

in the Austrian statutes would be repealed. This done, we should have gained an entering wedge toward ameliorating the similar laws of other countries, and eventually we should succeed in obtaining for our countrymen as full privileges in Europe as in the United States.

Our representatives, in advocating the appropriation, seem to look no further than the so-called protective certificate to be granted to exhibitors. It should be distinctly understood that the certificate simply purports to afford protection for a year; that is, it saves the inventor from the loss of his right to a patent during the period of the Exhibition. There is nothing to prevent an Austrian from gaining all possible knowledge regarding an idea, completing every preparation, and at the end of the specified time putting all he has thus acquired into practical execution. We have shown that nothing can be accomplished by bringing infringement suits, and that to this piracy there is no check. The certificate therefore merely permits the inventor to delay his application for a patent one year, and leaves him precisely where he would be in the beginning, did it not exist. He must accordingly then manufacture within the succeeding twelve months precisely in correspondence to his drawings, etc., and comply with sundry other similar regulations, or his patent, if he gets one, is null. On the other hand, an Austrian coming to the United States with a new invention may, by our law, make, sell and exhibit it all over the country for two years, and at the end thereof obtain a patent for seventeen years giving him complete and exclusive property in his device. He is not compelled to work his invention within any specified period, but is at liberty to do precisely as he pleases with his patent, which remains good for the term granted.

It is but little appreciated in this country to what an immense extent American inventions are manufactured abroad, and what vast benefits the people of Europe reap from our ideas. The continent is full of devices of American origin, and every new improvement of value is immediately adopted there, pirated and manufactured to the exclusion of the American inventor. The scientific publications of the continent are full of extracts from American patents, which they issue, with engravings, of all our latest and best improvements, which are promptly put in use. Of the dozen or more steam engine exhibitors from Austria, Prussia, Russia, Belgium, and other countries in the late Moscow Exhibition, nearly every one displayed Corliss engines of their own manufacture, made after the patterns used in Providence, R. I.; the entire steam power of the exhibition was supplied by these engines. In Russia, Prussia, Belgium, and Austria, the McCormick reaper, Howe sewing machines, Burleigh rock drill, Blake stone breaker, Gatling guns, Hotchkiss' projectiles, Colt's revolvers, Hoe's and Bullock's steam presses, Danks' puddlers, Westinghouse's railway brakes and hundreds of other American designs are well known, and many of them used; and without doubt large numbers of our best inventions of the most recent dates will be found among the entries of foreign manufacturing houses in this Vienna show.

We should have been glad had the motion in the House to strike out the appropriation altogether prevailed. Not that we do not appreciate the value of the Exposition, or fail to believe that, in the words of a contemporary, we "ought to join in all peaceful measures which belong to international courtesy and promote mutual goodwill," but simply to publish to the world that the United States failed to take part in the Austrian Exposition, because Austria has refused to do justice to American inventors. This it is yet in our power to do, and the amendment that we advocate should be so worded as to deny the payment of the appropriation until the Secretary of State receive official notification of the alteration of Austrian laws.

Our leading position among industrial nations, our world-wide renown as a people of transcendent inventive genius and our unexampled progress in civilization during the past century are due in great part to the stimulation and encouragement which our laws give to the inventor, teaching him to study new arts and processes, to develop new ideas and in the end to turn the results of his thought and labor into substantial profit. Is it not evident that the stimulus, thus afforded, would be infinitely increased could we make a world, instead of a country, the market for our productions? Can it be controverted that the direct advantages to our people would be invaluable, did they possess an exclusive and guaranteed property in their own original ideas in foreign countries? Or is not the fact plainly manifest that, were such rights secured to the United States and other people forced to come hither for the most useful improvements in science and art, we should place all other nations under contribution. In view of such benefits, the acquirement of which is so easily begun, it seems impossible that our legislators will neglect so plain a duty as to secure for the country the advantage which is now within their grasp.

#### SUNDAY RAILWAY TRAINS.

A few weeks ago we published a paragraph, copied from a reliable source, to the effect that the Brotherhood of Locomotive Engineers, in their recent St. Louis convention, had passed a resolution having in view the entire stoppage of railway trains on Sunday. We commented on such action as unwise, showing that while we were as decidedly in favor of the general rest from labor, on the part of engineers, of one day in seven, as anybody could be, still we considered it to be a matter of public necessity that certain trains should be run on the Sabbath.

