

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 1873)..... 3.00
 The combined subscription rates and rates to foreign countries will be furnished upon application.
 Remit by postal or express money order, or by bank draft or check.
 MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, MARCH 4, 1905.

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.

STEEL CARS AND SAFE TRAVEL.

If, as the records of the Interstate Commerce Commission show, the majority of the injuries and fatalities on our railroads are due to collisions and derailments; and if, as unfortunately seems to be the case, the management of our railroads is unable to reduce the number of accidents of this kind; in other words, if derailments and collisions are, under existing conditions, an inevitable feature of modern railroading—then perhaps the best thing we can do is to render our rolling stock, and particularly our passenger cars, as collision-proof as possible.

The steel car is collision-proof.

A few years ago, a certain company began to build steel freight cars; and, of course, the first of these that were sent out upon the road were not long in running into a smash-up. Here they demonstrated, at once, their ability to stand an amount of pounding, crushing, and wrenching which would reduce a wooden car to the proverbial kindling wood. After such a collision, what was left of the wooden cars was burnt on the spot; but the steel cars were unearthed from the wreckage of their older and frailer brothers; their trucks were replaced beneath them; and they were hauled off to the car shops to have the kinks taken out of them.

In a heavy collision, it is the telescoping of one car into another that kills and wounds the passengers; but steel cars cannot telescope. Even with the momentum of a heavy train behind it, the platform of the telescoping car is unable to shear its way through the vertical steel posts (angle irons, channels, or T-irons) which form the frame of the car body. Following the line of least resistance, steel cars, in such collision, will slide past each other, or be slewed around and rolled to the side of the track. In this case the injuries to the passengers will be only such as are due to their being thrown violently around, and will generally be limited to cuts and bruises. The all-steel cars of the New York Subway, and the composite cars with steel underframes, have probably already saved more lives and limbs of the public than the operating company would care to admit. Had the collisions which have already occurred taken place between wooden cars of the old type, the casualty list would have been very much longer.

The Interstate Commerce Commission has accomplished a splendid work in enforcing automatic coupling and the application of the air brake. It may be too early yet, but the time is surely coming when the same Commission will urge or enforce upon our railroads the use of steel cars. For obvious reasons such a great and expensive change could only be brought about gradually; but it will surely come, probably by the voluntary act of the railroads, and as the result of a growing appreciation of the safety and ultimate economy of this durable form of construction.

THE MILITARY METHOD OF EDUCATING BOYS.

The average American boy is splendid material, but in the rough he is conspicuous neither for order, system, nor respect for authority. The military system supplies the most effective remedy for these defects—effective because the remedy is sugar-coated. What boy with red blood in his veins is there, who does not feel a thrill at the tap of the drum or the sound of the trumpet, who does not delight to handle a rifle, or who does not simply glory in popping away with blank cartridges at an imaginary enemy in an infantry skirmish; or, if he is proof against these, who will not yield to the dashing interest of the mounted cavalry exercises, or to the artillery drill with its fascinating suggestions of power? What other method is there that will so surely and so quickly make the unpunctual boy on time to the dot, the untidy boy neat and trim, the bashful boy confident and assertive, the round-shouldered figure erect and full-chested?

The boy who at home, unheeding the gentle maternal protests, varies his rising hour indefinitely breakfastward, at the military school springs from his bed at the first note of the reveille, and dresses as though the

house were on fire. The boy whose mother "picked up his things" for him at home, is now his own chambermaid; he makes his bed, sweeps his floor, keeps his furniture innocent of dust, keeps everything in its place. The boy who was accustomed to argue indefinitely with parental authority now obeys without question or delay the commands of the smallest and most youthful corporal. The boy who at home thought it looked "stuck-up" to stand and walk straight and slouched disfiguringly, goes about now with his head up and his chin in, his chest out and his stomach "sucked up," his figure straight and well poised and a goodly sight to see.

The military method, however, to be effective must be real, there must be no sham about it. It must not be too diluted, too modified. The military schools that have succeeded best are those that have been the strictest, and have trained their cadets in their military work as earnestly and exactly as if the making of soldiers was the end in view, and not simply a means. The mere natty and glitter of the uniform can appeal only to the unworthy traits. If it is to appeal to the best there is in a boy, the uniform must stand for something more than a mere tickler of pride or fancy. The uniforms of the best military schools are eloquent of prompt and unquestioning obedience, of system and order, of setting-up exercises that square the shoulders and expand the chest, of drills with every detail accurately hammered out, of days of early rising and early to bed and of wholesome living, and of many other things which must of necessity exercise on the cadet's after life an important and lasting influence.

And not only must the military system, if it is to create the desired *esprit de corps*, be thorough and businesslike, but if it is to keep the cadet's interest from lagging, it must have its spice of variety. For it must be remembered that the cadet of the private military academy has not in most instances the incentive of a soldier's career ahead of him, but must gain his incentive solely from the temporary interest aroused by the military features of the school itself.

THE FREE-ALCOHOL QUESTION.

In a recent issue we pointed out the far-reaching effect which the removal of the tax on alcohol would have upon the industries of this country, and showed that the arguments in favor of free alcohol are based upon sound economic principles. There is no desire to remove the tax upon distilled spirits intended for consumption; that tax is perfectly proper and forms a useful source of revenue, against which no objection whatever can be urged. It is the denaturized alcohol, that is, alcohol which has been made undrinkable by mixture with noxious substances, and is, therefore, usable only in the manufacturing and the industrial arts, from which it is sought to have the tax removed. As matters now stand with us, alcohol for beverages and industrial alcohol are subjected to a tax of \$1.10 on the proof gallon of 50 per cent alcohol. Commercial alcohol has a strength of 94 per cent, and the tax on it amounts to over \$2 per gallon. Industrial alcohol, according to the Department of Agriculture, could be sold profitably, were there no tax upon it, for about 15 cents per gallon; and under the increased demand that would be sure to follow, it is probable it could be sold profitably for 10 cents a gallon.

