Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year postage included..... $3 20
One copy, six months, postage included 1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each: additional copies at same proportionate rate. Postage prepaid.

Remit by postal order. Address

MUNN & CO., 37 Park Row, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, postage paid, to subscribers. Single copies, 10 cents. Sold by all news dealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year postage free, on receipt of *seven dollars*. Both papers to one address or different addresses as desired.

The safest way to remit is by draft postal order, or registered letter.

Address MUNN & CO., 37 Park Row, N. Y.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2. Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 37 Park Row, New York.

NEW YORK, SATURDAY, NOVEMBER 5, 1881.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT,

No. 305,

For the Week ending November 5, 1881.

Price 10 cents. For sale by all newsdealers.

THE FONTAINE LOCOMOTIVE.

In the SCIENTIFIC AMERICAN of October 8 there was given a large engraving of No. 1 of the new type of locomotive engine designed by Mr. Eugene Fontaine, with a brief account of its peculiarities. In the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT will be found a corresponding illustration of the Fontaine locomotive, No. 3, recently completed, with critical estimates of the value of the improvements introduced by the inventor. There is given also a sufficiently full statement of the behavior of these engines to enable the reader to form an idea of the reasonableness of the high expectation which the friends of the new plan of locomotive construction entertain with regard to the advantages it involves. The SUPPLEMENT paper referred to, it is proper to say here, is by Mr. John Ortton, Mechanical Superintendent of the Canada Southern Railway, under whose direction engine No. 1 has been running for several months. The high professional standing of Mr. Ortton gives weight to the judgment which he expresses—a judgment based on a critical study of the theory of the inventor as well as the practical behavior of the engine.

From the evidence thus furnished it seems to be abundantly established that the Fontaine locomotive marks a long stride forward in the direction of speed and economy in railway service. If it is not, as its friends confidently believe, the most important improvement made for many years in the construction of locomotive engines, it is still one that cannot fail to give a notable impetus to the advancement of railway engineering and to the social and commercial changes incident to increased facilities for rapid transit.

The distinctive mechanical features of the new engine have been sufficiently dwelt upon in the articles already mentioned. It is enough in this place to say that, by a bold and ingenious change in the manner of applying the power through auxiliary drivers, a large increase of speed is obtained with a given size of driving wheel without increasing the number of piston strokes or the amount of fuel consumed. Or, the speed of the train being constant, the improved method of applying the power and the more complete development of the working force of the steam enable the engine to haul a much heavier load than is possible with the engines in common use. Theoretically the advantage gained is nearly eighty per cent in speed or traction above the best performance of engines of the same size, built in the prevailing style—a practical gain of 30 per cent is deemed well within the bounds of demonstration.

The dimensions of engine No. 2, designed for freight service but not yet built, are given in the SUPPLEMENT.

The new engine (No. 3) has not yet been tested for speed. No. 1 has developed a speed approaching seventy miles an hour over long distances. In May last it drew a light special train from Amherstburg to St. Thomas, on the Canada Southern Road, a distance of one hundred and eleven miles, in ninety-eight minutes. The run from Amherstburg to Buffalo, two hundred and thirty-five miles, was made in two hundred and thirty-five minutes, including stops for coal and water. The expectation is that No. 3 will make ninety miles an hour, in which case it will be placed on the road between Jersey City and Philadelphia.

The influence upon commercial and social life certain to flow from an improvement like this—which greatly cheapens the cost of power for hauling freight and passengers—it is impossible to estimate. Social and commercial activity increases not in simple but in compound ratio with each step in the mastery of time and space, and in every instance hitherto the results of such improvements have surpassed expectation.

For ages men have envied the ability of birds to cleave the air at a speed approaching a hundred miles an hour, and it has been thought that nothing short of a flying machine would ever enable men to achieve a transit so rapid. It seems incredible that the problem should be solved without leaving the ground, yet not so incredible, nor half as improbable, as a speed of fifty miles an hour seemed to engineers fifty years ago.

There are few existing railways, it is true, on which it would be possible or prudent to drive a train at anything like the speed expected of the Fontaine locomotives, owing to the instability of the road-beds and the sharpness of the curves. But the improvement of established roads is being rapidly carried out, wherever the service requires it, and we may be sure that any degree of excellence which the future may demand will be promptly supplied.

But aside from any consideration of increased speed, the new locomotive (if experience shall confirm the promise held out by the performance of the engines now on trial), will materially increase the economy of railway service. There are already something like a hundred thousand miles of railroad in this country, employing not far from twenty thousand engines. All our great locomotive works are burdened with orders, some having contracts which will require two or three years of constant work to fill. Obviously an improvement which will add thirty per cent. to the efficiency of the locomotive, the running expense being the same, has the capacity of adding millions to the value and vastly to the capacity of our railway systems.

