SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. L.—No. 21. [NEW SERIES.] NEW YORK, MAY 24, 1884. [$3.20 per Annum. [POSTAGE PREPAID.]

A NEW CABLE RAILWAY SYSTEM.

Of late years the rapid increase in size and population of many of our cities has brought into prominence the question of rapid communication between their distant parts, and the result has been that various systems of railroads have been put into operation to supplement those worked by horses.

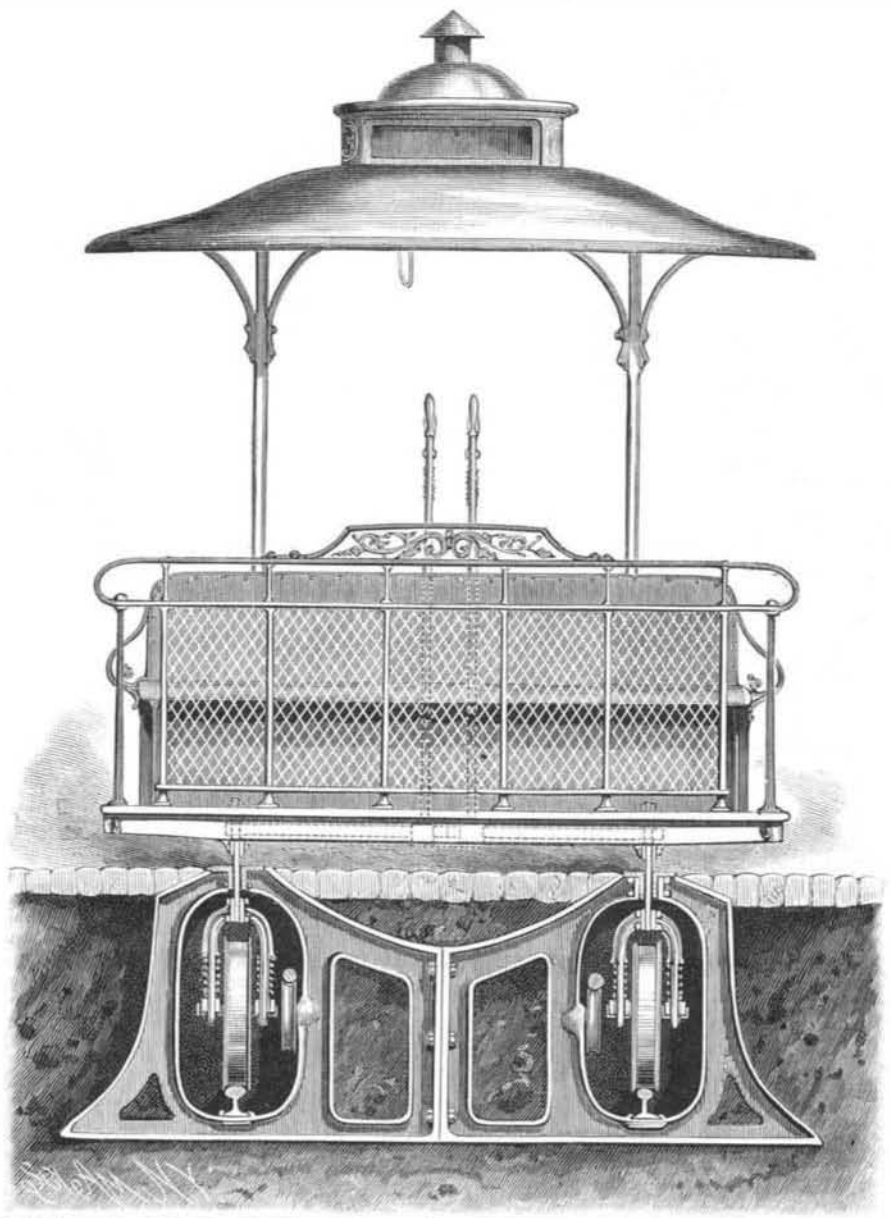
Among them we find, especially in New York city, the elevated roads, which, although they fulfill the object desired, are nevertheless attended by such grave and numerous inconveniences as to make their general adoption out of the question.

More recently cable railways have been put into operation in several cities, such as San Francisco and Chicago, and the results attained have been such that many now conceive this to be the best plan of car propulsion.

In these roads the cars run, as usual, upon tracks laid in the street, and running below the ground between the tracks is a trench or tunnel, through which a cable driven by a stationary engine travels. A slot permits of the passage of the bar to which the grip is attached, which when gripping the cable propels the car at the same rate as the cable travels. Although these roads are, in a measure, successful, they nevertheless present a number of disadvantages, and it is with a view to removing these that the system represented in our engravings was devised.

