Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

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

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S., Canada or Mexico.....$3 00
One copy, six months, for the U. S., Canada or Mexico..... 1 50
One copy, one year, to any foreign country belonging to Postal Union. 4 00
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner of Franklin Street, 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, for the U. S., Canada or Mexico. $6.00 a year to foreign countries belonging to the Postal Union. Single copies 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to one address in U. S., Canada or Mexico, on receipt of *seven dollars*. To foreign countries within Postal Union *eight dollars and fifty cents a year.*

Building Edition of Scientific American.

THE BUILDING EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans and perspective views pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To builders and all who contemplate building this work is invaluable. Has the largest circulation of any architectural publication in the world.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, $2.50 a year. To foreign Postal Union countries, $3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, to one address, $5.00 a year. To foreign Postal Union countries, $6.50 a year. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, $9.00 a year. To foreign Postal Union countries, $11.00 a year.

Export Edition of the Scientific American,

with which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," or Spanish edition of the SCIENTIFIC AMERICAN published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number contains about 50 pages, profusely illustrated. It is the finest scientific, industrial export paper published. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. THE SCIENTIFIC AMERICAN EXPORT EDITION has a large guaranteed circulation in all commercial places throughout the world. $3.00 a year, post paid to any part of the world. Single copies 25 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. MUNN & CO., Publishers, 361 Broadway, New York.

☞ The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO.

☞ Readers are specially requested to notify the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK. SATURDAY, DECEMBER 7, 1895.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 1040.

For the Week Ending December 7, 1895.

Price 10 cents. For sale by all newsdealers

IMPROVEMENT OF BOSTON HARBOR.

A movement is on foot to procure from Congress the necessary appropriations for the deepening of the channels at Boston, so as to admit vessels of the largest class. A depth of 30 feet is necessary, while at present only from 23 to 27 feet at mean low water are available. Boston is now one of our most important shipping ports and enjoys a great and growing commerce. There should be no delay in granting the most liberal appropriations for a work at once so necessary and advantageous to the whole country.

THE UTILIZATION OF WIND AS A MOTIVE FORCE.

For many centuries wind has been used in the countries of the old world as a motive power. In some of the low lying lands of Central Europe the lumbering old windmill is still one of the characteristic features of the landscape.

In this country the windmill has of late years been greatly improved and brought extensively into use. It is estimated there are over half a million windmills now running, and the annual increase in sales is estimated to be upward of 50,000. They are mainly used for pumping the domestic water supply; in many of the Western States a farm is scarcely considered to be complete unless it can boast of its windmill pump.

In some cases the mills are put to such work as cutting feed for stock, grinding corn, and the various lighter mechanical work of a farm. The success of the improved windmill in America has encouraged the manufacturers to push the trade in European countries and there is to-day a growing demand in the old world for these very useful and economical machines.

The chief drawback to the use of wind-driven motors is that the power is intermittent and uncertain. It has often been proposed to store up this power, so that the supply can be drawn upon in calm weather. This can undoubtedly be done; but whether such storage can be accomplished with economical results is open to question.

Water might be raised a certain height and stored in tanks prepared for the purpose. But on the basis that one horse power would require the lifting of 33,000 pounds one foot in one minute, it is evident that it would require large storage tanks and much time to lift enough water to provide a supply of any practical value. To this must be added the cost and care of a water motor to utilize this stored-up energy. A simple calculation shows that to furnish a constant supply of one horse power for a day of ten hours would require the daily storage of 47,000 gallons of water at a height of 50 feet. To accommodate this would require a tank 20 feet square and 16 feet high. To the expense of such a tank must be added the cost of the strong tower which would have to be built to carry at such a height this load of nearly 200 tons. The cost of receivers and motors for the utilization and storage of compressed air would in like manner largely neutralize any apparent utility of such device.

To store up sufficient electrical energy to run a one horse power motor for a day of ten hours would require a set of cells whose weight would be from 1,600 to 1,700 pounds. They would occupy some 20 cubic feet of space; and with the motor, belting, shafting and general fittings complete, the plant would cost about $500.

There would be a certain amount of drawback to the use of this system in the fact that the handling of a battery necessitates some technical knowledge and skill; a consideration that must necessarily limit the range of its application. Of the three systems of storage, the last mentioned would seem to be the best; and with further improvements in the way of automatic devices for regulating the charging and discharge of the batteries, we may look for a more extended use of this system in the future.

THE CHICAGO TIMES-HERALD MOTOR RACE.

