SCIENCE

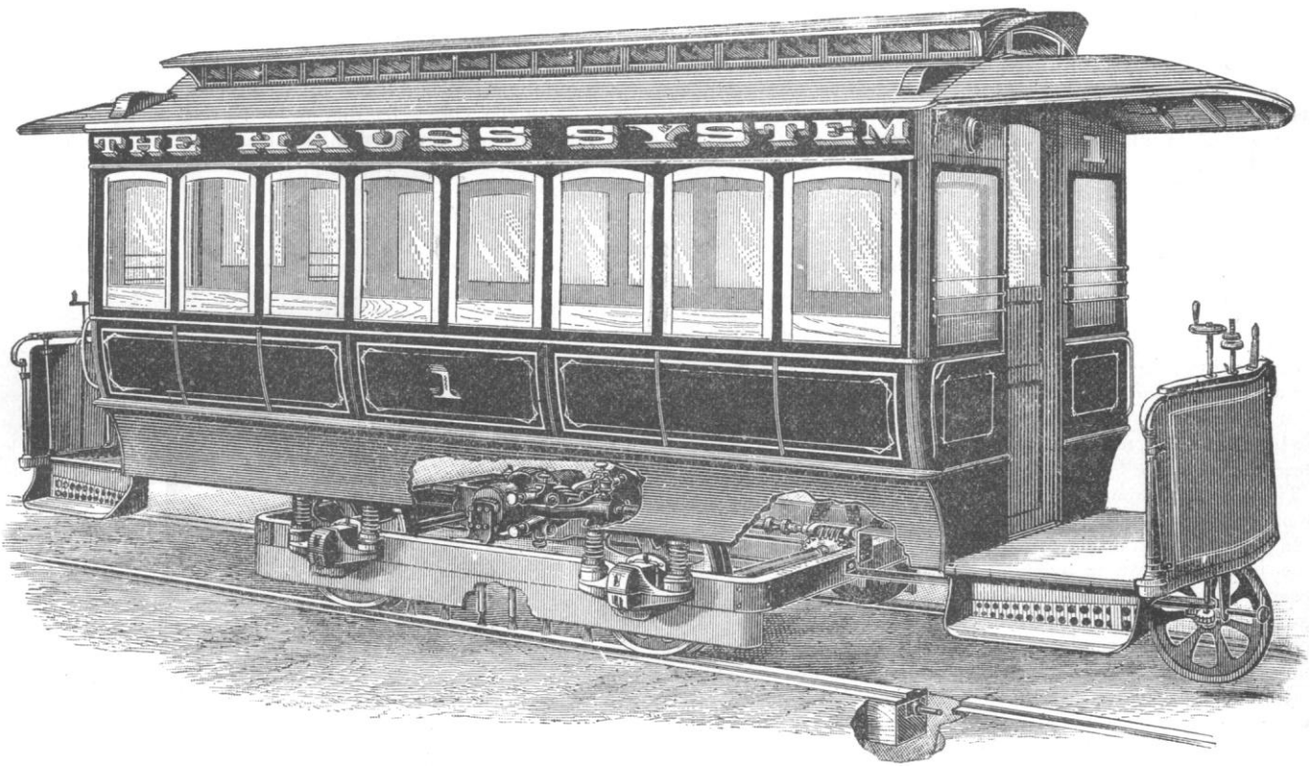
FRIDAY, DECEMBER 21, 1888.

THE HAUSS ELECTRIC RAILWAY.

ALTHOUGH that which has been accomplished within the past ten years in the applications of electricity to the arts of civilization affords a never-failing theme of interesting comment, it is more than probable that we have really only witnessed thus far the beginnings of its possible applications. We may anticipate, from the varied forms in which electricity will ultimately be applied for the ransmission of power, results even more remarkable than those which have followed its application in the field of illumination. It is well established that the energy of the electric current may be conducted, with comparatively little loss, over great distances; and the practical possibilities which this fact suggests of employing this agent as an advantageous substitute for steam in the production of motive power are fully appreciated by the army of able and ingenious inventors who are directing their energies to the practical side of electrical science. It is gratifying to know, also, by the admissions of so eminent an electrician as Professor Ayrton, that in this direction American electrical engineers have advanced considerably beyond their European brethren; for, while we have thousands of electric motors driving machinery of various kinds in this country, they are, with a few notable exceptions, practically unknown in Europe.