No Award in the Cattle Car Competition.

At the meeting of the American Humane Association in Boston, October 19, President Brown announced that there was no award by the judges of the $5,000 prize offered last year for an improved cattle car. Seven hundred designs and models had been submitted to the committee, but no one of them so complied with the conditions as to win the prize. Evidently the owners of good cattle car patents hold them at a higher figure that $5,000.

CASUALTIES IN BLASTING.

The introduction of the new blasting powders, especially those of which nitro glycerine is the basis, has given rise to many novel questions upon the responsibility for accidents. The workmen employed in engineering, quarrying, or mining operations, often disregard proper precautions simply because they do not know the nature and dangers of the explosives furnished for their use. This ignorance on the part of laborers, although natural and unavoidable, is the cause of many disasters. Gunpowder, formerly the only blasting agent used, has become quite well known to the common people. For more than a century the Fourth of July has been practically devoted to instructing the boys of the land that fire and gunpowder must absolutely be kept separate unless an explosion be desired. Thousands of casualties have re-enforced the lesson upon the minds of grown men in all the walks of life. What fact is better known than this, even among persons the least instructed? Quite otherwise as to the modern blasting powders. They have been so recently invented, are of so many kinds, and are in use under so many names, that no one should expect ordinary laborers to be fully acquainted with them all. Again, gunpowder can be fired only by an actual spark; if such a thing be possible as that it should be exploded by a blow, this could only occur under extraordinary circumstances, enabling the blow to heat the powder to the point of ignition. But, as all readers know, nitro-glycerine and its compounds, as well as some other agents somewhat used in blasting, may be exploded by concussion merely—the ordinary stroke of a hammer, the dropping of the can upon a floor or rock; and this concussion is believed to operate not at all by raising the temperature of the substance to the point where it will ignite, but, in some way not very well understood, by the change it introduces in the relation or position of the chemical constituents. The average laborer, though trained to recognize gunpowder and to guard it most carefully from every form of fire, does not equally know the blasting powders, either by sight or by their multitudinous names; nor does he realize that careless handling, an unlucky rub or stroke, may be to them what the spark is to the powder.

What once happened on a Boston railroad is a good illustration. Some one having work in hand involving blasting wrote to manufacturers of dualin for a quantity of that explosive, and to another manufacturer for a number of the exploders or detonators commonly used in firing it. It is a peculiarity of nitro-glycerine (also of gun cotton) that if a small quantity lying loose be touched with a match it will burn quietly; but if a blow be given to it an explosion will follow; and if the suddenness and violence of this blow be made as great as possible, which may conveniently be done by exploding some one of the fulminates in contact with the nitro-glycerine, the explosive power of the latter is raised to the maximum. Hence the use of exploders in connection with dualin. In the Boston accident the manufacturers of the dualin sent it, in cases plainly labeled, to the railroad depot to be carried to the customer. The manufacturer of the exploders sent those to the same depot; they also were labeled. Unfortunately both parcels reached the depot at the same time. Now this occurred ten or twelve years ago, when dualin was a novelty. The train hands saw the labels; but what did they know of the character of "dualin," the use of "exploders," or the peculiar danger of packing them together? And what did they do but put the two parcels side by side in the same freight car! The natural jolting of the car upon the journey fired the explosives and great mischief was done. Evidently such disasters are attributable not to carelessness in a strict sense, but to ignorance inseparable from the introduction of a novel and dangerous agent.

Recent books of court reports contain several cases illustrating the duties of those who furnish these powerful agents to untaught workmen. It is worth an employer's while to know that his obtaining leave from the public authorities to have a dangerous piece of blasting done does not diminish his responsibility for any disastrous consequences. There are rules of law limiting the right to keep explosives in store; and cities usually have somewhat stringent ordinances on the subject. When the Delaware, Lackawanna and Western Railroad Company constructed its tunnel through Bergen Hill it sought and obtained, in addition to the general authority given by the legislature in its charter, a specific license from Jersey City, in which the eastern end of the tunnel lay, to store the explosives needful in blasting. Under this twofold permission from the State and city their contractor built a magazine in which he deposited blasting powders. These exploded, damaging the adjoining houses. On behalf of the contractor it was shown that the magazine was built and the explosives kept in a most careful manner; no precaution was omitted. And he claimed that as he got leave to keep the explosives in stock, and kept them carefully, he was not liable for damages. The court said, in effect, that the keeping of nitro-glycerine or other explosive substances in large quantities in the vicinity of buildings is, generally speaking, unlawful; in New Jersey it is a misdemeanor. Getting permission to keep it simply relieves the person from this prohibition. It does not exempt him from damages if his dangerous goods explode. Whoever for his own profit stores these things in a city, must not only get leave, but also bear the entire risk.