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 "

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, FEBRUARY 14, 1903.

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.

"HOW MUCH, THEN, IS A MAN BETTER THAN A SHEEP?" Matt. xii.,'12.

The Editor is not about to preach a sermon. He is merely going to indulge in a few reflections on the cheapness of human life, as shown by the wholesale slaughter of passengers that is occurring day by day on our railroads.

It will not be a pleasant reverie; certainly it will not be flattering to our sense of national esteem; and it must needs make the most thoughtful of us, and the truly patriotic among us, realize that with all our boasted advancement in the useful arts of modern life, there are certain respects in which we are a long way behind some of those older countries, which we are apt to think we have left far behind us in all things that affect the comfort, safety, and sanctity of the life of the individual citizen.

Some time ago the British Board of Trade was able to announce that during a period of twelve months not a single passenger had been killed on the railroads of Great Britain. Since then another three months has passed without a fatality, making a straight record of fifteen months' operation of the most crowded railroad system in the world without a single loss of life.

Here, in the United States, our railroads have killed 77 passengers in fifteen days!

In cases of such astounding disparity as this there are usually to be found some mitigating, explanatory conditions. Let us then ask, are there any elements in American railroading that will satisfactorily explain why it is that the British railroad system can carry its teeming millions of passengers in fifteen consecutive months without killing one, while American railroads cannot carry a fraction of the number in fifteen consecutive days without killing 77 of them?

We have to confess that, so far from there being any mitigating circumstances, the more we look into the question the more inexcusable does our own shocking death list appear; and for the following reasons: First, the total number of passengers carried is greater in Great Britain; second, this greater number is handled upon one-eighth as many miles of track—24,000 miles in Great Britain as against 200,000 miles in the United States; and, thirdly, the average speed and the frequency of the trains is greater there. So that the slaughter that is going on is actually less excusable than the mere figures—and Heaven knows they are bad enough—would show. For with a smaller total number of passengers and trains, and in spite of the fact that they are spread over eight times as many miles of track, we kill 77 in 15 days while they kill not one in 15 months.

But why this appalling difference; and what, if any, shall be the remedy? Perhaps the trouble is that we have not as yet arrived at a proper estimate as to by how much a man is better than a sheep. Some people have been trying to solve the problem, and we believe that it is a fact that an enlightened legislature once put the difference at $5,000, or to be more exact $4,995—a fair average market value for a sheep being, we are told, about $5. It is true the correctness of this legislative estimate has been called in question, and twelve of the fellow citizens of a recent railroad victim have set the worth of a man at $60,000—an appreciation in value which has been sustained recently in one of the highest courts of appeal. There is no doubt that this higher valuation will go a certain distance in reducing the death rate on railroads; but it will never teach us to run our railroads 15 months without killing anybody.

We recently presented this comparison of railroad fatalities to the chief engineer of one of the leading railroads entering this city, who is a specialist on the question of block signaling, and asked him to explain the 77 fatalities, fully one-half of which, by the way, occurred on roads that were equipped with as fine a block signal system, and perhaps a better, than any in Europe. In his prompt reply he put his hand at once on the weak spot: "The different results are to be explained by a difference in national temperament—here, we take chances." He was right; our engineers do take chances; they interpret signals to please themselves; run past them, and—kill 77 passengers in 15 days.

But what are we to do? We cannot change "national temperament." True; but we can at least curb it, and we can do so in the case of the railroad engineer by extending the automatic principle, so that if he does not shut off steam for green lights and put on air for red lights, it will be done for him.

Let us place two levers on the engine and two corresponding trips on the track, one within sighting distance of the green and the other within sighting distance of the red signal. Let the green trip register with a lever that shuts an auxiliary throttle valve near the smokebox; let the red trip register with another that will set the emergency brake. Then should the engineer fail to shut off steam and let his engine coast on approaching the distant green signal, it will be shut off for him; and if he fail to set the brakes on sighting the home or red signal, the trip will open the train pipe. The levers could be so arranged that if the engineer manipulated his throttle and brakes in accordance with the signals, there would be no connection made between the trips and the engine. The suggestion as to automatic air-brake connections with the red signal was made several years ago, and it is excellent; the green light trip acting on the throttle is a logical extension of the idea.

"But," says the railroad official, "by the use of an absolutely automatic system you would destroy that element of watchfulness which it is our desire to cultivate in our engineers. They would become careless and would cease to watch for the signals. Then, should the signals fail, the chances of accident would be greater than before." Very good; then let the roundhouse foreman set a seal upon the automatic levers on the locomotive before it starts on its trip; and let it be a cast-iron law of the railroad that if an engineer come back with the green signal seal broken, he will be fined thirty days' pay, and that if the red seal be broken he will lose his job, and be blacklisted from Maine to Florida and from New York to the Pacific coast.

Here is a system that would prove an almost absolute preventive of collision, and that, incidentally, would produce in the first brief month of its operation a set of engineers who for alert vigilance would be hard to match.

But to extend this method to all the block systems would be enormously costly. True; but not so costly as to keep on killing 77 passengers in 15 days; especially if, as recent jury verdicts are suggesting, the people of the United States are waking up to the belief that the "how much" between a sheep and a man is some big multiple of 4,995 dollars.

