr. Anthony, who was one of the pioneers in taking up the famous invention of Daguerre, and afterward among the most prominent in developing and extending the business of photography, died at his residence in New York city Oct. 11, aged 71 years. The immediate cause of death was the result of injuries received from a fall in attempting to run out of the way of a cab car. Mr. Anthony was graduated from Columbia College in 1832, studied engineering and became a surveyor on the Erie Railroad, was employed on the Croton Aqueduct, and was also an engineer on the Hudson River Railroad. His name has for many years been most familiar, however, as that of a member of the firm of E. & H. T. Anthony & Co., manufacturers of and dealers in photographic materials. He had especial charge of the manufacturing department, and was the originator of many improvements in practical photography.

Raw Umber.

This is an ocher found on the island of Cyprus. It is known in the trade as Turkey umber, and the genuine article is a soft brown pigment, transparent in oil, and abounding in manganese, from the presence of which it derives its drying properties.