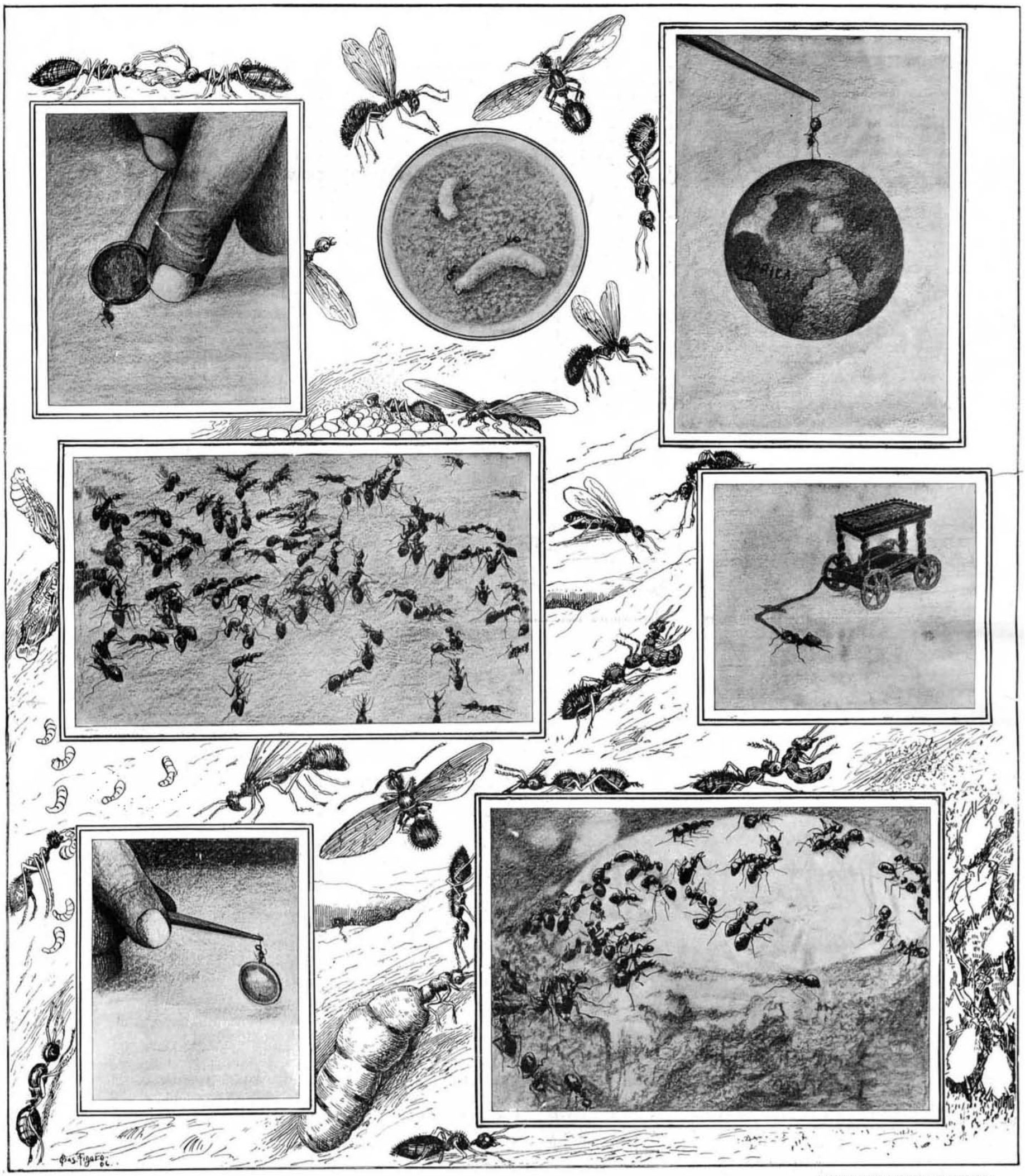
ANTS AND THEIR WAYS.

The ant, despite its biblical reputation for industry, has characteristics which are not altogether admirable, and which prevent it from posing as a general good example for sluggards to follow. For instance, it is well known that certain species of ants are most determined and ferocious slave hunters and slave keepers, and that they make destructive attacks on neighboring and less powerful colonies, for the sole purpose of carrying off the infant members of these into bondage. It is true that the slaves are afterward both well treated and protected, though it is doubtful whether this is done because of their value as chattels, or because the masters recognize the ethical iniquity of the situation and thus try to ameliorate it. Besides this, ants are not merely warlike, they are positively "spoiling for a fight," and often support in their communities armies of idle and otherwise useless fighters, not only for defense, but for the purpose of depredatory incursions upon their neighbors as well. As we are to-day painfully trying to point the way to general disarmament and universal arbitration, it would hardly do to follow the little insect in this particular. Physical strength is no doubt valuable and pleasing, but if we attempted to emulate, comparatively, the ability of the ant in this direction, the result would be numberless unfortunate accidents, or the development of a race of muscular monstrosities.