This system differs radically from all others in the fact that the wheels of the cars are placed underground in the same tunnel in which the cable travels.

The accompanying illustrations show a general and a cross sectional view of the new cable railway, that on page 326 being an isometrical view showing the grip arrangement. It will be seen that no tracks are laid in the streets, but in their stead



two slots appear which communicate with two tunnels, constructed in the following manner:

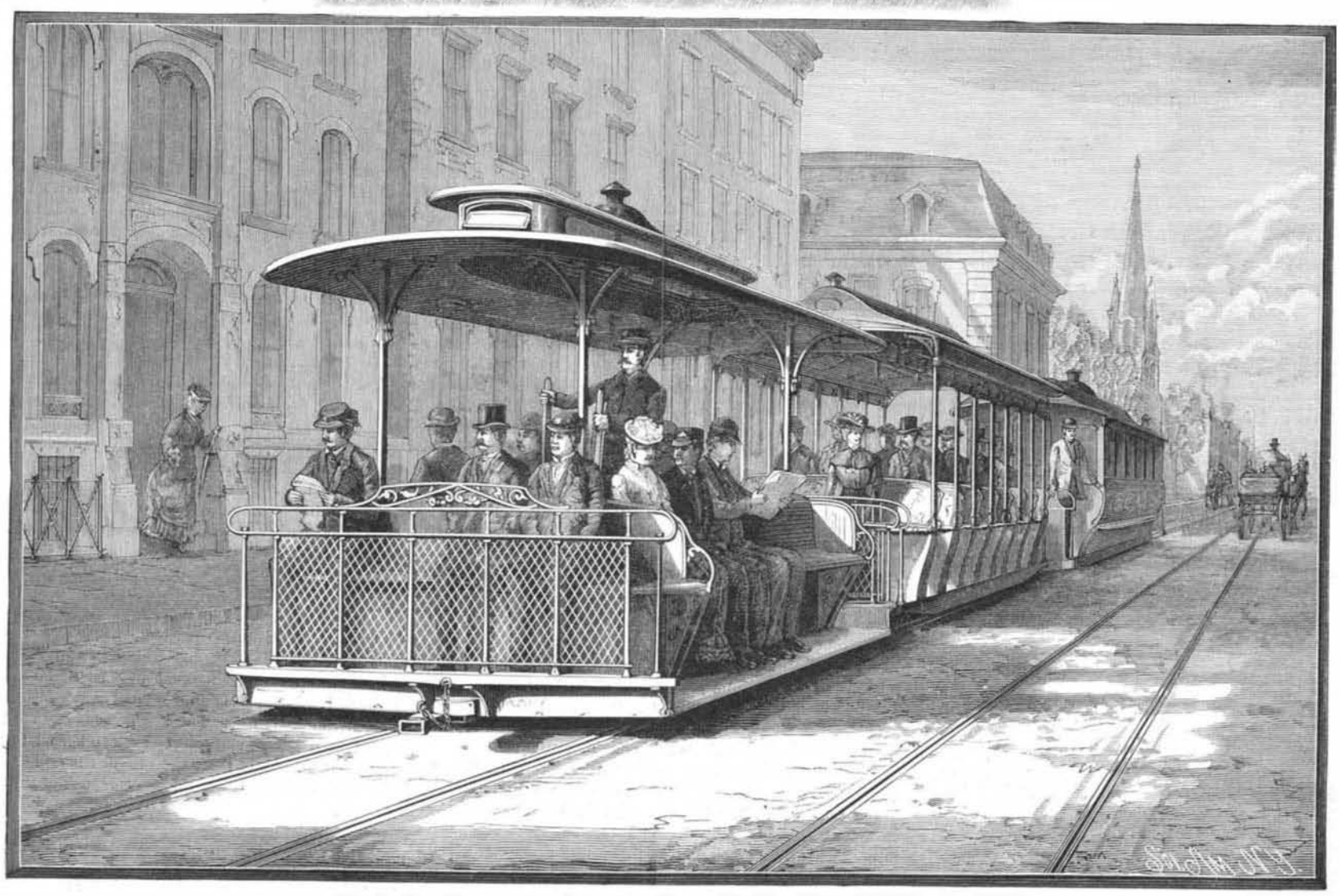
Upon a bed of concrete there are erected cast iron chairs, bolted together at their ends so as to form one piece. Each of these double chairs has two oval openings, and all openings on the same side are connected by sheet iron, thus forming two separate passages or tunnels. All the intervening space between these tunnels is filled up with concrete, and upon this solid bed the paving stones are laid, the distance from the bottoms of the chairs to the top of the pavement not exceeding four feet.

