

smutched kind of cleanliness, but polished and bright — as are also the woodwork, the fare register, the glass clock front, the incandescent lamps and the mirrors. All car cleaning is done by women at the car house; experience has shown that men can never be expert in such work. They neglect the corners. Cleanliness is said to be next to godliness. There may be very little of the latter in street railway management; there cannot be too much of the former.

The conductors and motormen are neatly uniformed, part of their outfit consisting of clean white collars and black ties, these two details forming a pleasant contrast to the soiled linen that is too frequently seen upon the employes of some roads. The conductors are taught that, although they are in full charge of the cars while running, they do not own the passengers. This, to the passenger, somewhat important fact, is occasionally forgotten by some conductors. They must be civil, polite, attentive, patient and firm. Difficulty with a passenger may arise in which the passenger is entirely to blame. The conductor will naturally feel like "having it in for him the next time." His instructions are to forget the occurrence, and to treat the offender with the same courtesy as is due to any passenger, when again he rides. The conductors are instructed to avoid familiarity with passengers. In small cities, where acquaintances are many, this rule is especially necessary. The habit is easily acquired and is offensive generally. Unnecessary conversation between conductors and motormen is prohibited. Conductors assist ladies and children on and off the cars, not in a perfunctory step-lively-push-up manner, but courteously. Smoking on any part of the closed cars is prohibited. The rule, at first, was difficult of enforcement, and the company was assured that business would suffer. The contrary has been the fact, and ladies are no longer obliged to force their way through a group of smokers on the rear platform.

Dogs are strictly tabooed. The one passenger with the dear little dog, you know, is offended. The other twenty passengers without dogs are pleased.

The motorman acknowledges with a nod all signals from persons desiring to take the car. This shows those waiting that they are seen, and prevents the nervousness naturally experienced when no indication is given that the car will stop.

The writer has endeavored to describe, as briefly as possible, such details of a successful street railway as are constantly under the public eye, and which, therefore, tend to secure the object aimed at by the companies, viz., a profitable traffic. It is only these visible details that the travelling public know or care anything about. They know little and care less about the power house—the very heart of the system—but they do know cleanliness from dirt, courtesy from incivility, heat from cold, and will freely and willingly shower their pennies upon the company that makes an effort to provide only the best.

#### ALUMINUM.

Aluminum has been pronounced to be an intermediate between the base and the noble metals, and it has many features that seem anomalous. Its weight is one-third that of iron, yet its tensile strength is twelve tons to the inch; it is only one-seventh the weight of gold, yet it is nearly as ductile. After being rolled or hammered, it is nearly as hard as iron, yet when cast it is as soft as silver. Neither air nor water suffices for

its oxidation, and even nitric or sulphuric acid attacks it but slowly. Even when exposed to the fumes of sulphuretted hydrogen, its lustre remains undimmed. In this consists the great superiority of aluminum to silver; and besides this, it has the advantages of greater strength and lightness. The acids of the body have no effect upon it whatever, and this renders it peculiarly adapted for surgical instruments. It conducts electricity eight times better than iron. The ease with which it conducts heat renders it wonderfully useful for making cooking utensils; moreover, even if corrosion did take place, the salts produced would be harmless. It has been found that even as little as one-tenth of one per cent. of aluminum added to iron increases the tensile strength from twenty to fifty per cent. and renders it less liable to oxidation. Aluminum bronze, owing to its freedom from flaws and its uniform strength, will probably be the gun-metal of the future, and its use will render more rare those burstings of guns which have been in the past so fatal. For all objects requiring a combination of lightness with great strength, aluminum will probably be used more and more.

#### FATIGUE IN IRON.

There appears to be little doubt, says the *Locomotive Engineer*, that iron undergoes what is styled "fatigue." There is a bending or a lengthening and shortening action going on even when the change is too minute for measurement. This movement of the metal causes molecular changes which reduce the adhesion of the particles, thereby making the metal weaker. Every observing person who has had much to do with iron must have noticed breakages when what had once been good metal had become so brittle and crystalline as to be unfit to sustain a reasonable load. Any long continued strain, or constantly repeated jarring, tends to induce a molecular change very detrimental to the metal's quality of strength. It is stated that the strength may be restored to iron which has been weakened by use, by merely having the metal re-worked.

#### HIGH PRESSURE.

The present tendency in engineering circles is to increase pressure in the boiler rather than to decrease it. Engines, it has been found, can be worked with a comparatively smaller consumption of steam if run at a high pressure. The exact ratio of gain according to increase of pressure has not yet been ascertained reliably. But it is believed that in a compound engine with an increased pressure of from say 100 pounds to 150 pounds, there is at least 10 per cent., or possibly 15 per cent., saving; and between a compound engine running at 100 pounds, and a triple-expansion engine running at 150 pounds, both suitably proportioned and loaded, there is a similar gain, due to the engine working under greater expansion and higher pressure. In order to withstand the increased strain attendant upon the employment of high pressure, the boilers and steam-piping should be made extra strong. A better class of packing and more stable joints must also be provided. The plant must be watched with greater care than would be necessary for low-pressure engines. As an offset to the advantages of high-pressure working, may be mentioned the increased wear and tear, and depreciation and the loss of fuel. We are not sure, on the whole, whether the losses entailed by a high-pressure system do not counterbalance its gains.