The student of the life and habits of the ant is often astounded by the prodigious strength and activity displayed by the insects. Certain of the possibilities in the strength of an ant are graphically illustrated in the accompanying engraving. In one picture, an ant is shown supporting in the air a globe weighing eight hundred times its own weight. To understand exactly what this would mean if a man were to attempt a feat comparatively similar, we must imagine him suspended from a height by one leg and holding in his jaws a weight of nearly 130,000 pounds, or, say, a 75-ton locomotive, if we assume that the man weighs 160 pounds. The mere contemplation of what such strength represents renders comment unnecessary, and



Grasping a coin preparatory to lifting it.
A battle for sugar.
Lifting a coin. The ant hangs by one leg from a pair of forceps.

Ant warfare. Fighting and capturing caterpillars.

An ant lifting a globe eight hundred times its own weight.
Ant dragging thirteen hundred times its own weight.
Feeding on honey.

THE WONDERFUL POWERS OF THE ANT.

it enables us to comprehend how these little creatures can perform such marvels of labor in the building of their great communistic dwellings and colonies.

In two other views an ant is shown first grasping a coin with its jaws, and then holding it while hanging from a pair of micro-forceps. The remarkable strength of the jaws is well illustrated by this performance, for the coin weighs over five hundred times as much as the insect itself. It is said that the natives of Colombia, South America, use the jaws of a certain species of indigenous ants for closing wounds. They induce the insects to bit the two lips of the wound, and thereupon sever the bodies from the heads, which then serve as a suture.

In another engraving there is shown an ant displaying its pulling power by dragging a little silver coach toward the nest. This coach has a weight some thirteen hundred times that of the insect, and if it were possible for a man to pull a hundred-ton railroad train, his labor would be commensurate with that of the ant. In dragging the weight up an incline, the ant wisely eases its toil by moving from side to side like a horse going uphill.

Ants are undoubtedly to be numbered among the fiercest fighters, not only of the insect world, but of all living creatures as well. So strong is their fighting instinct and tenacity of purpose, that if two of the soldiers have grappled, the hold is not released till one has succumbed. One of our illustrations shows a number of ants attacking and destroying two caterpillars. The caterpillar is often able to put up a stiff fight, and not infrequently a number of its little adversaries are killed, though in the end the caterpillar is invariably slaughtered and triumphantly dragged to the nest. Another of the engravings depicts a portion of a battlefield upon which the armies of two ant colonies are shown in mortal combat. The engagement has degenerated into a series of sanguinary individual fights, and large numbers of dead and wounded are shown scattered about the scene of action. The other of the larger illustrations does not show a similar battle, but is merely illustrative of the swarming of a number of ants upon a bit of honey, of which they are inordinately fond. Sweets in general are highly prized by these insects, and it is known that certain species of ants keep *Aphides* (small louse-like insects) in their colonies, and milk these of a sweet fluid which they secrete. In other words, ants keep cows.

The "agricultural ant" myth has apparently been in part exploded, for it has been shown that ants do not plant grass seeds or "ant-rice" for a harvest. It is probable that the error was due to the fact that the sprouted seeds stored up, and then cast away as inedible, take root, and thus form a partial circle of tall grass around the nest. It has, however, been recently shown that certain South American species of *Atta* cut and bring pieces of leaves into their cellars and comminute these till they form a pulp, which is heaped up and soon becomes invaded by a fungus which is carefully cultivated and used as food.

Sawmill Refuse as Fuel.

The manufacture of lumber is the chief industry of Portland, says O. B. Coldwell in an article on the value of sawmill refuse as a fuel, published in the Journal of Electricity. The daily output of sawdust amounts to 568 wagon-loads. The sawmills all use this by-product for steam-raising purposes, but much remains over, and this is sold. The Portland General Electric Company uses from 100 to 150 loads of this refuse per 24 hours in its boiler plant, this being burnt in a Dutch-oven type of furnace, built out in front of the boilers. These are entirely filled with the fuel to reduce air leakage. A number of evaporative tests are given to show the value of this refuse for steam-raising purposes. The cost of fuel per kilowatt-hour in these tests varied from 0.57 to 0.83 cent, as compared with 0.97 cent, when oil was employed. Oil is displacing coal in California on account of its lower cost, but in Portland it will have to compete with sawmill refuse, and as these comparative trial tests show, the refuse is the cheaper fuel for steam-raising purposes.