The rails are laid on the bottom of the tunnels, and at suitable intervals along the sides pulleys are provided upon which the cables travel. The car runs on four 24 inch double flanged wheels, and is supported by four steel standards half an inch in width, which pass through the slots and are attached to the fork-shaped journal bearings, which rest on springs.

The slots are formed by two angle irons placed half an inch apart, the tops being flush with the pavement. This does away entirely with troublesome tracks and leaves the street unbroken from side to side, besides providing an excellent track for vehicles to run on without fear of breaking axles or wheels when turning aside.

Another very important feature of this system is the means provided for establishing varying rates of speed, according to the amount of traffic in the street. This is effected by means of two cables, a slow speed and a high speed one in each tunnel, each of which has a constant speed of its own. Each grip car is provided with two levers, and by throwing out one or the other the corresponding grip is fastened either to the slow speed or the high speed cable. Thus the car can

(*Continued on page* 326.)



A NEW CABLE RAILWAY.—CROSS SECTION AND GENERAL VIEW.

A NEW CABLE RAILWAY SYSTEM.

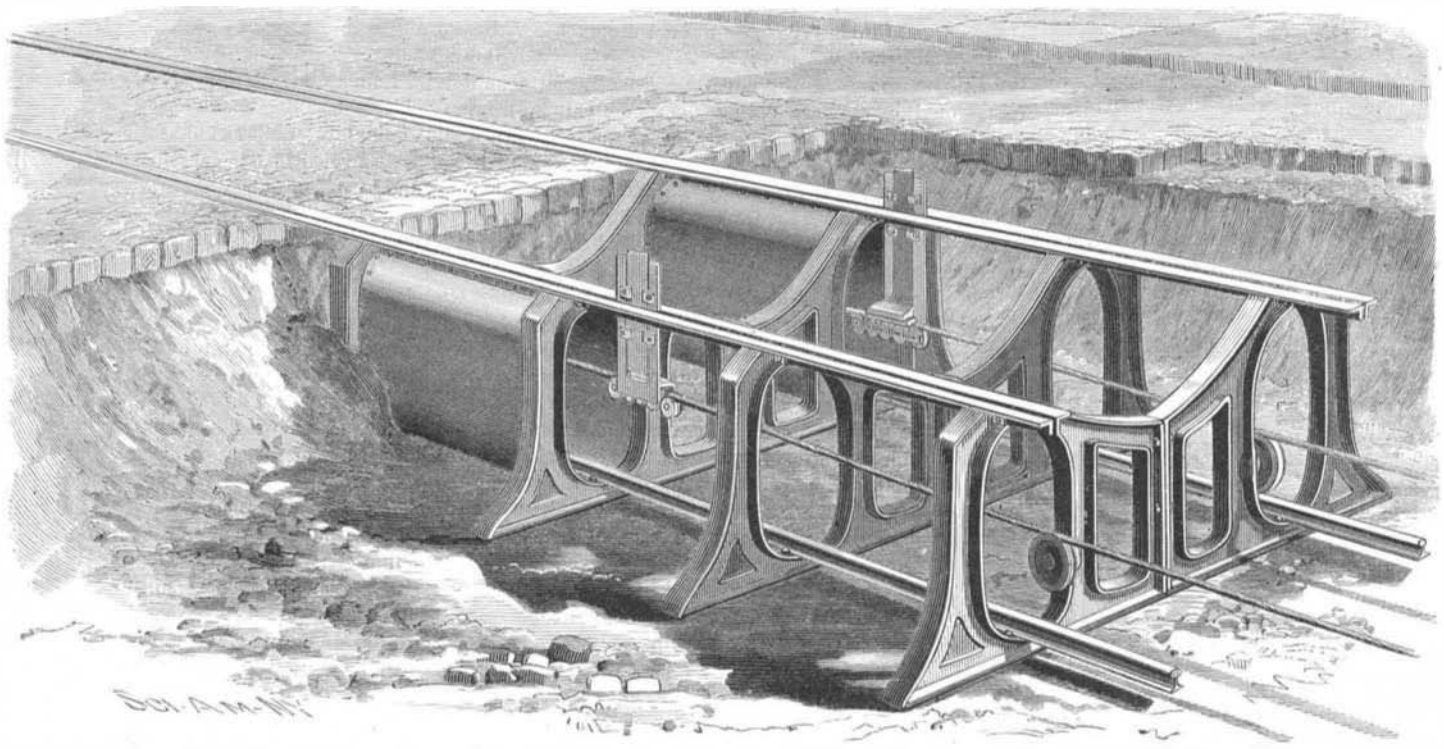
(*Continued from first page.*)

be propelled at a rate of 4 miles or 8 miles an hour at the will of the grip attendant. This feature is especially valuable for roads which run into the suburbs, where a high rate of speed is not objectionable, and it also affords a means of "making up lost time," when the road is accidentally blocked.

