

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, £1 10s. 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 Edition (Established 1885) 3.50

Scientific American Export Edition (Established 1875) 3.00

The continued 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, corner Franklin Street, New York.

NEW YORK, SATURDAY, FEBRUARY 4, 1899.

THE NEW PANAMA CANAL.

All the world is pretty well agreed that a ship canal ought to be built somewhere across the neck of land which unites North and South America. All the world is also agreed that only one canal should be built. The points upon which it is not agreed are as to where it should be built, by whom and at what cost.

The United States Senate has cut the Gordian knot at a stroke by declaring that it should be built at Nicaragua, by the United States government, and "for a cost not to exceed \$115,000,000."

One of the most distinguished and representative bodies of engineers that ever gathered to discuss an engineering problem of international importance, after examining the results of a four years' survey by 150 engineers, has recently stated that the waterway should be cut through at Panama, where it finds a canal already two-fifths completed, and that the cost of its completion will be \$102,000,000.

Three successive estimates, based upon preliminary surveys of the Nicaragua route, have been offered to the public. In 1895 the engineer of a private company (the Maritime Canal Company) reported that the canal could be built for \$69,893,660. Then a government commission of engineers (the Ludlow Commission), at about the same time, after examining the route, said it would cost at least \$133,472,893 to do the work; but stated that the many unsolved problems could only be determined after a complete survey by a competent staff of engineers. Thereupon the government dispatched an admiral, a college professor, and an engineer to make a more detailed examination. In its frantic haste to know the truth, and before the commission had had time to arrange its data and draw its final conclusions, the Senate demanded a statement of the cost. At a hearing before a committee of the Senate the college professor stated that he thought the thing could be done for "inside of \$90,000,000;" the gallant admiral, "speaking as anybody on the street might speak, thought that the canal could be put through for \$125,000,000;" while the engineer thought it could be built "for a maximum of about \$140,000,000." The preliminary report of the Walker Commission, recently handed to the President, states that the cost will be between \$123,000,000 and \$140,000,000. The Senate, without waiting to learn the very facts which it had dispatched its commission to ascertain, lumped the three guesses above mentioned together, divided the result by three, and authorized the construction of \$115,000,000 worth of ship canal!

Now, without dwelling upon the precipitancy, or shall we rather say the absurdity, of such legislation, we ask whether it would not be wise, before authorizing the construction of a new canal, to ascertain whether there is any probable competitor in the field. For we take it that if it were once proved to the people of the United States that another canal was within measurable distance of completion, they would never countenance for a moment the folly of constructing a second in its close proximity.

With a view to giving publicity to the facts regarding this vital and fundamental question, we devote a considerable part of this week's issue to a statement and illustration of the exact condition of the Panama Canal. Our illustrations are reproductions of photographs taken within the past few months along the route of the canal. The plan, profile, and cross sections are drawn from plans furnished by one of the American members of the International Commission of Engineers, and the facts are taken from the recent report of the commission, or were communicated to us verbally by various members of the commission, American and foreign.

In presenting the data we wish to give it our fullest indorsement as being an exact, unbiased statement of facts; and we do this, not because we have the slightest interest in the Panama scheme as against any other, but because we are satisfied that the ability, experience, and high professional character of the gentlemen of the International Commission are such as to place their findings upon any engineering question of this kind beyond the faintest suspicion of incompetence or partiality.

If expert testimony counts for anything, the unanimous report of a commission which includes the chief engineer of the Croton Dam and the chief engineers of the Manchester and of the Kiel canals, in favor of the construction of the Panama scheme, should set at rest all doubts of the feasibility of the plans as now drawn up, and lay forever the ghosts of floods, fraud and fevers, which have haunted this enterprise ever since the days of De Lesseps' catastrophe.

The Panama Canal then is feasible, and the cost and time of its construction are accurately known. Two-fifths of the actual excavation is completed, a plant that cost originally \$30,000,000 is scattered along the route, engineering surveys of the most thorough character are completed, the working plans for every structure big or little are completed, and the specifications drawn up; and a company composed of representatives of the leading financial institutions of France with \$13,000,000 of paid-up capital stands ready to concentrate a maximum force of labor upon the work with a view to its energetic completion.

Finally, in respect of the all-important question of control, it will doubtless surprise many of the public to know that by the articles of a treaty concluded in 1848 between this country and New Granada (which is now the United States of Colombia) this country, in return for special privileges, "guarantees" (to quote the treaty) "... the perfect neutrality of the isthmus with a view that free transit from one to the other sea may not be interrupted, . . . and the United States also guarantee, in the same manner, the rights of sovereignty and property which New Granada has and possesses over the said territory."

These rights are of the very essence of sovereignty, and, in accordance with their stipulations, this country has already had occasion to land its forces to protect the property of the Panama Railroad.

After consideration of the facts as above set forth, the question will naturally suggest itself whether, if it is desirable for the government to participate in the construction of a canal (which we very much question), it would not be advisable for it to take such steps as will give it a strong representation in the directorate of a company whose property it is by treaty pledged to protect. Should the question be answered in the affirmative, the next and most obvious move would be the appointment of an expert commission to be given all the time it needs to look carefully into both the Nicaragua and Panama schemes, and report which, all things considered, has the most features to commend it to the support of the United States.

In a future article we shall present the available data regarding the Nicaragua scheme. Our first attention has been given to Panama because we believe that any discussion that ignores or belittles the older enterprise is worse than misleading.

PROF. DEWAR'S EXPERIMENT WITH LIQUID HYDROGEN.