The New York Daily Witness, in commenting upon our remarks, says:

"Is it not strange that the SCIENTIFIC AMERICAN should

be in antagonism to this Brotherhood of Locomotive Engineers, which recently passed resolutions in St. Louis in opposition to the running of Sunday railroad trains? The SCIENTIFIC AMERICAN believes in running them for mails, passengers, and freight as a necessity. The Brotherhood believes in no such necessity; but that the running on Sunday is a breach of the divine command and an infraction of public morals. We are glad that the Brotherhood are not afraid to speak their minds in favor of all classes connected with railroads having the rest of the Sabbath. Right is might and must prevail."

The Witness, if it wishes to give reliable testimony upon this subject, should inform itself better before attempting to speak. The SCIENTIFIC AMERICAN did not urge the running of freight trains on Sunday, but spoke of the necessity of running a limited number of trains for the transit of the mails and the carriage of such passengers as from necessity had occasion to travel on that day. The SCIENTIFIC AMERICAN further alleged that it was no more sinful to travel in case of necessity on a railroad, which was a public road, on Sunday and in a railway car, than to ride on an errand of necessity in an ordinary buggy on a common road on the Sabbath.

The Witness is also mistaken as to the objects of the Brotherhood. We have received a letter from Mr. Charles Wilson, G. C. E., of the Brotherhood, from which it appears that the engineers do not seek to stop all trains on Sunday, but only the unnecessary trains. He states that on some roads more traffic is run on Sunday than on any other day of the week, and it is to prevent this and cause the Sunday trains to be restricted to such as are actually necessary that the Brotherhood have resolved.

In this laudable endeavor the Brotherhood well know that they may count upon the aid of the SCIENTIFIC AMERICAN, and to this end we will thank them to give us the names of the roads and their controlling officers who impose in the manner stated by Mr. Wilson upon their engineers.

Inasmuch as the Brotherhood do believe with us, as represented by Mr. Wilson, that the running of certain trains on Sunday is necessary, the Witness' fervid puff of the piety of the Brotherhood, as relates to the breach of the divine command and the infraction of public morals, is entirely wasted.

#### THE NEW YEAR.

The present number of the SCIENTIFIC AMERICAN is the first for the new year of 1873, and we would remind those of our readers who have not already done so that their subscriptions should be at once renewed. This will prevent interruption in the regular coming of their papers, and save them the risk of losing any numbers. One of our subscribers says that he regards the loss of a single number of the SCIENTIFIC AMERICAN like time lost in the prime of life. Send in your subscriptions as fast as possible. Terms, \$3 a year. One copy of the SCIENTIFIC AMERICAN for one year and one copy of SCIENCE RECORD for 1873 will be sent for \$4.50.

Some idea of the interesting and valuable character of the SCIENCE RECORD may be gleaned by reference to the general statement of contents published in our advertising columns. It will be noticed that every department of science is to be represented. Among the biographical illustrations several fine steel plate engravings are given, among which are portraits of Professor Henry, of the Smithsonian Institute; Professor Pierce, of the Coast Survey; Professor Dana, of Yale; portraits of Professor Morse, as he appeared in the prime of life, soon after the completion of the first telegraph line, of Professor Tyndall, who is now lecturing here, and other distinguished men of science.

#### RAPID TRANSIT IN NEW YORK.

The New York Times does not look with favor upon the proposition to use steam upon the street cars, in lieu of horses, for the reason that there would be increased liability to accident without any gain in speed. Our cotemporary thinks that the only way to realize fast traveling in the city is by means of tracks removed from the surface. The two ends of the metropolis are now twelve miles apart, and the people suffer great inconvenience for a lack of quick means of communication. The discussion of the various plans by which this may be best effected is a matter of interest, not only to New Yorkers, but to the people of all large cities. Nothing so stimulates business, gives value to property, and promotes the comfort of city life, as prompt and safe modes of local conveyance.

It is only by an elevated or an underground railway that rapid transit can be realized in New York. The relative cost of these roads is about the same, namely, from one million to one million five hundred thousand dollars per mile. The elevated road is inevitably an obstruction, in whatever street it is built, for it is simply an immense bridge, which no one wants before his doors. On the other hand the underground railway is entirely out of sight, does not interfere with the streets, and disturbs no one. In London a shopkeeper in one of the main streets was asked by an American where the underground railroad passed. He said he did not exactly know, but he believed it was on the next street back, a block distant from his premises. But the truth was, the railway in question passed directly in front of the man's door, forty feet below the surface of the ground; and the shopkeeper, who had moved in subsequent to the building of the road, was not aware of the fact, although three hundred trains a day were regularly passing. It has been affirmed by experienced engineers in this city that a single omnibus, clattering over the Broadway pavement, shakes the adjoining buildings

and makes more noise on each trip than would all the trains of an underground railway during an entire day, if built on that street. Well-made cars slide along very smoothly over a properly constructed track.