It was extremely unfortunate that the weather should have interfered so seriously with the Chicago Times-Herald motocycle contest, which came off at that city on Thanksgiving Day. The recent storm had left the roads heavy with snow and mud. We are told that "for miles on the west side the boulevards were unbroken fields of snowbanks and slush." Six machines lined up for the start: The Duryea, of Springfield, Mass.; the Morris & Salom electrobat, of Philadelphia; the H. Mueller motocycle, of Decatur, Ill.; the R. H. Macy, of New York; the De la Vergne, of New York; and the Sturges electric motocycle, of Chicago. The Roger motocycle, with a view to giving it a long distance test, was started from New York to Chicago by road on November 15; but it was stalled by snow when it reached Schenectady.

Two of the machines covered the distance fixed for the race; the first being the design of an American inventor, Charles E. Duryea, of Springfield, Mass. His vehicle, a gasoline motocycle, covered the fifty-four miles in 10 hours and 23 minutes; a really creditable feat, when we consider the wretched state of the roads. The H. Mueller, also an American machine, was second, making the journey in 1 hour 35 minutes longer time. The De la Vergne, the Morris & Salom, and the Sturges electrical machine made no effort to cover any great part of the course.

The R. H. Macy had to retire after covering half the distance on account of broken running gear.

Although it is to be regretted that the recent storm should have spoiled this most interesting contest as regards the number of contestants and the rapidity with which the course was covered, we must bear in mind that the great severity of the test speaks all the more favorably for the excellence of the vehicles which completed the journey.

The storm of a day or two previous had completely paralyzed vehicular transportation in the very district where the Duryea motocycle completed a fifty-four mile journey at a five mile gait, and came in to the winning post none the worse for the trying ordeal. No better proof could be given of the all-round excellence of this vehicle. The greatest care must have been exercised in the proportioning of parts, and the general setting up, both of the motor and carriage, to enable it to battle for ten hours against the combined obstacles of mud and snow.

It is, moreover, greatly to the credit of the manufacturers that all this strength should have been obtained without the sacrifice of general appearance. As shown in the illustration, the Duryea motocycle is certainly an elegant "turnout," and for looks it could hold its own with the average horse carriage of to-day.

Undoubtedly the motocycle has come to stay. For private use, as compared with the horse carriage, it has many points in its favor. The space required for stabling would be merely that occupied by its own bulk; and its running expenses would be limited to the fuel consumed and such repairs as might occasionally be required.

We think that this new means of transportation is destined to play an important part in the question of city traffic. In the main thoroughfares of the larger cities traffic is badly congested. The adoption of the motocycle will largely relieve this, for the reason that it occupies only about one-half the space of the horse carriage; moreover, it turns in a much smaller circle, and is in every way more flexible in a crowded thoroughfare.

The metaphorical allusion to a flow of water in speaking of city traffic is well chosen. The "stream of traffic" is subject to the same laws as any fluid moving in a fixed channel. The more easily the particles adjust themselves to each other, the more rapid will be the flow, other things being equal. Nothing hinders the flow of traffic so much as a line of vehicles moving on a fixed track and having the right of way over other traffic. If such a thoroughfare as Broadway, in New York City, were asphalted from end to end, and its vehicular traffic carried on by various forms of the motocycle, its capacity would be largely increased.

The force of this statement will be realized by any one who has watched the ease with which the bicycle can thread its way through a crowded thoroughfare. Making allowance for its larger bulk, the motocycle shows an equal facility of control.

The general adoption of this vehicle, and the consequent removal of many thousands of horses from the streets of our cities, would result in greatly improved sanitary conditions. The introduction of the trolley and the cable car removed the nuisance in part, it is true, but it still exists. A gusty wind will raise at any time in dry weather a cloud of dust, which is composed more than anything else of pulverized manure. The gravity of this nuisance, viewed from a sanitary standpoint, is not generally appreciated. The adoption of any device, such as the motocycle, which will abolish the horse from a city's streets, would be welcomed by its sanitary officers as largely conducive to public health.

Wire Flywheel.

Among the most recent and novel applications of wire, attention is drawn in Hardware to the wire flywheel lately erected at the Mannesmann Tube Company's works, Germany, and especially notable, in view of the well known fact that heavy flywheels, driven at high velocities, present such dangers of breaking asunder from the great centrifugal force developed. The wheel at the factory mentioned is described as a cast iron hub or boss, to which are attached two steel plate disks or cheeks, about 20 feet in diameter. The peripheral space between the disks is filled in with some seventy tons of No. 5 steel wire, completely wound around the hub, the tensile resistance thus obtained being found to be far superior to that of any casting.

This huge flywheel is driven at a speed of about 240 revolutions per minute, or a peripheral velocity of 2·8 miles per minute, or approximately 250 feet per second, which is said to be nearly three times the average speed of any express train in the world. For such a constructed flywheel the length of wire is estimated at about 250 miles. The use of paper is also regarded with favor for large flywheels, the tensile strength of paper being enormous, and it is quite possible that some of the new big wheels will be built up with a paper rim.