

length of 16 miles, and 64 bridges and viaducts. Of the entire length of the St. Gothard line 17 per cent is tunneled and 1 per cent bridges and viaducts. The main tunnel carries two lines of railway, 4 feet 8½ inches gauge.

The contract for the work was taken by Mr. L. Favre, August 9, 1872. The construction was begun at Airolo, September 24, and at Groeschonen October 24, 1872.

#### IS INSANITY INCREASING?

It is a common saying that an increase in the number of insane persons is one of the necessary results of the intensity of modern life. There is certainly a steady increase in the number of inmates in asylums for the insane, an increase greater than the growth of population would seem to warrant. For this there may be several causes:

1. An actual increase in the proportion of persons of unsound mind in comparison with the entire population.

2. A more general and systematic commitment of insane persons to asylums for protection and medical treatment.

3. A steady accumulation of insane persons owing to the better care of the insane and the consequent lowering of the death rate of such persons.

That the second and third causes are real and potent is amply sustained by the statistics of our public institutions. The proportion of insane persons at large naturally diminishes with the improvement and multiplication of asylums and the growing popular conviction that neither individual nor public well-being is furthered by allowing the insane to go free, uncared for, and without medical assistance; and as a natural result the number of the insane in asylums increases proportionally.

Accordingly we may have an increase in the number of annual commitments to asylums, as well as in the number of permanent occupants, without any increase in the total percentage of insanity in the country.

Increased efficiency in the medical treatment of the insane may also seem to increase the number of cases as well as the actual number under care at any time. With unskillful treatment many cases of acute mania may result in speedy death, or, what is worse, chronic insanity. In such cases the patient counts but once. With better treatment the patient is ultimately, often speedily, discharged, apparently or really well. The disease is liable to recur, however, and in the course of years the same patient may have to be under treatment several times, each time adding one to the statistics of insanity.

Another fact which tells against the theory that "high pressure" living tends to unbinge the mind may be found in the source of the larger portion of the inmates of insane asylums. The records of asylums show that most of the insane come, not from the busy professional, mercantile, and manufacturing classes, but from those whose lives are a monotonous round of petty drudgery, or, what is equally killing, petty inaction, unfruitful idleness, and dissipation. Frivolity probably leads more men and women to the insane asylum than the hardest and intensest pursuit of mental or material wealth.

#### RAILROAD INVENTIONS WANTED.

Notwithstanding the fact that the past twenty years have witnessed wonderful improvements in railway fixtures and appliances there yet remains a wide field for mechanics and inventors to labor in in this direction. The fact that there are more than 2,000 existing patents on car couplers is no evidence that the demand is supplied. On the contrary, a good automatic coupler is among the needs of American railways, and the inventor who will produce a satisfactory coupler will not only be regarded as a public benefactor, but at least a dozen fortunes are at his command. A complicated rattletrap of an affair will not do. One that is plain, simple, durable, and reliable at all times is what the railway public are looking for and will, undoubtedly, pay handsomely for when found. There are a few of the couplers that have been brought out lately that are not entirely without merit, but they are lacking in many of the essential points of a perfect coupler.

The foregoing has reference solely to freight cars. The couplings now in use on passenger trains are, in the main, satisfactory, but for freight service the coupling is yet to be found. Here are some of the requisites of a perfect coupler: Any number of cars coming in contact should be coupled automatically. But it should be so arranged that no coupling will be effected unless so desired. It is obvious that if cars coupled at all times when they came in contact it would cause trouble in switching and yard work. The coupling must be so arranged that it can be operated from the tops of cars or on the ground without going between them. By "operated" is meant that a brakeman can uncouple from the top of a car or he can "set" the coupler so that it will not couple if so desired, and an operator on the ground can do the same thing without going between the cars. Next comes durability, which may be regarded as the "mountain in the path."

Chief among the causes of railway disasters are misplaced switches. It is true that we have safety switches that are reliable, but as their use (like many other good things) has not become general, there is a demand for a reliable switch signal. It is also true that we have some very good switch and drawbridge signals, but they do not always prevent accident, which may be accepted as proof that they are defective in some vital points. We have reports of from seven to twelve accidents from misplaced switches monthly, and accidents of this class are usually of a serious nature, being destructive of life and property. In August last eleven accidents are reported from this cause, and it is certain that

many accidents from misplaced switches are not reported, and we have from three to five drawbridge accidents yearly. About a year since a \$40,000 accident occurred at a drawbridge in New Jersey, and the draw was provided with an electric signal, but it appears to have become deranged. Some of the interlocking signals now coming into use are so arranged that if they get out of order in any manner the signal always stands at danger. This would seem to render switches and draws absolutely safe, but accidents are yet far too frequent, and although we have greatly improved these appliances they have not yet reached perfection.

