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THE THOMSON-HOUSTON EXHIBIT AT THE INTERNATIONAL ELECTRICAL EXPOSITION, PHILADELPHIA.

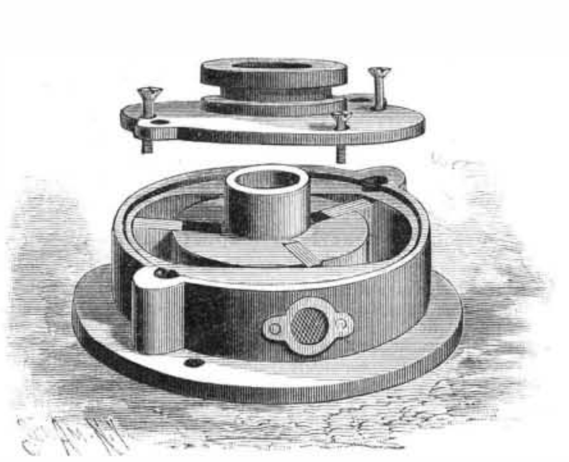
Visitors to the Exposition, upon entering the main gate and then turning to the right, had their attention attracted, before they had proceeded far, by a multitude of powerful arc lights suspended above a raised and richly carpeted flooring. Here were displayed a series of finely wrought mechanisms, from an exposed core of a dynamo to the perfected machine. This was the headquarters of the Thomson-Houston Electric Company, of Boston, Mass., which of late has become widely known for the efficiency of its apparatus and the business-like thoroughness of its system.

In the general exhibit this company had five dynamo machines in constant action, two having a capacity of 30 arc lamps, two more of 12 lights capacity, and still another of 6 lights. Besides these there were models of the unfinished Thomson-Houston dynamo, so arranged that the parts could be inspected, and other specimens of the latest improved type.

To those who had the time and inclination to attentively study this exhibit—and there were many such—conclusive evidence was presented of its possession of novel and striking features when compared to other systems of the same type. It was noticed that the hissing and sputtering, so common in some arc systems, were here reduced to a minimum, and the lights were powerful, constant, and steady.

A diminutive dynamo and plant designed by Prof. Thomson illustrated the system in all its workings far better than could have been done by a plant distributed to distant parts of the building. It showed clearly the relations between current, electromotive force, and work. A small dynamo generated a constant current, which kept aglow six arc lights, each of the intensity of sixty candles, and by switching the current it could be made to leave the arc lights and supply the requisite energy for an incandescent plant.

The peculiarity of the Thomson-Houston dynamo may be said to lie mainly in the armature, the construction of which is strikingly original. This armature is made of a cast iron hollow shell; and iron wires, forming an oblate



