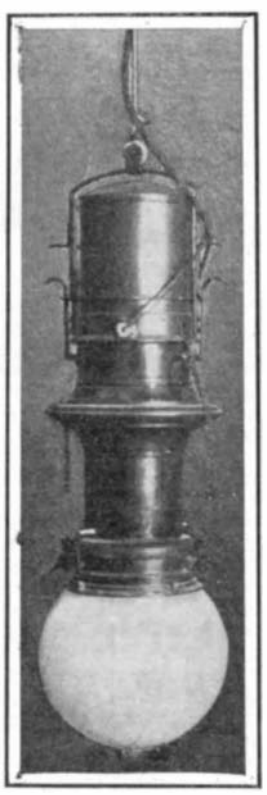
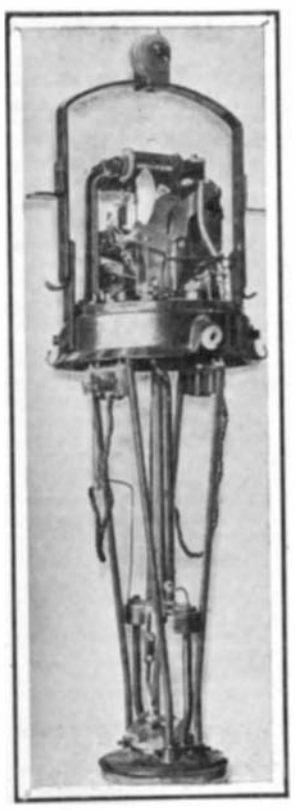
positive carbon, but instead a very small surface of vaporization, its light being not much greater than that of the arc itself, which now becomes extremely brilliant; in other words, it is no longer the incandescence of the carbons that supplies the chief source of light, but the arc or flame, as luminous as though it was taken from the sun.

During the past five years many improvements have been made, not only in the carbons, which in some instances have, in addition to the substances enumerated, a metallic core arranged to give a good electrical contact along the entire length of the carbons, this scheme greatly reducing the ohmic resistance. The lamps for utilizing mineralized carbons are made for either direct or alternating currents. In one of the recent makes of lamps a metal base is held in a ring fixed to the lower ends of the supporting rods; attached to the top of this base is the mechanism for striking the arc. When the current is switched on the shunt magnet is energized, its action attracting the armature raising the rod, and through a sliding device the carbons are brought together; the arc is struck by the current flowing through the series magnet, its pull on the armature drawing the carbons apart. As the carbons burn away, the shunt magnet becomes more powerful and the rotating disk is caused to revolve in the reverse direction and feed the carbons. The length of the arc between the ends of the carbon electrodes is about 1½ inches. The carbons are designed to burn from 10 to 17 hours, the time depending on their length, which ranges from 12½ to 24½ inches, and a diameter which varies from ¼ to ⅜ of an inch. When the carbons are completely consumed, the mechanism ceases to feed them downward, the shunt circuit is then automatically broken by a carbon-faced switch, and this break causes the series magnet to draw the carbons far enough apart to extinguish the flame. On higher potentials than 125 volts, a blow-out magnet is employed to extinguish the arc. To produce the best results two of the flaming arc lamps should be burned in series on 110 or 125 volts, or four in series on 220 to 240 volts.

Further, this rough comparison is backed up by actual figures. In tests made at the electrical testing laboratories it was found that one of the flaming arc lights using 360 watts gave an average of 1,560 mean hemispherical candle-power, while the inclosed arc requiring 413 watts gave 265 candle-power. By "mean hemispherical candle-power" is meant the total quantity of light given out below the level of the lamp. In interior lighting this is the only part of the light that is of any practical value, as all the rays radiated upward are lost; and in the vast majority of cases of interior lighting, only the light below the level of the lamp is useful. In other words, the flaming arc light using 13 per cent less current during the tests gave 600 per cent more of useful illumination than the inclosed arc light.



THE FLAMING ARC LAMP.