It is now about eight months since hydrogen has been liquefied in the laboratory, and on January 20 Prof. Dewar gave an interesting lecture on the subject at the Royal Institute. His experiments were most interesting, and a description of them has been cabled to The New York Sun. A little ball, cooled and exposed to the air, was first covered with a coating of solid air. It then began to drop liquid air. A piece of cotton wool soaked in it appeared to be magnetic, but the liquid itself Prof. Dewar is satisfied is not magnetic. This phenomenon must, therefore, be due to the cotton wool being immediately filled with solid oxygen, which is highly magnetic. He explained how vacuums of high tenacity were easily obtained by immersing a closed tube in liquid hydrogen. The air in the tube was immediately solidified, and if the tube was so arranged that the portion combining the accumulation of solid air could be sealed up, the other part would have, according to the calculations of Sir William Crookes, a pressure amounting to only one ten-millionth of an atmosphere. With vacuum vessels for use with liquefied hydrogen it is, therefore, not necessary to pump out the air. It is only needful to put liquid hydrogen in a double walled vessel and it may itself make a vacuum by solidifying the air between the two walls.

COPYRIGHT OF PHOTOGRAPHS.

An amendment has been proposed to the copyright law in the interest of photographers, which will enable them to prosecute the alleged infringement of their copyright at any time after publication. It also gives the photographer the full amount of the penalty of the violation of the law instead of dividing the amount with the government, as is now provided by law. Even the present law has been used by unscrupulous persons in the photographic business for levying blackmail, and these operations have been highly successful. The amendments proposed will enable them to carry on their designs with still more success, as they will not be obliged to divide with the government. It will be readily seen that this new amendment might result in great hardship to the publisher; thus a photograph might be brought to the newspaper, which had

been remounted, cutting out the copyright notice, or it may not have been copyrighted at the time of publication. The owner of the copyright sees the violation, and after waiting two or three years sues the newspaper publisher, the photographer saying that the newspaper published a copy of his copyrighted picture. This may or may not be the case, but in the meantime it is more than likely that the newspaper editor will have lost all trace of the photograph from which the cut was made and he is practically without means of proper defense. In many cases innocent infringers have had to pay \$5,000 for using a photograph the value of which was not \$5. The law should be amended so as to bring damages within reason, and endeavor should be made to make them in some degree commensurate with the actual damage which the photographer has suffered. Photography is a common art, and no photographer was ever yet damaged anything like \$5,000 for even a very flagrant infringement of his rights.

THE FOURTH ANNUAL CYCLE AND AUTOMOBILE EXHIBITION.

More prominence has been given to horseless vehicles, or automobiles as they are called, in this exhibition than in previous years, and naturally they form one of the chief attractions to visitors.

The exhibition was held in the Madison Square Garden, in this city, from January 21 to January 28, 1899, the main floor being divided in sections for the various exhibits of many different manufacturers of bicycles and accessories.

We shall refer briefly to the exhibits of automobiles. Near the main entrance slightly to the left stood an electric runabout styled the "Orient," and manufactured in Waltham, Mass. Its bright red running gear contrasted well with the black body. The framework for holding the body and motor is built of weldless steel tubing, and the front axle support is swiveled to allow for unevenness of roads, there being attached also steering rods which operate the two front wheels in combination with a center lever located in front of the driving seat. The raising of the lever, we will say, turns the wheels to the left, the lowering of it steers to the right. A foot lever connected underneath rearward, by diverging wire ropes to brake bands located near the hubs of the rear wheels, operates the brake. A three-kilowatt motor attached to the frame underneath gears into a special spur differential gear, thereby equally distributing the power on the wheels whether going straight or around a curve. The controller lever for switching on the electric current is on the outside of the carriage, left side. The chloride accumulator battery is located in the rear compartment and has an efficiency of 1,800 ampere hours or a discharge which will propel the vehicle for twenty-five miles on a level road.

Near by this exhibit, on the left, were three electric vehicles by the Riker Electric Company, one of which was a new covered phaeton, light in construction and tasteful in design. In this vehicle a special steering gear is provided working the hubs of the front wheels, and connected to a vertical steering rod which rises to the level of the seat and is there hinged to lie horizontally, with a handle on the end for steering with the left hand. Projecting upward between the cushions in the center is the controller lever operated by the right hand for switching on the battery. The motor at the rear gears into a large gear wheel, keyed to the rear axle, and the latter is ingeniously constructed to compensate for different rates of speed of the two rear wheels. The Willard storage battery is employed on account of its compactness and efficiency. Another vehicle was a covered delivery wagon of unique design. The vehicle is very attractive and easily operated.

The third exhibit of electric vehicles was that of the Pope Manufacturing Company, of Hartford, Conn., at the further end of the hall. These vehicles appear to be more solid and substantial than those of other makes. Three styles were shown, a top-covered two-seated doctor's vehicle, a four-seated trap, and a covered delivery wagon of solid proportions, all equipped with the usual controller lever and brake device. The motor is well incased at the rear, motion being conveyed therefrom to the wheels in an effective manner.

It was said these vehicles would make a distance of thirty-five miles on one charging of the battery on a hard level road. Each carriage is equipped with the chloride storage battery.

Near by, in the same section, was on exhibition by this company a novel motor merchandise vehicle, propelled by a gasoline motor. The carrying boxes are supported on each side of the main central frame, there being one steering wheel in front and two driving wheels at the rear. The gasoline motor is located at the right hand side, about ten inches above the ground, and gears into a driving shaft running across the rear of the machine. The motor cylinder jacket is provided with flanges for cooling by air currents.

Attached to the main shaft is a chain connected with a separate foot-driven sprocket wheel. A seat is provided conveniently for the operator, who, to start the machine, works the foot pedals. The forward motion