The cleaning of streets through which these roads run is greatly facilitated by attaching sweepers to the cables, and in winter the snow could be cleared for traffic as fast as it falls. From the nature of the system it will be seen that a snow blockade is impossible, since, the wheels being below ground, the one-half inch standards would pass through the snow with very little resistance. The floor and platforms of the cars, as the engraving shows, are close to the surface of the street, the platform requiring no steps—a great convenience for all, especially ladies and children.

This proposed system contemplates the building of a large main tunnel in the center of the street and two smaller ones directly under the chairs. The former will be of ample size to take in all necessary pipes and electric light wires, while the latter may be used exclusively for telegraph and telephone purposes. All the tunnels will be constructed of concrete, so that when once built they will last indefinitely. The increasing number of overhead wires and subterranean conduits makes it highly important that some system be adopted which will do away with both evils at the same time, and this proposed railway system, devised by Messrs. Orel D. Orvis and Nelson B. Adams, has this end in view.

The Orvis and Adams system, which presents many novel and interesting features, is controlled by the United States Cable Road and Subway Company, of No. 261 Broadway, New York, and those interested in city passenger traffic, as well as all city authorities and electric companies, are asked to examine into its merits.



A NEW CABLE RAILWAY.—ISOMETRICAL VIEW, SHOWING MANNER OF CONSTRUCTION

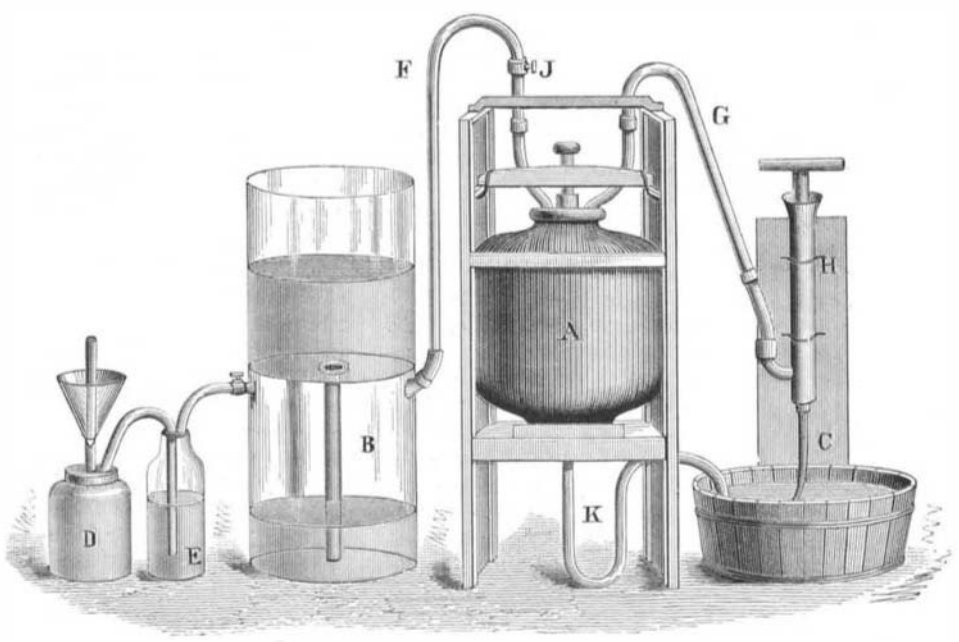
Idle Steamers.

Already about one-fifth of the total number of merchant steamers registered at northeastern ports has been laid up by the owners in consequence of their inability to obtain remunerative freights. The shipping trade is actually becoming worse instead of better, and the question of a remedy is beginning to strongly exercise the minds of the underwriters. Notices convening special meetings of the Mutual Insurance clubs in the Hartlepools, clubs which have an aggregate capital of over four millions sterling, have been issued, and it is the intention of the clubs to consider the advisability of increasing the return premiums for steamers detained in port by 50 per cent during the period from April to September. This is done with the intention of offering a premium to owners to lay up their ships, so as to produce a strengthening effect upon the freight market. The remedy seems a curious one, though at the same time it is no more out of place than the resolution of ironmasters to subsidize those who agree to put their furnaces out of blast in order to increase pig iron prices.—*The Engineer.*

A LINE of railway cars, to be drawn by camels, will shortly constitute one of the peculiar features of travel and transportation in Central Asia.