One and a half millions of dollars a mile is an immense cost for a city railway, and to insure its pecuniary success the first essential is to locate its route where its cars and accommodations will be constantly under the public eye, readily accessible to the largest portion of the population. Such was the testimony of the eminent engineer, Mr. John Fowler, before the Parliamentary Committee in respect to the London underground railways. It is evident that the route under Broadway in this city is the natural and proper line for such a road.

A variety of charters have been granted for steam roads in this city; but their routes are faulty, and none have been built, save the post railway on Greenwich street, which is far away from Broadway, and has proved a bad bargain to its original stockholders. They have not only lost their charter, but every cent of their original investments, amounting, it is said, to over one million of dollars in cash.

Another grand scheme was the Viaduct or elevated railway, the charter for which was granted to the notorious Sweeny & Co. The routes proposed were on side streets, east and west of Broadway. Although five millions of dollars were to be taken from the city treasury to help the scheme, still such was its enormously expensive character, so defective the route, and so greatly was it disapproved by the public, that it was impossible for the corporation to procure subscriptions enough to start the thing.

Three other charters were granted last year, one to Mr. Vanderbilt for an underground road on Fourth avenue, east of Broadway, another to Mr. Gilbert for an elevated railway to run on a side street either east or west of Broadway, according as certain commissioners may determine; and another to Mr. Swain for a double road, with both elevated and underground tracks, to run on the side streets west of Broadway. There seems to be no great obstacle to the procuring charters for New York railways. The grand difficulty is to secure the right route.

Of the various plans for fast railway in this city, that of the Beach Pneumatic Transit Company, for an atmospheric railway under Broadway, has been the most carefully examined and the most widely approved by the public. It has been shown that, for a cost of about one million dollars per mile, a double track railway can be built from the City Hall to Harlem which, with certain lateral branches, will give to our citizens the luxury of rapid transit all through the county. At the inception of this enterprise, the trustees of the corporation caused the most careful investigations to be made in respect to route and the method of building, and the unanimous conclusion was that the Broadway route was not only the most economical for construction, but afforded promise of accommodating a larger number of people than any other line that could be selected.

Great pains were taken to accumulate reliable evidence. Nearly all on the leading architects in New York were consulted in the matter, especially those who had had occasion to erect important buildings on the above thoroughfare. With an almost unanimous voice they joined in certifying that the railway could be built and operated on Broadway on the plan proposed by the company, without any molesting or of injurious effect upon adjoining buildings. The advice of the most eminent and experienced civil engineers was also taken, among whom were A. W. Craven, Esq., C. E., George S. Greene, Esq., C. E., Major General J. F. Barnard, U. S. Engineers, General Charles K. Graham, C. E., all of whom, after personal examination, certified in the most unqualified terms that the work proposed by the company could be executed and the railway worked without injury to adjacent property.

The advice of prominent English engineers was also taken upon the subject, among whom were Mr. F. E. Cooper, of the London Underground Railway, and Charles Douglas Fox, Esq., C. E., the well known railway constructor and engineer of London; all of whom fully coincided with our own engineers and architects. Mr. Fox did not merely write upon the subject, but had come to this country and made a personal examination of the route.

To illustrate the matter still further, and remove every lingering prejudice against the work that might exist in the minds of property owners, the company determined to construct a short working section of railway under Broadway. This they were enabled to do under the provisions of their original charter, which gives them the right to place pneumatic tubes under the streets for carrying freight and parcels. The company accordingly secured premises in the lower part of the large marble building at the corner of Broadway and Warren street, and, having constructed a novel boring machine, set it to work to excavate a railway tunnel down Broadway, below the foundations of the buildings, under the water pipes, sewers and gas pipes, without disturbing the surface of the street, and with all the omnibuses, trucks, and the enormous traffic of the street going on directly over the heads of their workmen. So carefully, expeditiously, and successfully was this work executed that the entire section of the tunnel, which is between nine and ten feet in diameter, from Warren street down Broadway to Murray street, was almost completed and the track laid before the newspaper reporters or the public were informed that anything of the kind was in progress. The work was then finished up, a large blowing engine put in, a handsome passenger car placed on the track, and the railroad set in operation. All this was done at an outlay of about a quarter of a million dollars. The admirable working of this short railway has been before described in our columns. It will