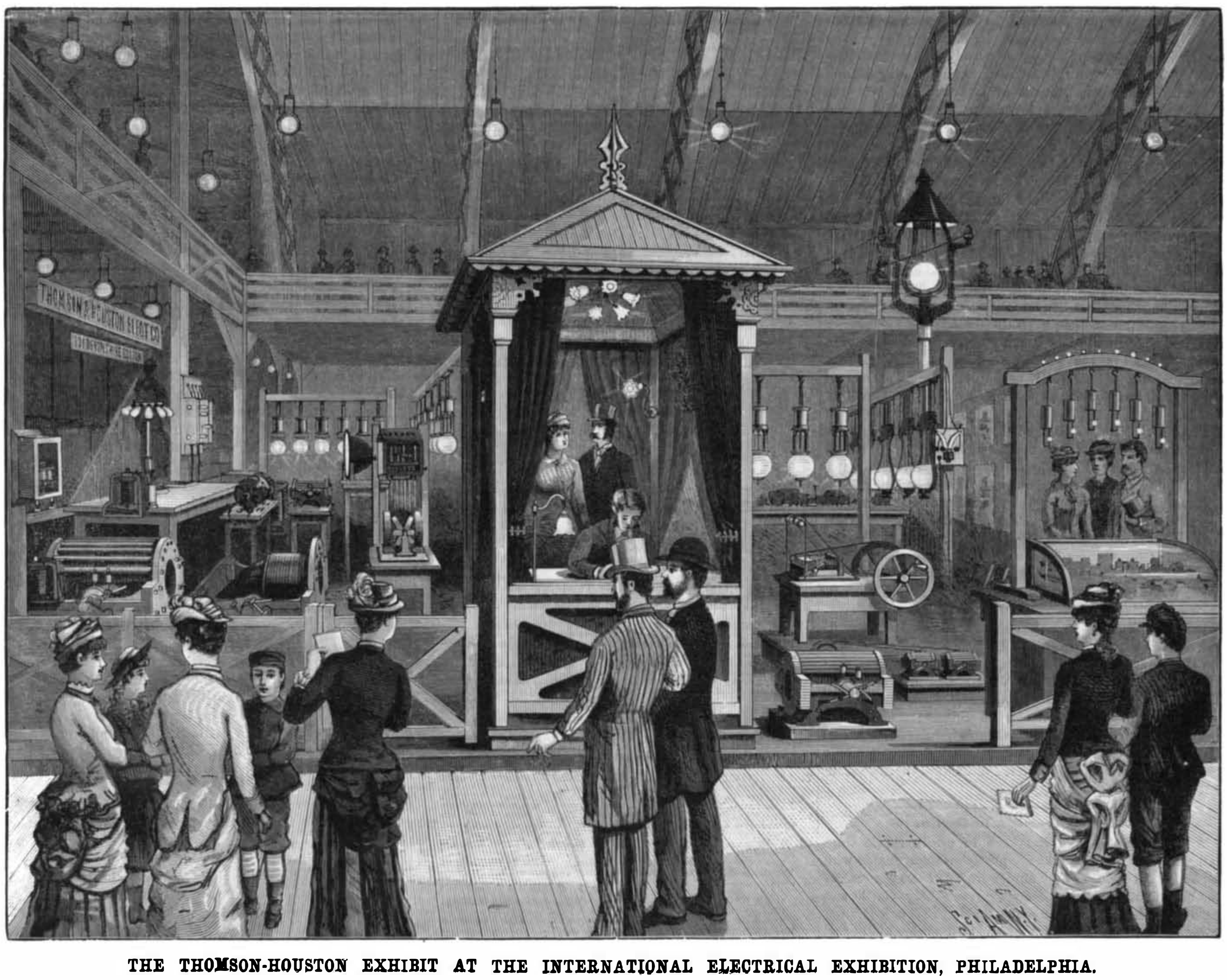
spheroid, surround this. Insulated copper wire in three series is wound on this core. Starting at that part of the shaft opposite the commutator, the wire of each of these series is led over the longitudinal circumference of the core, and, in order to avoid the shaft, changes its course and returns *via* the opposite circumference of the core. After making a sufficient number of convolutions, the terminal is carried out to a segment of the commutator, the beginning of the wire being attached to a coupler near that portion of the shaft which is opposite the commutator.

A like direction is taken by the second series of wires, which are kept at an angle of sixty degrees with the first, and the third series of wires follows at another angle of sixty degrees. The initial ends of these last two series are affixed to the coupler to which the first is attached. Hence all of them are electrically connected. To different plates of the commutator the three free ends are affixed. This method of winding has proved to be very efficient, two series being constantly maintained in the field of force.

By means of a combined motor and generator shown in the exhibit, the arc light or motor circuit can be made to feed incandescent lamps, an alternating current being used. The system employed is that of building on the same shaft the armatures for both the motor and the lighting apparatus, and any kind of current as to character or potential may be taken off.

What attracted not a little attention to this exhibit was the running of arc lights in multiple series. This is an invention of Professor Thomson, and a very important one, for, as seen at the Exposition, it permits the running of arc lights of altogether different intensities from a single circuit, some of them being in series, while others are in multiple arc or in multiple series, and renders practicable divisions and redivisions of lights as well as the rejoining of arc circuits.

For the benefit of scientific institutions and the lecture room generally, the Thomson-Houston Company make a hand dynamo. As exhibited, it showed that it is capable of generating a small arc light or several incandescent lights,



THE THOMSON-HOUSTON EXHIBIT AT THE INTERNATIONAL ELECTRICAL EXHIBITION, PHILADELPHIA.

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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(Illustrated articles are marked with an asterisk.)

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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.