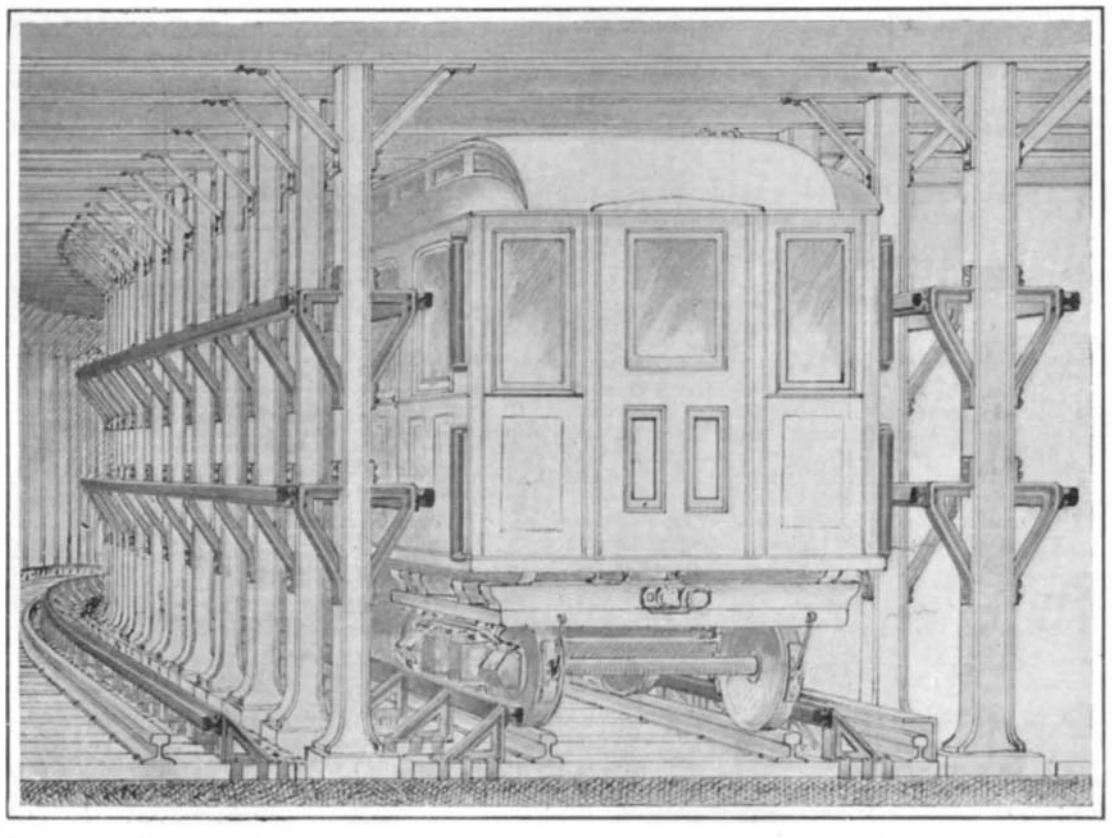
MECHANISM OF THE LAMP.

PROPOSED SYSTEM OF GUARD RAILS FOR THE SUBWAY.

Although the Subway system, in spite of the great number of trains and the speed at which they are run, has suffered very few derailments, and these few fortunately have not been attended by any serious results, it is well understood that if an 8-car, 350-ton express train should be derailed when it was running at high speed around a curve, it would result in a serious wreckage of the cars and probable fatalities and wounding of passengers. The SCIENTIFIC AMERICAN has, more than once, pointed out the advisability of placing horizontal lines of guard rails on the columns which support the roof of the tunnel, with a view to preventing the end-on impact of the cars; for we believe that in addition to the wrecking of the cars, there would be a possibility of the carrying away of some of these columns and the fall of the roof above. We have been favored by Mr. Louie H. Martin with the accompanying drawing of a design which he has worked out for the protection both of the cars and the tunnel structure from the consequences of a derailment. It includes the mounting of four lines of column guard rails, two on each side of each track, the rails being mounted on brackets, with the proper amount of clearance provided both on tangents and around the curves. To prevent the comparatively frail superstructure or body of the car from bearing directly on the rail, our correspondent suggests the mounting at each end of the car of four vertical steel rollers, so placed as to bear in case of derailment against the corresponding guard rails.

It has long been recognized by railroad engineers that the higher the guard rail for the car wheels is carried, the less is the risk of the wheels biting the rails and climbing over them. It will be noticed that in the present design, the wheel guard rails are mounted upon brackets bolted down to the ties, and that they are carried at about double the height of the guard rails which are at present commonly used. Consequently, in the event of derailment, the wheels would run upon the ties, and the guard rails would bear against the wheels at a point about 12 inches above the bottom of the wheel tread, thus providing a very effective check to guide the trucks parallel to the rails and prevent the car from swinging over into the line of columns. Care, of course, would have to be taken to adjust the wheel guard rails at such a height that they would not be struck by the axle boxes, even when the wheels were off the track.

