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, £0 16s. 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) .... 2.50 "
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, NOVEMBER 23, 1901.

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.

OUR NEW NAVY.

It is likely that but few, even among those of our readers who take a special interest in naval matters, realize what a large addition has been made to the United States Navy since the conclusion of the Spanish war. The great popularity of the Special Naval edition which this journal brought out during the war, coupled with frequently-recurring requests from our subscribers for a similar work bringing the development of our Navy up to date, has satisfied us that a special number describing our naval growth during the past three years would meet with public favor, and would answer a large number of inquiries, written and unwritten, regarding the exact present strength of the United States Navy. In preparing this Special Number, we have thought that we could not do better than be guided by the great popularity achieved by its predecessor, and the issue will, therefore, contain a photographic illustration of every type of ship authorized, building or completed since the Spanish war, with a complete description of its construction, armor, armament and general fighting qualities.

A special chapter will be devoted to the remarkable work accomplished by the Bureau of Ordnance in designing for our new warships entirely new guns of unprecedented power, the pieces ranging from the 40-caliber, 12-inch rifle down to the 50-caliber, 3-inch piece which will enter so largely into the make-up of our modern batteries. The naval lists, which were a popular feature in the former number, will be brought up to date, and we shall present a comparative table showing our present fighting strength compared with that of other navies of the world.

By way of marking the great stride made by our navy in the brief three years since the war, we may mention that the aggregate displacement of battleships, monitors and cruisers in commission during the war, omitting the hastily improvised auxiliary fleet, was a little over 153,000 tons, whereas the double-page drawing showing all the new ships put in commission since the war, and all the ships at present authorized and under construction, represents an aggregate displacement of over 313,200 tons.

In other words, the addition now being made to our navy is over twice as great, measured in displacement, as the actual fleet that won the Spanish war. To this must be added the fact that in range, power, and accuracy the new guns of this modern navy are at least 100 per cent superior to the low-velocity, smoke-producing weapons of Santiago and Manila Bay.

A COMPOUND CONDENSING STEAM CARRIAGE.

We do not know of a more promising subject of investigation for the practical mechanic than that of the production of a suitable condenser for the steam-driven automobile. Manufacturers of the steam carriage have made wonderful progress in the development of the type, and considering the inherent difficulties of the problem, the steam carriage to-day exhibits an ingenuity and skill in its design not excelled by that of any of its competitors. There are few prettier pieces of mechanism to be found than the compact, powerful little two-cylinder, Stephenson link-motion engines which are almost universally used on the steam automobile of to-day. The boiler and various regulating appliances, automatic or otherwise, are the result of most careful thought and reflect the greatest credit upon the makers. Type for type, and considering the limitations under which each type labors, the steam carriage of to-day, as a piece of mechanical design and construction, is fully abreast of its electric or gasoline-driven competitors.

The radius of action, as far as it is governed by fuel capacity, is much greater than that of the electric and not far short of the internal-combustion-motor machines; but when we come to the question of water capacity, we find that the steam-driven type, while about on a par with the electric, is still far short of that of the gasoline type. It has long been recognized by the makers that as soon as a satisfactory condenser can be devised, the radius may be increased to almost any extent desired, and this for the reason that the water instead of being thrown away in the form of exhaust steam, will be pumped back to the boiler, and perform a continuous cycle through boiler, engine, and condenser, the replenishing of the water tank taking place at long intervals, the loss being only such as is due to leakage and evaporation. In addition to the advantage of increased radius of action, the provision of a condenser would, of course, result in great fuel economy, a large portion of the heat being returned to the boiler.

There are, however, well-understood difficulties attending the design of a suitable condenser. There is the increased weight; there is the difficulty of separating the oil which will necessarily be carried over from the cylinders; and there are the well-known difficulties attending the pumping of hot water, that is approximately at the boiling point, into the boiler. Judging from an experimental condenser which a member of our staff fitted to his steam-driven machine, merely for the purpose of reducing the clouds of exhaust steam in cold weather, it should be quite practicable, by making use of aluminium piping and a suitable system of flange or pin-cooling devices, to secure sufficient surface to condense all of the steam. While an air-cooling condenser would, of course, add appreciably to the weight, the increase would be by no means prohibitive, nor would it even begin to offset the gain in economy and in radius of action that would be secured. Of course, the chief difficulty, if air-cooling were used, would arise when the machine is doing its maximum work in hill-climbing. At such a time it might be necessary to increase the air current by means of a rotary fan; but even supposing that condensation during hill-climbing were only partial, the worst that could happen would be the loss of a portion of the water in the form of uncondensed steam. Furthermore, the provision of a successful condenser for the steam carriage would open the way for other important improvements tending to increase the power and efficiency of the motor. The water-tube boiler, higher steam pressures of from 250 to 300 pounds to the square inch, and the use of multi-cylinder engines, compound or even triple-expansion, would be improvements which would tend to bring the performance of the engine and boilers nearer to the economy which is realized in marine practice.