The most interesting and important of the problems involving the utilization of electricity for the transmission of energy is that of the electric railway. The successful solution of this problem, it is safe to say, will prove a great blessing to our cities in definitely settling the question of rapid transit. That sooner or later a method of electric transmission for this important service will be found, is something that no one disputes; and the eagerness with which intelligent people of all occupations follow the details of every new experiment having this for its objective point, affords the best evidence that the right method will receive a warm and unanimous welcome when it makes its title clear to the claim.

The conditions which an electrically operated railway in the streets of a city must fulfil are difficult of attainment. It must be entirely free from danger; it must be simple in construction and operation; and it must be an economical system in respect of first cost, maintenance, and operation. An additional point will be gained if a system of this kind could be devised by which the rolling stock of the present tramway companies could be utilized. The system that shall most fully realize these conditions will have successfully solved the problem of the electric railway for city service.



THE HAUSS SYSTEM OF ELECTRICAL TRACTION.

We have lately had the opportunity of examining and witnessing the operation of a system of electric railway for which claims of unusual merit are made. It is the Hauss electric railway, controlled by the Hauss Electric Company, and we shall devote some space to the consideration of its merits. As these may best be made conspicuous by comparison, we may properly consider the features of the several electric railway systems now in use.

The various systems now before the public may be enumerated as follows: first, the overhead system; second, the third-rail system; third, the use of the two rails as conductors; fourth, underground conduits; fifth, storage-battery; sixth, the Hauss insulated, sectional, underground system.

Respecting the system employing an overhead conductor, it may be said that its characteristic feature — the necessity of employing lines of posts and wires strung overhead — is an objection of the most serious character, which is practically prohibitive of its use in the built-up sections of cities, leaving out of the question the

serious troubles encountered in switching and crossing where many cars are used.

The third-rail system has in many cases been discarded, on account of the danger of receiving shocks to which persons and animals are exposed in crossing the rails, and on account of the great loss by leakage due to the extreme difficulty experienced in maintaining proper insulation.

The system using the rails as conductors has been discarded, because of the same objections that have just been urged against the third-rail system. The objections to the underground conduit system are the great first cost; the necessity and the expense of tearing up the streets, which in many cases prohibits its adoption; and the necessity of providing for its perfect drainage, which, in connection with the serious troubles in maintaining insulation, greatly adds to the cost of its maintenance and the running expenses.

The storage-battery plan, at first thought, would seem to be the ideal system. It dispenses with the necessity of a continuous conductor, the electrical generator and motive power are all contained within the car, and there is apparently an entire absence of any possibility of danger to passengers. These favorable anticipations would be justified were it once demonstrated that a storage-battery had been devised that was economical of power, of reasonable weight, and durable in service. Thus far, however, the best storage-battery that has been devised is very wasteful as a source of motive power, yielding at most but forty per cent of the power applied, excessively heavy and bulky, making it necessary to carry about three times the load of an ordinary car, and requiring a special car to be built to provide the necessary space beneath the seats to receive the batteries, — a matter of very notable importance, since it prohibits the use of the rolling stock of the surface roads without considerable cost for alterations. Furthermore, the storage-battery, as thus far developed, has a life of only two years of constant service, and it is subject to the danger of short-circuiting, which at once destroys its usefulness. Whether any or all of these deficiencies, which at present seriously interfere with its usefulness, may be remedied in the future, is a question which time alone can determine. It is sufficient for our present purpose to know that the storage-battery, in the best forms of to-day, is seriously handicapped by reason of these objectionable features.