Furthermore, we must remember that, to-day, of our 200,000 miles of tracks, only 25,000 miles, or one-eighth, is equipped with a block signal system of any kind. And here we find another potent cause of our perpetually-recurring railroad horrors. Train dispatching by telegraphic orders assists in keeping up the frightfully high average of railroad disasters. Take note of Accident Bulletin No. 5 just issued by the Interstate Commerce Commission, which records that in the three months ending September 30, 1902, 263 persons were killed and 2,613 injured in railroad disasters. At that rate, in the 15 months of which we have spoken, the total number of killed would run up to 1,315 and the injured to over 13,000.

And to think that it is all preventable! Moreover, just as soon as we really understand how infinitely much a man is worth more than a sheep, it *will* be prevented—if not by the initiative of the railroads, then by legislative act compelling the application of a direct, engine-controlled, block signal system to every one of the 200,000 miles of track.

GERMAN-AMERICAN WAR GAME.

The series of war games now being played at Portsmouth, between representatives of the American and German navies, has passed through the first critical stage. The close of this stage was an important battleship action in the Philippines, in which the American fleet, owing to numerical inferiority, was practically wiped out. As those of our readers who are following this very interesting series in the SUPPLEMENT are aware, at the opening of the war game the various contending fleets and squadrons on the checker boards were assumed to be in the exact positions in which the fleets of the two nations were at the date of the opening of the game. In the Pacific were stationed only four of our battleships, the 'Wisconsin," "Oregon," "Illinois," and "Kentucky," with the monitors "Monterey" and "Monadnock." Immediately upon the declaration of war the Germans dispatched, post haste, to the Philippines a battleship fleet made up of the very latest of their new battleships that have been completed within the last five years, all ships of 18 knots speed. The principle of concentrating in superior force upon some chosen weak spot of the enemy's line is a sound one, and is unquestionably the course which would be followed by Germany in a state of actual war. The United States players, to meet this move, wished to dispatch the North Atlantic fleet to Manila, but were prevented by the umpires from doing so on the ground that American public opinion along the Atlantic coast would not allow the seaboard to be left in such an undefended condition. The umpires demanded two or three weeks' delay of the North Atlantic squadron until a system of patrol by monitors, etc., could be established. Even with this loss of time, however, the situation in the Philippines might have been saved had the Panama Canal been built and in operation; for it would have been possible to send additional battleships to Manila in time to provide an equal United States fighting force, if not a preponderance of strength, for the great naval battle that was impending off Manila. The full significance of these strategical lessons of the war game will be appreciated, when it is remembered that the war game at Portsmouth is being fought out with absolute impartiality by British officers, who take up the opposing fleets simply with a view to training themselves in naval tactics and strategy. Hence, to everyone who takes an intelligent interest in naval affairs in general, and is therefore capable of forecasting the trend of events in case of a German-American war, it will not be surprising to learn that the three great lessons of the war game thus far developed are: first, that the far-distant Philippines are our most vulnerable point, and therefore the probable seat of attack in our next naval war; second, that if we are to render our navy fully efficient to cope with the new situation opened by the possession of the Philippines, we must dig the Panama Canal, and do it with all possible dispatch; and thirdly, that the United States fleet, at its present strength, is totally inadequate to cope with the larger series of operations now demanded of us as a colonial power.

After the defeat of the American fleet the German troops disembarked from the transports and made an assault on Manila which was repulsed, and this repulse, coupled with the advent of the American North Atlantic fleet, led to the re-embarking of the troops and the retreat of the German fleet to its naval base at Kiao Chau, China. Meanwhile, the second German battleship fleet, which crossed the Atlantic, captured Havana, and proceeded to recoal and refit, while the American fleet concentrated at Key West; so that the situation to-day consists in the juxtaposition of two opposing fleets: a German Pacific fleet in Kiao Chau Harbor blockaded by an equally powerful American fleet, and another German fleet in Havana Harbor watched by the American home squadron. In both hemispheres the combatants are so equally matched that the outcome is considered to be uncertain; but likely in any case to terminate the war.

A REFRACTORY PISTON NEEDED.

This title may cause a cynical expert to say to himself that pistons are generally refractory enough without calling for a new type, but that is as may be. The piston itself is a docile detail unless too much enforced by persons who follow tradition instead of exercising good judgment in the management of it. It is nothing more or less than a sliding, steam-tight partition in a cylinder; but to secure it against leakage various devices are used, most of them not only useless but harmful as well. Tradition teaches many that packing rings should be very wide and heavy, and provided with stiff springs behind having set-screws through them. Whoever achieved this last-named absurdity in a piston should have had special mention, for he could not have given much thought to the matter, or he would have seen that a spring with a set-screw through it was no spring at all, the elasticity and resiliency of it being destroyed.

In so far as the rings are concerned, the best practice now makes them as light as possible, in many cases dispensing with springs entirely. This type of piston is used on the heaviest kind of work, with very high pressures, in locomotive and torpedo-boat engines, and is wholly reliable against leakage. The advantages are that being relieved from abnormal and unnecessary pressure on its walls, the cylinder wears true and is not scored or cut by the packing rings. These last are called "snap rings," from the fact that they are sprung into the piston, having elasticity enough to go over its flanges and resume their form when they get into the grooves provided in the piston for them. In the early history of the steam engine great difficulty was experienced in getting true cylinders, for the lack of proper boring mills; and it in said that Watt, in alluding to this, wrote to a friend that they had at last succeeded in getting their cylinders so nearly correct in this respect that they "could not insert a crown piece between the packing and the cylinder walls anywhere." I do not know how thick a crown piece may have been in those days, a scant