SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO., - - Editors and Proprietors

Published Weekly at

No. 361 Broadway, New York

TERMS TO SUBSCRIBERS

One copy, one year for the United States, Canada, or Mexico $3.00
One copy, one year, to any foreign country, postage prepaid. £0 16s. 5d. 4.00

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (Established 1845) ..... $3.00 a year
Scientific American Supplement (Established 1876) ..... 5.00 "
Scientific American Building Monthly (Established 1885) ..... 2.50 "
Scientific American Export Edition (Established 1878) ..... 3.00 "

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MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, NOVEMBER 5, 1904.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

THE SHOCKING DISFIGUREMENT OF THE SUBWAY.

The first impression of American visitors to the city of London is one of astonishment that in a municipality in most respects so well governed, such free rein should be given to the advertising bill poster. Cars, busses, and above all the station walls of underground railways, are so plastered with hideous advertisements that the metropolis of the world looks to the eye of an American like one big blistered abomination.

During the building of our splendid Subway it was a matter of frequent congratulation that the Rapid Transit Commissioners and their engineers had given such a large share of their attention to the question of its artistic appearance. The various photographs that were published in our journal during the construction of the road, showing the station interiors, were the subject of much favorable comment, and in the two or three weeks preceding the opening of the Subway, the citizens who, by virtue of their passes, had an opportunity to inspect the system and ride upon the cars, were unanimous in their praise of the simplicity, chaste beauty and hygienic excellence of the glazed tiling in which the station walls are finished.

No sooner, however, had the road passed into the hands of the operating company than every station was invaded by an army of bill posters, who proceeded to distribute along the walls of the station from end to end, a lot of miserable gilded tin frames, each containing a specimen of the lurid color work in which the bill poster delights. We have no quarrel whatever with this last-named gentleman; he has his place and a very useful one in the economy of modern life, but never, we think, did his zeal carry him so utterly outside of his lawful province as when, "rushing in where angels fear to tread," he transformed every one of the artistic walls of our Subway stations from a thing of beauty into the cheapest kind of billboarding.

Judged from the sanitary point of view the introduction of these tin signs is about the worst thing that the Interborough Company could have done. There is a natural prejudice on the part of a people as fond of fresh air as are the citizens of New York, against underground travel as such. In the early days of the struggle of the principle of Subway construction for recognition, the writer, who was ever an earnest advocate of the new road, found that this objection was very widespread, and even at the present time there are many people who have yet to be taught that the air of the Subway and its general hygienic condition are not unhealthful. The germs of disease love dark corners and a damp atmosphere, and it was largely because the Rapid Transit Commissioners recognized the necessity of building the station platforms and designing the station fittings with a view to securing good hygienic conditions, that they decided to use tiling for the walls, and to make these walls as plain and free from projecting ornamentation as possible, so that dust and dirt, those great harborers of disease germs, might have as little place of lodgment as possible. They even carried the principle so far as to abolish the sharp corners where the walls meet the platform, the tiling at the base of the walls being rounded off into the platform so as to admit of easy cleaning.

In view of these facts, we cannot conceive of any means by which the Interborough Company could have so effectually undone the sanitary work of the engineers as by leaning these miserable tin pictures, with their moldings and angles and corners, against the walls, thereby covering up the corners, and providing an excellent nesting place for dust, dirt, and disease.

As to the effect of this display upon the artistic paneling and dainty colors of the walls, it is hideous. The simple dignity of the architectural and engineering features of the stations is destroyed at once, and the platform spaces look like a tenement house moving, before the pictures have been hung.

Surely this magnificent city of ours bears sufficient evidence of the blighting effect of purely utilitarian and mercenary tendencies as against considerations of good taste and artistic sentiment, without this last and most splendid of its engineering achievements being so pitifully belittled and cheapened.

The burden of the public indignation which is being felt at this desecration is entirely upon the shoulders of the Interborough Company, for the public will not be surprised to learn that, when the question of advertising was mooted, the Rapid Transit Commissioners, and the Chief Engineer and Counsel of that body, protested bitterly against the very thing that has happened. Of course, the tin pictures are there because "there is money in it"; yet we cannot but think that upon mature consideration the Interborough Company will feel that the hundred thousand dollars or so a year of revenue derived is after all a most pitiful return, in view of the degradation to which this great municipal work has been subjected in the very hour of its inauguration.

RAPID ACCELERATION OF THE SUBWAY TRAINS.

The average speed of the express trains on the new Subway will, for the present, be about 25 miles, and of local trains 18 an hour, including stops, and the maximum speed of expresses between stops will be 45 miles per hour. The average speed of local and express trains will exceed the speed made by the trains on any elevated railroad. Now the only way in which such a high average speed as this can be maintained is by providing a very rapid acceleration of the train in starting, and, of course, a rapid retardation in stopping. The powerful motor equipment provided is capable of accelerating the trains, when they are loaded to their maximum capacity, at the rate of 1.25 miles per hour per second in starting from stations on level track. It is stated by Mr. L. B. Stillwell, who is responsible for the whole of the electrical equipment of the Subway, that to obtain the same acceleration, if the road were operated by steam or electric locomotives, would require a drawbar pull of 44,000 pounds, which is equal to the maximum effect of six of the steam locomotives that were used on the Manhattan Elevated Railway. To secure the same acceleration with standard-gage passenger locomotives would require two of the latest Pennsylvania Railroad type, which latter would weigh together about 250 net tons. In the Subway express trains of eight cars, the necessary tractive effort is secured by equipping five of the cars with two 200-horse-power motors apiece, and the total addition thus made to the weight of the train aggregates only 55 net tons. Evidently, then, if the work had been done by locomotive, it would have been necessary to employ a lower rate of acceleration for express trains. This could have been done without sacrificing the average speed by using a higher maximum speed between the express stations, the average distance between which is approximately two miles. In the case of local trains, which average nearly three stops to the mile, no considerable reduction could be made in the rate of acceleration without materially reducing the average speed. The increase in the weight of local trains, due to the motors, is 33 net tons, and to obtain the necessary adhesion and acceleration, if locomotives were used, would require a load of eighty net tons upon the driving wheels. This comparison serves to illustrate very forcibly the advantages of the multiple-unit system of electrical control under which the Subway trains are run.