Another fruitful source of frequent and serious disasters is imperfect signals at railway grade crossings. Crossing collisions are frequent and disastrous, and a signal that will effectually prevent this class of accident is in demand. Signals for the purposes named above should be of such a nature that they cannot be either misunderstood or run past unnoticed.

For daylight or clear weather targets or semaphores may be arranged so as to be effective, but on foggy days or at night the gong, bell, or torpedo should be brought into use. Interlocking signals are in use to a considerable extent, but they are mostly of a complicated and delicate nature and liable to become deranged. Moreover, there are such a diversity of signals that those who operate them and those who are to be governed by them are liable to become confused and the results are disastrous. Accidents have frequently occurred by the engineers passing a distant signal which stood at safety when it was passed, but was changed with the switch or draw before reaching the home signal or switch or draw, and the home signal not being visible by reason of fogs, or obscured by curves in deep cuts, buildings, piles of lumber, etc. No switch, draw, or crossing is safe without both a home and distant signal, both interlocking. And there should be intermediate signals at short intervals between the distant and home signals, and all connected with the switch or draw and operated with the single movement that operates the distant signal. As signals trusting to the vision for safety are not reliable at all times, the bell or gong must be brought into use. The torpedo may also be made to give warning of danger by a simple mechanism connected with switches and draws, by which a number of the explosives may be automatically placed on the rail at proper intervals.

The American Humane Society some time since offered a prize of \$5,000 for the best stock car, but at their recent annual meeting, at Boston, they decided that none of the many hundred designs so far submitted came near enough to the requirements to entitle any one to the prize. The offer is now open, and it is hoped that some one will soon win the prize.

The above hints may be worth something to inventors working in the directions indicated.

WM. S. HUNTINGTON.

[In respect to the prize offered by the Humane Society, one of the conditions was that the successful plan should be protected by a patent which should be assigned to the society. In these days of industrial progress it is idle to suppose that any patentee of a perfected cattle car would sell his patent for the small sum of \$5,000. Such a patent would be worth more nearly five hundred thousand dollars than five thousand. We have good authority for the statement that the offer of the Humane Association had the effect to call out a number of highly valuable cattle car inventions, the patents for which were at once bought up by the Palace Cattle Car Company at figures a little above those offered by the association. This left in the hands of the association only the inferior plans, none of which were found to be within the association's offer; hence no award could be declared. The Palace Cattle Car Company ought to feel greatly obliged to the association for its arduous and gratuitous services in assisting it to acquire its valuable patent rights at a tithe of their real worth. Ten millions of dollars, we believe, is the amount at which the car company now values these patents; at any rate that is the par value of the company's stock, which we believe is based chiefly on these acquisitions.]

#### NEW COMPRESSED AIR LOCOMOTIVE ON THE ELEVATED RAILWAY, NEW YORK.

A trial was made on the Second Avenue Elevated Railroad of a new air locomotive on the 23d, and again on the 28th of October, with entire satisfaction to the Pneumatic Tramway Engine Company, who own the machine. In this locomotive air at a high tension is stored in tanks and distributed to the motive cylinders through a reducing valve and then through hot water, according to an old and well known plan, for the purpose of heating it, to counteract the refrigerating effect of the expansion of the air, and also to provide moisture as a lubricant for the pistons.

This locomotive was built by the Baldwin Locomotive Works, of Philadelphia, and is the invention of Mr. Robert Hardie, of Edinburgh, Scotland. It is on the same principle and an improvement on a street motor that was tested and reported on by General Haupt, whose report was published in the SCIENTIFIC AMERICAN SUPPLEMENT of June 28, 1879, No. 182. The obvious advantages of a noiseless exhaust, and the absence of fire, with its disagreeable odors, dust, and smoke in a street motor, are claimed for this locomotive, and so far as the experiments are concerned which have taken place in the last few days on the Second Avenue Elevated road, the claim is well established.