We consider that the general principles upon which our correspondent's design has been worked out are correct, although the particular method adopted is more expensive than would probably be found to be necessary in practice. It might be found that the brackets carrying the column guard rails could be dispensed with and a single deep flange rail substituted for the two rails proposed; for, in view of the excellent protection afforded by the wheel guard rails, we think that a single line of column guard rails, located at the level of the upper tier shown in our engraving, would probably be found to be sufficient.



PROPOSED SYSTEM OF GUARD RAILS FOR THE SUBWAY.

The Effects of Altitude.

Every year M. Janssen, the well-known director of the observatory at Mont Blanc, intrusts a corps of robust savants with the commission of observing for five or six days the phenomena of different kinds peculiar to high altitudes. For example, last summer MM. Guillemard and Moog confined their studies to the physiological field and they have communicated their results to the Academy of Sciences. These gentlemen spent five days at the summit of Mont Blanc (4,810 meters—15,781 feet) and three days at the Grands-Mulets (3,050 meters). They noticed, in their own case, that the beneficial action of the altitude (shown at first by a perceptible acceleration of nutrition) ceases abruptly at the end of a few days, and that everything then returns to the previous condition. This observation adds nothing to our knowledge. It has been known for a long time that at high altitudes (3,000 meters and upward) the "crack of the whip" by which the organism at first benefits is followed not only by a return to the normal, but often by a depression that renders a prolonged stay more or less painful, according to temperaments. The phenomenon does not occur at the "cure" stations, whose elevation exceptionally exceeds 2,000 meters, and the persistence during the whole stay of the beneficial effects of altitude is no longer contested. Let us remark, too, that the altitude cure admits of a very variable period of acclimation. MM. Guillemard and Moog were at the summit of Mont Blanc eight days after having left Paris. It was at the descent, and not at the ascent, that they stopped at the intermediate station at the Grands-Mulets; from then, the observations that they made upon their persons present a case essentially their own and having but an anecdotal interest.

Moreover, years ago the physicians of the Engadine (average altitude 1,800 meters) scientifically demonstrated the beneficial influence of the altitude cure; at the end of a few days the number of the globules of the blood increases in considerable proportions. When the subject redescends to the plain this number returns very quickly to the normal, if this normal was reached previously; in the contrary case, the subject benefits by an increase that lasts quite a while. The reality of the phenomenon, long contested, is admitted to-day by those few physiologists who have studied the question—notably Profs. Regnard, of Paris, and Lépine, of Lyons. It is, nevertheless, sometimes asked whether this hyperglobulation shown by the blood drawn to the periphery is produced in the entire circulation. MM. Guillemard and Moog, desirous of investigating in their turn this especial point, took to Mont Blanc four guinea-pigs and six white rats. By means of delicate punctures, they proved that merely the *peripheric* hyperglobulation (increase in the number of the globules) manifested itself from the second day, *almost* always compensated by a *central hypoglobulation* or diminution. In all cases, the average quantity of hemoglobin attached to each globule diminished with the altitude. MM. Guillemard and Moog do not hesitate to consider this fact as a powerful argument in favor of total hyperglobulation. It is perhaps prudent not yet to draw practical conclusions for the human species from the state of health noticed in a half-dozen rats suddenly condemned to spend three or four days on the top of Mont Blanc. These observations, however, can but theoretically strengthen the opinion which experience creates as to the salutary effects of the altitude cure.

Notable Increase in Shipping at Antwerp.

The total amount of shipping entering Antwerp during 1905 was 6,034 vessels with a total tonnage of 9,850,592 tons, showing an increase of 182 vessels and 450,257 tons over that of the previous year. This increase is considerably larger than that of the year 1904 over the year 1903, which amounted to 268,504 tons; and the returns for 1905 may, therefore, be considered as highly satisfactory for the Belgian port. The increase in British shipping accounts for the greater portion of the augmentation, inasmuch as the vessels and tonnage entering under the British flag amounted to 3,210 vessels and 4,996,704 tons—increases of 103 vessels and 375,490 tons respectively.