THOMPSON'S BLEACHING PROCESS.

When any marked advance is made either in applied science or the industrial arts, it is by no means wholly unprofitable or devoid of interest to take a retrospective glance at the history of the matter at issue. On the contrary, it may prove very profitable, as showing the various landmarks in progress which have been reached and passed, and highly interesting as indicating the degree of proximity in which present development stands in relation to ultimate perfection. It is in this connection that we here revert to the early days of bleaching, in order to bring out to the full the important advances recently made in that useful art by Mr. Jacob Baynes Thompson, the practical working of whose invention we have recently had the satisfaction of witnessing. The early days of bleaching stand a long way off from the present time, but we need go no further back than the second quarter of the last century to find the Scotch sending all their brown linen to Holland in the month of March to be bleached, and receiving it back in the following October. Then it used to be crofted, or spread out on the bleaching grounds for months, and sprinkled with water several times a day. Some advance was, however, made in 1749, when bleach works were established in the north of Scotland with tolerable success. The course of procedure consisted in first bucking the cloth or steeping it in alkaline lyes for some days, and then washing it and crofting it for several weeks. After bucking and crofting the goods some half dozen times, they were steeped in sour milk for some days and then washed and crofted, these processes being repeated until the bleaching was complete. The process was an expensive one, not only from the time occupied in effecting it, but from the large area of grass land necessary to carry it out.



THOMPSON'S BLEACHING PROCESS.

In course of time an improvement upon this method of bleaching, which was known as the Dutch method, was effected by substituting dilute sulphuric acid for sour milk in the souring process. This was a grand step in advance, for it reduced the time required for bleaching from eight months to four. But the year 1785 saw a marked improvement introduced by Berthollet, who suggested the application of chlorine to bleaching. Watt took up the question in the following year, and in course of time the chlorine process was adopted in bleach works, and chlorine forms the basis of the process as now carried out.

It would fulfill no useful purpose were we here to follow the various improvements which contributed to reduce the period required for bleaching from months to weeks and from weeks to days. We, therefore, pass on to describe briefly the process as we find it carried out in ordinary at the present time. Although great advances have been made, bleaching is still a comparatively slow process, and any recent attempts to hasten it have been carried out at the expense of damage to the fabric. In the ordinary process the goods to be bleached are first boiled with lime in a large circular boiler, or "keir," as it is termed. The boiling is continued for about seven hours, after which the goods are washed in clear water, and are then submitted to the souring process. This consists in steeping the goods for four or five hours in water made sour by means of hydrochloric acid. The goods are then washed again, boiled for nine hours in a soda lye, washed again, and then submitted to the "chemicking" process. This consists in steeping the material in a dilute solution of chloride of lime for about four hours. These processes, with the exception of the lime boiling, are repeated over and over again until the bleaching has been effected.

There are in all some sixteen distinct operations for ordinary cotton goods, the time occupied usually being from five to eight days. This condition of matters would now appear to be greatly changed by Mr. Thompson's ingenious process, which has now further reduced the time required for bleaching from days to hours. The main feature in this process consists in the peculiar and original methods of chemicking and souring, these two operations being performed at one and the same time. The bleaching liquid used is a very dilute solution of chloride of lime, of about specific gravity 1·0006, or less than a degree Twaddell. The decomposing or souring agent is carbonic anhydride, commonly known as carbonic acid gas.

There is another original feature in this process, viz., the use of a solution of triethylrosaniline and oxalic acid, through which the fabric is passed, the object being to remove the faint, natural yellow tinge of the cotton.

In carrying out the Thompson process, says *Iron*, to which we are indebted for our illustration, the goods are first boiled in an alkaline solution, and washed. They are then placed in an air-tight keir connected on the one hand with a vessel containing the bleaching solution, and on the other with a gas holder containing the carbonic acid gas.

In the annexed engraving we illustrate the apparatus by means of which the success of the process was practically demonstrated on a working scale, and which is capable of treating 100 yards of cloth. In our engraving, A represents the bleaching keir, B the gas holder, C the vessel containing the bleaching solution, D the carbonic acid gas generator, E the wash bottle containing water for the purpose of cleansing the carbonic acid gas as generated, F the gas pipe leading from the holder to the keir, G the pipe through which the chlorine solution is pumped into the keir, H the force pump, K the siphon pipe through which the chlorine solution is run from the keir back into its tank, and which prevents the escape of the carbonic acid gas with which the keir is filled after the chlorine solution has been drawn off. The mode of working the apparatus is as follows: After the material to be bleached