SCALE DIVISIONS AND ERRORS OF GRADUATION.

In a paper recently presented to the Académie des Sciences, M. G. Bigourdan, an eminent astronomer of Paris, brings out some new points relating to the graduated scales of different measuring instruments, and the errors which may be due to the same. In the high class instruments, the division of the graduated scales is generally made upon silver. This metal gives a clear cut by the point of the graduating machine and thus furnishes permanent lines which can be set with great exactness. But as the metal is expensive the circle cannot be made entirely of silver, and a cheaper metal is used for the support, into which a thin plate of silver is inserted. Brass or bronze has been generally used as the supporting metal, but for the larger astronomical instruments cast iron has been used for a long time past, in spite of the fact that it is not very homogeneous. The divided circles all have errors of division and these are determined very carefully with the instruments of the observatory. Generally a number of operations are carried out so that by averaging the results the error of each line of the scale is known very closely, and afterward it is supposed that these errors remain always the same. However, if the errors are determined again after a number of years, the results which are found sometimes differ from the former in a considerable proportion, and we must come to the conclusion that the hypothesis of permanent errors of division is not verified by experience. M. Bigourdan considers that this variation is due simply to the influence of temperature changes, even independently of the non-homogeneity of the support. If we consider a circle formed of a solid cast-iron framework at the periphery of which a silver band is incrusted, this band, which is thin and malleable, is evidently obliged to follow the temperature variations of the cast iron. The expansions of iron and silver, expressed in microns, are 20 μ and 11 μ per meter and per degree C. respectively, making a difference of 9 μ. As to the greatest variation of temperature during the year, it exceeds 40 deg. C. in this climate. In a circular scale of 1 meter diameter, for instance, the difference of expansion of the silver band with relation to the iron would reach during the year the value $9 \mu \times \pi \times 40$, or 1.13 millimeter. This is the elongation or contraction of the band in passing from one season to the other. For the errors of division to remain permanent, each point of the band should be displaced in the same radius, but this condition is only obtained exceptionally, seeing that the two kinds of matter which react upon each other are not perfectly homogeneous, and because the silver band cannot be fixed at all points alike. In the circle in question of 1 meter diameter, the angle of 1 dec. corresponds to an arc of 2.43 $\pm$ length. At the supposed degree of approximation, μ 0.1 dec., the errors of division will only remain invariable if the lateral displacements have been below 0.24 μ, which quantity is about equal to 1-5000 of the total change of length. In the case of brass or bronze supports these difficulties are nearly all suppressed, as the expansion coefficient of these alloys is scarcely below that of silver. Cast iron should therefore be rejected as a supporting material, and brass or bronze preferred. But it is still better to make the circles of a single metal which should be cheap and not easily tarnished, capable of a good polish and of giving a fine line in the tracing machine. These conditions seem to be fulfilled by nickel and certain kinds of nickel-steel.

A NEW METHOD OF OBSERVING THE N-RAYS.

In a paper recently read before the Academie des Sciences, M. Blondlot indicates a new method of observing the effect of the N-rays. It is easier than the previous methods, and does not fatigue the eye. It indicates the N-rays or the new heavy emanation which M. Blondlot has recently discovered. A difference in brightness of a spark or flame is not used here; but it is only required to see the appearance and disappearance of a luminous line upon a background lighted by a complementary color. To carry out the experiment, a streak of calcium sulphide paint is brushed upon a piece of rough grained white cardboard. It forms a line 0.004 or 0.01 inch wide and 1.5 inch long. The sulphide is insulated and then taken to a dark room. The latter is provided with a dark-lantern containing a gas-burner. It has an opening in one side which is covered by an orange-yellow glass. The lantern is placed at 6 or 8 feet from the cardboard, and thus gives it a yellowish light. The flame is turned up or down during the experiments to regulate the light on the screen. At first the flame is made very small and the blue phosphorescent line of sulphide is observed on the yellow ground of the cardboard. By slowly turning up the flame a point is reached where the sulphide becomes quite invisible upon the yellow background. This point is reached when the orange-colored light, which is reflected by the sulphide, combined with the blue rays which it gives off by phosphorescence, form a tint which is almost white. This tone gives practically no contrast with the yellow background and is hence invisible. After carefully regulating the burner until the sulphide line disappears, the experimenter holds his head perfectly still and the N-rays are thrown upon the sulphide. Now the blue tint re-appears. When the N-rays are thrown off, the streak disappears again. Care should be taken to avoid making an undue effort of vision, which might give rise to physiological and even physical effects. Just as Helmholtz remarked that the ear needs to be educated in order to separate a sound into its different component sounds, so in this case we need to adapt our organs to a special kind of work which is quite different from the ordinary.

The success of the experiment of introducing the Guatemala ant to combat the cotton-boll weevil, which has been undertaken by the United States government, was threatened by an effort to have the courts interfere. A large Texan plantation owner named Ross took the matter into court, to have Dr. Cook enjoined from bringing these ants into this country, on the ground that they would in all likelihood become a greater nuisance and a more serious menace than the weevil. He claimed that the ant was very ferocious, and would make it so disagreeable for the cotton pickers that it would be difficult to get them to go into the fields. The court refused to entertain this view of the matter, and declined to grant the injunction asked for.