ELECTRIC TRACTION ON THE SIMPLON RAILWAY.

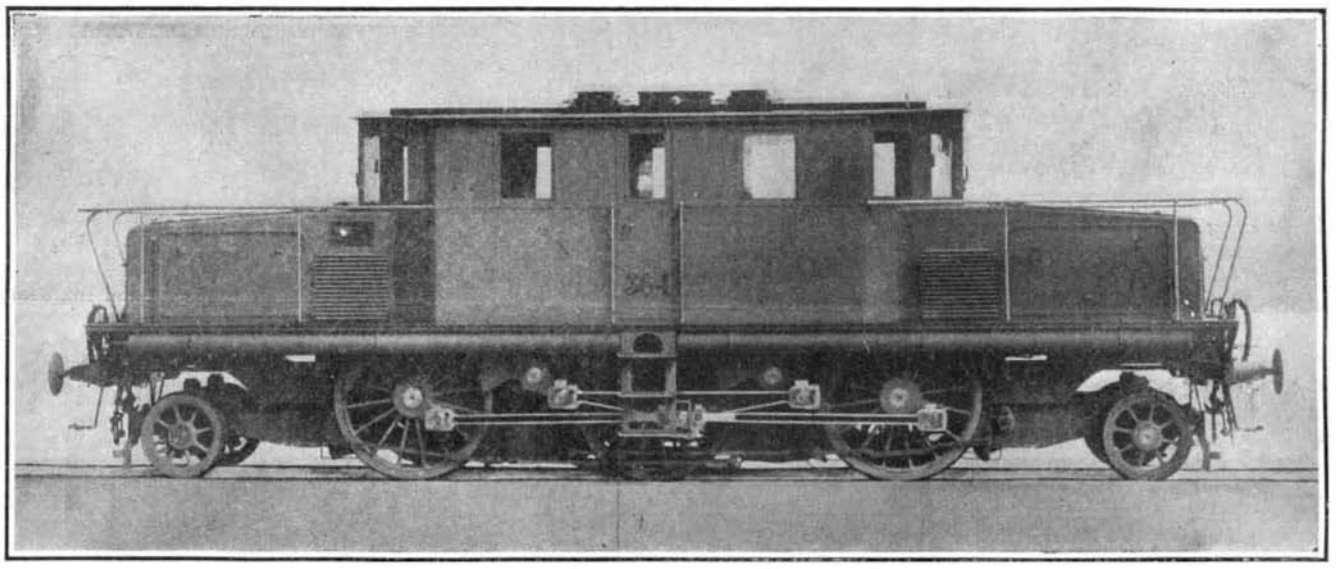
BY DR. ALFRED GRADENWITZ.

Although the first railway train has recently traversed the Simplon Tunnel, regular service on this important line leading from France and Switzerland to Italy will not be commenced before the end of May. Now this date is destined to be one of the most important in the annals of electric traction, this being the first instance in which electricity is used on one of the international European railway lines. It may be said that apart from the special advantages inherent in electric traction, and which were fully appreciated by the Swiss Railway, the ventilation difficulty in the case of steam operation was among the factors responsible for the choice of the electric service.

An interesting offer has been made by one of the most important Swiss electric companies, viz., to complete the whole of the electrical equipment of the tunnel by the date of opening, to place these equipments at the disposal of the Swiss Federal Railways, and thus to permit of a comparison between steam traction and electric service on a line especially adapted to illustrate the advantages of either system. In case, however, the electric service be not found at least as satisfactory as steam traction, Brown, Boveri & Co. will have to reduce the whole of the line to its primitive state, suitable for steam operation.

As on account of certain circumstances this offer could be made only a few months ago, the construction of a special railway stock was quite out of the question, and the constructors have to content themselves with using two three-phase locomotives of 900-1,000 horse-power each, which had been ordered a short time ago by the Italian State Railways. The three-phase system was accordingly adopted, which system has of late years given the most satisfactory results on numerous Swiss mountain railways.