Practically all of the leading nations of Europe permit the use of spirits in the various industries without the payment of duty. Great Britain permits a limited use of it, and in that country the Chancellor of the Exchequer has recently appointed a committee to consider the whole question of free alcohol. This committee is to inquire into the existing, but limited, facilities for the use of spirits in the arts and manufactures without payment of duty. It is composed of experts and large manufacturers of alcohol, some of whom have been active in showing how much the chemical industries of Great Britain, and particularly those involving the use of alcohol, have suffered through the restrictions of inland revenue regulation, while German chemical industries, because of these restrictions, have profited greatly at their expense. It seems that there are in that country over a hundred manufactured products, in the preparation of which alcohol is necessary; that many of the processes of production were discovered in England and originally used in that country; but that when Germany, with her far-sighted provisions for the use of alcohol free of tax in the industrial arts, came into the field, the British manufacturers were unable to meet the competition, many of the factories being abandoned, and others experiencing a hard struggle for existence. Although industrial alcohol, according to one authority, could be produced in England at from 16 to 18 cents per gallon, the revenue tax raises the price to \$3.04 per gallon. As an example of the effect of this high cost on chemical industries, it is mentioned that dimethyl aniline, which Germany can produce for 7½ cents per pound, costs 57 cents per pound in England.

In a lecture recently delivered by one of the above-mentioned committee before the Society of Arts, stress was laid upon the fact that, when it is used with the

incandescent mantle, alcohol forms a splendid and very clean illuminant, alcohol lamps being made on the Continent which are capable of giving as much as 1,000 candle-power, while 250 candle-power lamps are quite common. Moreover, the alcohol lamp vitiates the atmosphere to a sensibly less degree than any other illuminant, excepting, of course, the incandescent electric light. As a result of alcohol being an indispensable ingredient of many valuable dyes, medicines, and chemicals, there is a great importation into England of these articles from all continental countries in which there is no tax on industrial alcohol.

As regards the use of alcohol on the Continent, it is chiefly in the development of power, light, and heat that the industry has had its growth. This fact was emphasized in a recent meeting of the Automobile Club of Great Britain, where the statement was made that, although more progress had been made with alcohol for the propulsion of motor vehicles in France, the quantity consumed as fuel by internal combustion engines in Germany was far larger. Of the suitability of alcohol for the purpose there is no doubt whatever; the tests of the laboratory being amply confirmed by the subsequent work of the motors. The difficulty which inventors have to contend with in the production of alcohol motors, is that the heat of combustion of alcohol is about 100 per cent greater than that of gasoline; but the value of a fuel depends not upon its heat of combustion, but upon the number of heat units which can be converted into work. Out of the ten alcohol-driven engines entered in 1902 in the competition for the prize offered by the German Agricultural Society, three gave efficiencies of from 32.7 to 30.9 per cent when working under full load. The degree of compression in an alcohol motor is much higher than that of the gasoline motor. In some cases in these tests a compression as high as 10¼ atmospheres was used, and the greatest explosion pressure attained was 33 atmospheres—results which appear to prove that the higher efficiency of the alcohol motor is due almost entirely to the high compression which can be used. Gasoline has a specific heat very much lower than that of alcohol, and consequently the latter can stand a proportionately higher compression, before the pressure and temperature are carried to the point of ignition. Moreover, the alcohol used in the German experiments contained 10 per cent of its volume of water, which, of course, was conducive to a high compression.

On the other hand, a report sent in by the United States Consul-General at Marseilles, France, states that in that country the sale of alcohol motors has been unimportant, probably one hundred petroleum or gas motors being sold for one alcohol motor. The reasons alleged are the high cost of the alcohol, the greater consumption per horse-power, and the difficulties arising from oxidation. In a report prepared by the French Minister of Agriculture upon the competitions organized by his department, it is stated that if the use of alcohol could be rendered practicable, it would offer decided advantages in the merchant and military marine, where, in his opinion, the use of gasoline engines would be attended with considerable danger.

NEW TRADE-MARK LAW OF APRIL 1, 1905.

We have from time to time noted the progress of the Bonyge bill, which has been for some weeks before Congress, and which has been approved by both the House and the Senate. On Tuesday, February 21, the bill was signed by the President of the United States and has become a law. The new law goes into operation on April 1, 1905.

It has been understood for several years that the old law of 1881 was exceedingly unsatisfactory, and was not affording the protection that was sought after or expected by registrants. The decision of the Supreme Court in the case of Warner vs. Searle & Hereth Company, November 30, 1903, proved to be practically the deathblow to the old law, as under this decision it was not possible to recover damages for the infringement of a trade mark used in commerce between the States. Although long before this decision the necessity of having a broader and better law had become apparent to those who were interested in the welfare of the patent system, all attempts at procuring favorable legislation in the direction of correcting the evils of the old system had utterly failed, and it is with a great sense of relief, therefore, that those who have at heart the bettering of our trade-mark laws will learn of the enactment of this new act. Under its provisions registrants will secure much broader protection than has been possible before. Not only will it be possible to recover damages for infringement of trade marks used in foreign commerce and with Indian tribes, but it will be possible to protect trade marks used in commerce between the States. The mere fact of registration is *prima facie* evidence of ownership, and in case suit for infringement is brought, triple damages may be recovered from the infringer, if the circumstances are such as to satisfy the court that penalties in addition to the losses actually proved should be imposed.

Another very radical departure is the provision for