The construction and mode of operation of the Hauss system will be understood from the following explanations: —

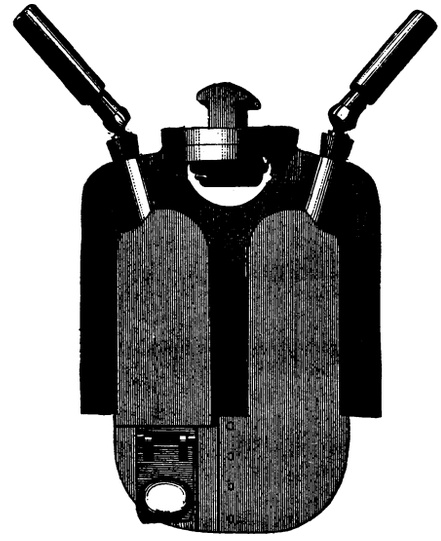
In this system an insulated wire is used, covered with rubber and other material known to be highly efficient in the case of underground electric-light wires. This wire is placed in a groove in the stringer underneath one of the rails, and is passed through metallic pockets, which are also placed underneath the rail. In order to obtain additional insulation, the stringer is coated with asphaltum. The metallic pockets are placed beneath the rail having the grooved stringer carrying the line-wire. The rails on this side are made in sections, each twelve feet long, each section being insulated from adjacent sections. When the car passes over the rail, contact is made with the wire in the pocket, and the current is collected by means of guard-brushes and the wheels. The entire length of the track is dead, and the only portion which is charged is a space twelve feet long directly under the car. When the car leaves one twelve-foot section, this section immediately becomes dead, and the next section over which the car is then passing becomes charged. There is at no time any portion of the track charged except that portion directly under the car, thus not only insuring against all danger to persons or animals, but also insuring efficient insulation along the entire route, and preventing a heavy leakage of current. The current is conveyed from the guard-brushes and the wheels to the motor, and through the other rail to the ground.

The speed or direction of the motor can be controlled from either end of the car. The motor is built as light as is consistent with the best electric results (a twenty-horse motor, weighing one thousand pounds), and the armature is run at a very moderate speed. The efficiency of the motor is affirmed to range, by actual test, at about ninety-five to ninety-eight per cent. The power is applied directly to the axles of the car by means of a worm and worm-gear, the latter being placed on each of the axles, and the worm connected directly to the armature shaft and provided with two ball-and-socket joints, to compensate for any slight derangement in the relations between the motor and the shafts. The motor is bolted to a frame hung on the axles of the car, and fastened rigidly to the journal-boxes. The springs rest on the journal-boxes, and support the body of the car. The motor and truck are entirely independent of the car-body, and have no connection therewith. The motor can be geared so as to run the car ten or more miles an hour, and, as we witnessed at the trial of the system, can be perfectly controlled from the slowest movement up to full speed, and instantly stopped or reversed, if necessary, without injury to the machinery. No hand-brakes are required with this system, as the wheels are automatically locked when the armature ceases to revolve. In going down grade, there is no danger of the operator losing control of the car, and no possibility of the car running away. Another feature introduced on the car is a fifth wheel, shown suspended at the front end, which can be let down, and by means of which the front end of the car can be jacked up. When thus resting on three wheels, the car can be led around any obstruction and brought back to the track, connection with the track-conductor being temporarily made with flexible conductors. By this system the cars are able to leave the track, to go around a breakdown or an obstruction, to go over fire-hose when stretched across the track, or to cross over and take the back track. Finally, there is not an inch of room required for passengers that is used, and not a sign to denote the use of electricity in the propelling of the car to be seen above the floor. By this system, it is claimed, the cost of running is brought lower than has been possible with any other thus far devised, and the claim appears to be based on reasonable grounds.

The simplicity of the motive mechanism is such as to insure the minimum of trouble in operation; and the entire system, in respect of economy of construction, maintenance and running, and absolute safety, appears to have eminent merits.

THE CONDUIT SYSTEM OF ELECTRIC RAILWAYS.

Among all the different types of motors which have been pressing their respective claims upon the attention of the public during the last few years, there is none which can compare with the electric motor in its efficiency, its adaptability to all sorts of work, and its practicability as a means for the distribution of power from a



CONTACT DEVICE.

central station at a moderate expense. The number of electric motors now in every-day operation, and the extended range of the uses to which they are put, are matters furnishing constant surprise to all who are unpossessed of the latest information on these points.

One of the most interesting of the applications of the electric motor is found in the electrically propelled street-car of to-day which has already created a revolution in the field of locomotion and which promises in the near future to be as commonplace an