The hydraulic power plants installed at either end



1,000-HORSE-POWER, 3-PHASE ELECTRIC LOCOMOTIVE FOR THE SIMPLON TUNNEL.

of the Simplon Tunnel, and which had so far served for operating the extensive machinery used in the construction of the tunnel, will after a few immaterial alterations and extensions be used in generating the current required for the electric service of the tunnel section. The current produced in each of these central stations, situated at Brigue and Iselle, respectively, has a tension of 3,300 volts at 15 cycles. As at first only the tunnel section proper connecting the two stations referred to is to be operated by electricity, this current is supplied directly to the trolley wire traversing the tunnel without any previous transformation or long-distance transmission. The trolley line in the tunnel is mounted on span wires fastened to hooks that are fitted in the masonry. The span wires are arranged at intervals of about 25 meters (82 feet) each, no shorter distances being required on account of the fairly uniform temperature in the tunnel, which eliminates the possibility of any considerable variations in the sag of the wire. The rails were bonded on the usual Brown, Boveri & Co. system. An electrically-operated turnout is provided at the center of the tunnel, but under normal conditions trains will not pass each other in the tunnel. Switches arranged at the ends of this turnout permit the trolley wire of the tunnel being divided into sections.

In carrying out the electric service, the steam locomotives will have to be uncoupled from the trains arriving from Lausanne at Brigue Station, and after substituting the electric locomotives the trains will be conveyed by electricity through the tunnel as far as Iselle, where the electric locomotives will again be replaced by steam engines. While, at first, only the tracks required in carrying out these operations are to be equipped with electricity, five tracks placed side by side will at some places have to be dealt with. Iron poles are used throughout in the station plants, the contact wires being mounted on span wires similar to those of the tunnel. At Iselle Station, where several tracks are to be spanned without any intermediary supports, the chain suspension principle is to be used, reducing the load of the poles to a minimum.

The locomotives constructed by Brown, Boveri & Co. (one of which is represented in the accompanying figure) have three coupled axles, driven by two motors through connecting rods without the employment of spur gearing such as are ordinarily used. The motors are designed for two speeds, viz., 34 and 68 kilometers (21.1 and 42.25 miles) respectively. The drawbar pull of the locomotive is 6 tons in the case of the low speed, and 3½ tons with the high speed. The total weight of the engine is 62 tons, and the adhesive weight 42 tons.

Gradients of up to 10 per cent occur only on some short sections of the line, which otherwise possesses a constant gradient of 2 per cent from Brigue to the middle of the tunnel, while the southern incline from the middle to Iselle shows a constant gradient of 7 per cent. Passenger trains will be limited to a weight of 365 tons, and freight trains to 564 tons, 20 minutes being allowed for the former in traversing the tunnel in the direction from Brigue to Iselle, and 30 minutes in the opposite direction, while freight trains will be allowed 40 minutes in either direction.

The preliminary installation work was commenced a short time ago, and while the trial runs are to be begun in the months of April and May, the electric service according to contracts will be opened on the first of June of this year.

One Person in Every Ten is Illiterate.

According to the census use of the term an illiterate is a person not under ten years of age who is unable to write either in English or in any other language. In most cases the illiterate is also unable to read.

At the census of 1900 the number of illiterates enumerated in the United States, exclusive of Alaska, Hawaii, and all other outlying territory, was 6,180,069. This was approximately one-tenth of the population at least ten years of age, the exact mathematical proportion being 106.6 illiterates to 1,000 population.

The fact that one-tenth of the population above nine years have failed to obtain even the little education that is implied in the ability to read and write seems to indicate a rather surprising degree of ignorance, reflecting upon the boasted efficiency of the common school systems. Therefore the patriotic American will naturally inquire whether this is not mainly due to the presence in our population of the foreign-born and the negro, and will be somewhat reassured to find that when the comparison is restricted to the native white population, the proportion of illiteracy is reduced to 46.4 per 1,000, or less than one in twenty. For the foreign-born white the proportion is 128.5 per 1,000 and for the negro 444.7. Moreover, international comparisons, restricted as far as possible to corresponding classes of the population, are on the whole favorable to this country, indicating that in most European countries illiteracy is much more prevalent than it is here, although the United States is still far behind Germany, Sweden and Norway, Denmark, and Switzerland. There is also ground for satisfaction and encouragement in the statistical evidence that illiteracy is steadily being reduced. In 1890 the number of illiterates per 1,000 was 133.4 for the total population, 62.3 for the native white population, 130.6 for the foreign-born white, and 567.6 for negroes, including Indians and Mongolians.

In Wales there are about 450 tin-plate mills of which 95 per cent were in operation at the close of November. In the United States there are about 340 regularly operative mills, which have been in work at one time or another within the past year, the leading interest having some 242 independent interests. There are about thirty other mills not in regular work. It can be assumed that an average of not less than 400 mills were operated in Wales during 1905, while an average of scarcely more than 275 mills were worked in the United States. With substantially the same total production, says the Iron Trade Review, it appears that the output per mill has been between a third and a half greater in the United States than in Wales.