The locomotive, as shown in our engraving, consists of four steel cylindrical air tanks of very perfect construction,

having dished heads and triple riveted spiral seams in lieu of the usual longitudinal form, and double riveted circumferential seams, all of which are made tight by means of Connelly's calking, and tested at a pressure of 850 pounds to the square inch. These tanks, having an aggregate capacity of 460 cubic feet, are supplemented by two smaller distributing tanks, a small steam generator, and a pair of motive cylinders, similar to steam engine cylinders, 12½ x 18 inches, with Stephenson link reversing gear and adjustable cut-off on the back of the slide, connected in the usual manner to four coupled 42-inch driving wheels. The cab is located at the forward or cylinder end of the machine. The method of hanging by means of equalizing levers between the drivers and an improved two-wheeled swinging center bearing pony truck effects the distribution of eighty per centum of the weight upon the drivers, and practically carries upon three points of the frame, thereby avoiding undue strains and securing steady motion over the inequalities of the track. The initial air pressure is 600 pounds to the square inch at starting, but is distributed to the motive cylinders through the distributing tanks, reducing valves, and steam boiler, at a uniform working pressure, about the same as that of ordinary locomotives. A small fire is kept burning in the furnace of the steam generator, which is a small upright tubular boiler. For the purpose of obtaining a high grade of expansion and a noiseless exhaust, the cut-off is arranged on the back of the slide, as above stated, which is instantly adjustable to any desired grade by means of an ingenious hand device within the cab.

A new and peculiar feature of this engine is the use of the main cylinders for working the vacuum brakes, which is done by simply putting the reversing lever in mid-gear, when the main cylinders become vacuum pumps, thereby greatly simplifying the handling of the train.

On the 26th of October we had the pleasure of a ride on this admirable engine, and we testify to the perfect manner in which it fulfills its mission as a noiseless, odorless, smokeless, and perfectly controllable motor. It will cover the full length of Second Avenue, from 127th Street to the Battery, with four loaded cars, at a higher rate of speed than the schedule calls for, with a single charge of air, and then the recharging is done in as short a time as is needed to change horses on a surface road.

The engine is now in charge of John A. Wallace, one of the "L" road engineers, who is more than pleased with it, and especially is he delighted with the absence of anxiety about boiler water, which is the steam locomotive driver's bugbear.

#### Curious Experiment in Crystallization.

The following experiment is given by Peligot in *La Nature*: Dissolve 150 parts by weight of hyposulphate of soda in 15 parts of boiling water, and gently pour it into a test tube so as to half fill it, keeping the solution warm by placing the glass in hot water. Dissolve 100 parts by weight of acetate of soda in 15 parts of hot water, and carefully pour it into the same glass; the latter will form a layer on the surface of the former and will not mix with it. When cool there will be two supersaturated solutions. If a crystal of hyposulphate of soda be attached to a thread and carefully passed into the glass, it will traverse the acetate solution without disturbing it, but on reaching the hyposulphate solution will cause the latter to crystallize at once in large rhomboidal prisms with oblique terminal faces. When the lower solution is completely crystallized, a crystal of acetate of soda similarly lowered into the upper solution will cause it to crystallize in oblique rhomboidal prisms. The appearance of two different kinds of crystals will not fail to surprise those not acquainted with such experiments.

#### Early Steamers in England and Canada.

At present (1814) there are five steamboats on the Thames. 1. The Thames (originally the Argyle), 14 horse power, plying between London and Margate; reckoned the best boat. The paddles alternate with each other, and are set at an angle of 45 degrees. 2. The Regent, 10 horse power, paddles set square, with rims like an overshot wheel; is expected to ply between Chatham and Sheerness. She was first built for the wheel to work in the middle; but this, not having been found to answer, has been altered. 3. The Defiance, 12 horse power, to Margate, with double horizontal cylinder engine. 4. A boat which plied between London and Gravesend was laid aside on account of a lawsuit, as she was not worked by a privileged person. Such a person has now taken her, and she will soon start again with a new 12 or 14 horse power Scotch engine, being originally fitted with a high pressure engine. The wheels of this have rims, and the paddles swing like top butt hinges. 5. A boat with double keel, 6 horse power, is now building above Westminster Bridge; paddles upright; said to be for London and Richmond. 6. Mr. Maudslay built a small boat last year for Ipswich and Harwich, 16 miles done in two and a quarter hours, but against a strong wind in three hours. This has six frying pan paddles set square, without rims. I have been informed, by letter of August last, from Gainsborough, of a steamboat from thence to Hull, which performs the voyage, 50 miles, in eight hours. And this week, from Canada, at present there are two steam vessels on the river St. Lawrence, one 48 the other 36 horse power, which go at 7 miles an hour, measure about 170 feet long and 30 feet wide! Another 48 horse power vessel will be launched next year on that river. So that one may go by steam from Quebec to New York in eight days, with a short land carriage.