

## SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN &amp; 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, \$0.10s. 5d. 4.00

## THE SCIENTIFIC AMERICAN PUBLICATIONS

Scientific American (Established 1845)	.....\$3.00 a year
Scientific American Supplement (Established 1876)	..... 5.00 "
American Homes and Gardens	..... 3.00 "
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, JANUARY 12, 1907.

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.

## CAPE COD CANAL.

Attention has been again directed to the project for cutting a ship canal across Cape Cod, by the recent announcement that a prominent financier, who controls the transportation interests in this city, has become interested in the scheme, and is prepared to furnish the necessary capital to put it through. It takes only a glance at the map of the New England coast to understand why the opening of this canal is desired both by maritime and naval interests, and particularly by the former. The passage from Long Island Sound to Boston and northern New England ports must now be made around Cape Cod, where navigation is rendered perilous by the stormy waters, the fogs, and the swift tides off the Cape. Moreover, the cutting of the canal would shorten the distance between New York and Boston by one hundred and forty miles on the sea route, and by seventy-six miles over the route through the Sound. It is estimated that at present the annual tonnage of coastwise trade which passes around Cape Cod is about 22,000,000 tons. As the greater part of this consists of coal, it is certain that the opening of the canal would mean the supplying of fuel to the mills of northern New England at a considerably lower rate than is now possible. The advantage to passenger traffic would lie in the fact that travelers who left New York in the evening would be landed in Boston next morning without having to make the uncomfortable early morning change from boat to train.

Commencing at Buzzard's Bay, the route of the canal extends across the narrowest part of Cape Cod to a terminus at Barnstable on Massachusetts Bay. The entrance on Buzzard's Bay will call for about 4½ miles of dredging through the shoals, and the length of the canal proper from shore to shore will be about 7½ miles; the total length of the canal, from deep water to deep water, being thus about 12 miles. The survey follows the valleys of two rivers, with a maximum deviation of not more than half a mile on each side of a tangent drawn from terminus to terminus.

The canal is to have a depth, throughout, at low tide of 25 feet. The minimum width at the bottom is to be 125 feet, and there will be four passing stations to accommodate vessels going in opposite directions, where there will be a maximum width of 350 feet on the surface. The borings, which have been of a very extensive character, indicate that the sub-surface is composed entirely of gravel, sand, and loam, free from quicksands, rock ledges, and boulders. The average height of the ground above tidewater level is 9 feet, and it is the easy character of the excavation which accounts for the comparatively low estimated cost of the canal, which can be built in three years at an outlay of \$12,000,000.

An important point to be considered in connection with any canal in the Northern States is that of the formation of ice during the coldest weather of the winter. Fortunately, there is a variation of four feet in the respective rise and fall of the tides in Buzzard's Bay and in Massachusetts Bay, the range being about 9 feet in the former and 5 feet in the latter waters. Moreover, the times of high tide are different. There will, therefore, be a constant current through the canal which, with the passage of shipping, will serve to prevent the canal from being closed by the ice.

## THE PENNSYLVANIA AND NEW HAVEN CONNECTING RAILROAD.

Seldom has a franchise been granted by the city of New York of greater importance than that recently conceded for what is known as the New York Connecting Railroad. The line has been designed to form a link between the Pennsylvania and New Haven and Hartford Railroads, and it is to be operated ultimately in conjunction with the tunnels which the Pennsylvania Company is now building between Jersey City

and Long Island. This system of tunnels, including the terminal station, is, however, designed exclusively for passenger traffic; whereas the avowed purpose, for the present at least, of the Connecting Railroad is to form a connecting link for the transfer of freight traffic between the two railroads.

At present, the method of transfer of freight from the New England territory to the Pennsylvania system is by means of large car floats, which are towed down the East River and across the Bay to the Pennsylvania freight yards in New Jersey. Under the new arrangement, the New England freight will be taken from Jersey City across the Bay to Bay Ridge, where the cars will be transferred to the Long Island Railroad tracks and hauled to Sunnyside, a suburb of Long Island City. The connecting railroad will start from this point, and will be carried by means of a viaduct to a point opposite Ward's Island, where it will cross the East River by means of a massive four-track arched bridge, with 150 feet clearance above the river, and a single span of 1,000 feet. From Ward's Island the tracks will be carried at high level to the Mott Haven yards of the New Haven system. This arched bridge, which has been designed by Gustav Lindenthal, the late Commissioner of Bridges, will be the largest arched bridge of any kind ever built, being 200 feet greater in span than the 800-foot arched highway bridge at Niagara Falls.

Although the connecting railroad is designed primarily, and will have its first use, as a freight line, there is little doubt that ultimately it will serve to give the New Haven passenger trains an independent entrance to their own terminal station in New York city. Recent heavy purchases of real estate in the neighborhood of Thirty-fourth Street and Park Avenue are believed to mark the beginning of a scheme for building a new passenger terminal for the New Haven system at this spot. It has for many years been evident that the Forty-second Street Grand Central Station, even when the proposed enlargements are completed, must ultimately become insufficient to accommodate the rapidly-growing passenger service of two great systems, and that the New Haven Company must, sooner or later, seek an independent terminus. The locality will be admirably placed for the convenience both of the railroad and the traveling public; for the passenger trains will be run over the Ward's Island bridge, to Long Island, and through the Thirty-fourth Street East River tunnel of the Pennsylvania Company to the new Park Avenue station, where passengers will be in direct communication with the underground rapid transit system of the city.

## THE SEVENTH NATIONAL AUTOMOBILE SHOW AT MADISON SQUARE GARDEN.

To the student of the art of automobile manufacture, the annual exhibition at the Madison Square Garden affords an unrivaled opportunity, not merely for observing the progress of the year, but of forecasting the probable trend of development in the future. In the present issue of the SCIENTIFIC AMERICAN we have endeavored to illustrate the machines and the parts and accessories, which, because of their novelty and importance, illustrate both the progress of the year and the present state of the art. In summing up the impressions of the Show, we find that the general trend of improvement is in the following directions.

In the contour or outline of the cars, one notes a disposition to avoid the curved lines of the earlier cars, and accentuate the rectilinear lines, particularly in the horizontal direction. In this we see an instinctive appreciation of the fact that an automobile belongs more to the class of the locomotive than that of the carriage. When steam railroad trains were first introduced, the car bodies were modeled after the stage coach, the early cars being simply stage coach bodies mounted upon flanged wheels; but ultimately it was realized that the simple, vertical and horizontal lines, which now distinguish the railroad car, were more suitable to its structural requirements and produced a better looking vehicle. So, in the development of the automobile, it is coming to be realized that the longer bodies and straight lines produce a car, which is not only, if we may use the term, more shipshape, but which possesses more of that inherent beauty that belongs to a properly proportioned self-propelled vehicle, whether it be intended for use upon steel rails, or upon a macadam road.

The improved appearance of this year's cars is largely aided by the considerable increase in the wheel base which, in the case of some of the heavier machines is now as great as 123 inches. Furthermore, the use of six-cylinder motors has brought with it a considerable increase in the length of the bonnet, and this also adds to the generally rakish and smart appearance of the up-to-date machine. By a judicious attention to these principles, the builders of even the low-powered and low-priced machines have succeeded in giving to their output a style, which was altogether lacking in the earlier models. Other elements which have helped to improve the appearance are the bet-

ter designed mud guards, which are now frequently brought up to a junction with the frame of the cars, and are designed in long, easy, sweeping lines of decided grace and beauty, and the provision of continuous running boards in place of the earlier and rather crude-looking step, which, like the curved car bodies, was a relic of the carriage builder's influence.

The detachable or folding tops for summer use, and the closed and semi-inclosed bodies for winter, have become standard; and, thanks to the care with which the carriage builders have accommodated the bodies to the necessities of the chassis, the majority of the automobiles shown are marked by no little beauty and distinction.

We notice a tendency to increase the diameter both of the wheels and the tires, particularly of the rear wheels. It is not unlikely that in the future the prevailing custom will be to make the front wheels and tires smaller than those at the rear. In some machines the diameter of the rear tires has reached the rather high limit of 5 inches; although at its first introduction, this size rather detracts from the graceful and otherwise well-proportioned appearance of the cars. The disastrous failure of American non-skid tires in the Vanderbilt cup race proves nothing material against such tires when used on touring cars, as the experience of the past year has proved that the best makes are capable of showing excellent endurance under the severe test of the roads of this country. Considerable attention is being given to the subject of shock absorbers, most of these being designed to operate by friction, and others by air on the method of the well-known door check; while a meritorious attempt is being made to apply the principle of the hydraulic brake as used in checking the recoil of heavy guns. A novelty in shock absorbers is a device which consists of a central cylinder, containing brake shoes, associated with two smaller cylinders provided with compound springs, the slight vibrations being absorbed by the springs, while in the heavier shocks the springs and brake shoes act together to retard the rebound.

Although the four-cylinder, vertical, water-cooled engine must still be reckoned as the standard type, the six-cylinder engine has unquestionably come to stay, the advantages of more even torque and better control offsetting, in the opinion of its votaries, the disadvantages of greater weight and multiplication of parts. A refinement of design based on good mechanical considerations, is the tendency to unify the engine and transmission by inclosing both in a single housing, mounted on a three-point suspension. In one instance, the flywheel is mounted at the forward end of the engine, this change being made to avoid the enlargement of the casing which is necessary when the wheel is carried between the engine and the transmission.

There is an increasing use of the shaft drive, although many of the old-time, standard cars show a preference for the side chains. One maker, in the endeavor to secure the dust-proof qualities of the shaft drive, has inclosed the chains in a dust-proof shield, a device which was found to have valuable qualities on the bicycle, and should prove of even greater value in prolonging the life and reducing the resistance of automobile chain drives. There is noticeable a more general adoption of ball-bearing crankshafts, the favored type being the spring-separated, one-ring bearing. Ball bearings are also being extensively used on the transmission, the rear axles, and the wheels. Several novel and important designs of transmission are shown, some of these providing four speeds with the direct drive on the third speed; the fourth speed giving multiplication from the engine to the wheels and being used for fast traveling.

In carbureters there are also several improvements, among which we noticed the use of multiple jets, or the adoption of two distinct carbureters of different sizes, the smaller one being used for ordinary running at low power, and the larger one for high speed or hill climbing.

One of the novelties this year is a new gasoline-electric touring car brought out by one of the oldest New England firms and one which has had considerable experience with electric vehicles. This car is provided with the usual 4-cylinder engine which is direct-connected to a dynamo forming a magnetic clutch. In ascending hills the magnetic clutch is allowed to slip to a greater or less extent, and the current generated is passed to an electric motor which helps to propel the car at a slow speed but with increased pull, while the full torque of the engine is still transmitted directly through the propeller shaft to the rear axle. The car is fitted with five forward and two reverse speeds and an electric brake. The advantage of this construction is that a large percentage of power of the engine is always used direct without its efficiency being reduced, by conversion into electricity, and then back into mechanical power. The magnetic clutch acts in the same way as a friction clutch, but there is no contact between the driving and driven part of the clutch, and consequently, no frictional loss through slipping.