Having said this much, however, we must bear in mind that there is one radical difficulty which would immediately present itself if the exhaust were turned into condenser. At present the large steam-raising capacity of the steam-carriage boiler is due in considerable measure to the fact that the exhaust is used to induce a strong draft through the burner and tubes, and if the exhaust were directed to the condenser, some other means of increasing the draft, or some other form of boiler, would have to be resorted to. Of course, sufficient draft might be secured by a rotary fan; but as our proposed condenser already calls for a cooling fan, it can be seen that the accessories of the new design would be beginning to multiply beyond the point of working practicability. However, after all is said and done, it must be admitted that the problem is a very live one, full of interest and promise to the inventor who can work it out to a practical solution.

M. SANTOS-DUMONT'S PLANS TO CROSS FROM NICE TO CORSICA.

INTERVIEW BY OUR PARIS CORRESPONDENT SPECIALLY FOR THE SCIENTIFIC AMERICAN.

The Paris correspondent of the SCIENTIFIC AMERICAN had the opportunity of meeting M. Santos-Dumont shortly before his departure from Paris, and made a visit to the balloon shed at the Aerostatic Park in company with the aeronaut. The famous "No. 6" is being dismounted and made ready to be taken to Nice, where the experiments are to be carried on during the winter under more favorable conditions than at Paris. Speaking of his present balloon, which has a double silk envelope, M. Santos-Dumont says that he had considerable difficulty in preventing it from folding together during certain maneuvers, owing to the insufficience of the ventilator which sends air into the small interior balloon. In fact, when the balloon is afloat it is submitted to differences of temperature according to the layers of air which it traverses; and in consequence of the endosmose which takes place in spite of all precautions, the gas leaks and a balloon of elongated form is always in danger of folding in the middle. This he knew from past experience, and accordingly provided the No. 6 with an interior air-bag which is more or less filled by a ventilating fan attached to the motor, and keeps the main balloon expanded out. The ventilator, however, did not prove all that was desired, and so he had hard work to keep the balloon in proper shape. The Buchet petroleum motor which he uses has also caused him considerable trouble. It has four cylinders mounted on the top of a long crank-box in aluminium. Once in the air, as a general rule, only two out of four cylinders worked, and this left him naturally at a great disadvantage. With this motor he counts upon 18 horse power, but as this is often cut down one-half he cannot make the balloon go through the evolutions he wishes. The Longuemare carbureter has always worked very well in spite of the considerable inclinations which it takes due to the varying position of the balloon. The carbureter is regulated by a wire which passes to the car. It will be remembered that the motor is at one end of the frame and the car at the other; the aeronaut is thus at a considerable distance from the apparatus, and uses a number of wires to carry out the maneuvers. A small pilot-wheel thus carries two wires which pass upward and then back to the rudder. In place of taking sand as ballast he now uses water, and this is contained in two long pointed cylinders mounted in front. Each cylinder, which contains 6 gallons, may be emptied gradually by a valve from which a wire passes to the car. The aeronaut is obliged to use a guide rope weighing 110 pounds and 150 feet long, which hangs down from the front end of the frame. This often causes difficulties by dragging upon the ground or catching upon the roofs of houses.

M. Santos-Dumont is now preparing to carry out a series of experiments on a much larger scale upon the Mediterranean, and will soon be ready to go to Nice. At present he is making great preparations for his new experiments, and is to have a large balloon house constructed upon a piece of property which has been offered to him for the purpose on the coast near Monaco. The shed will be 150 feet long and 80 high, much larger than that at the Aerostatic Park, and near it will be installed a hydrogen generating plant. The present balloon, No. 6, has already been emptied of gas and packed up and the framework will be transported as it is upon two flat cars. The aeronaut has already commenced the construction of a new balloon, the No. 7, which will be 30 feet longer than the No. 6 and built especially with a view of obtaining high speed. It is a much more powerful air-ship than the former in every way, and measures 120 feet long and 18 feet middle diameter. The same general shape is preserved, but the new balloon will be of a more elongated form than the other. The framework will be also 30 feet longer, making 85 feet, and will weigh about 140 pounds. The series of balloons has thus been gradually growing larger; the first balloon of 1898 gaged only 225 cubic yards. Since this he has made five others, increasing in size, and the present balloon is again an increase of 250 cubic yards over the precedent, or 1,030 cubic yards. Two screws are to be used, one at each end. They are 15 feet in diameter and driven independently by 45 horse power motors, thus giving 90 horse power in all, and a very high speed may be expected. This time he will use gasoline for ballast, and it will be used to feed the motors and thus be consumed instead of thrown overboard. Hence he expects to be able to stay in the air longer and cover long distances. The car, instead of being near one end, will be placed in the middle of the framework and the motors mounted one at each end, near the helices. In this way a much better balance will be obtained. The frame will hang as before from the balloon by steel piano-wires, and owing to the better equalizing of the strain there will be much less danger of tearing the balloon at the points of attachment to the silk. M. Santos-Dumont expects to occupy the next three months in making experiments in the bay of Monaco, and will then try to cross the Mediterranean from Nice to Corsica. This trip he is confident of being able to carry out, and he expects to make the passage in one-half the time taken by the steamers. He expects to be ready to carry out this project about the end of February. If it is successful the next step will naturally be to cross to Africa.

FURTHER TESTS AT SEA OF THE BELLEVILLE BOILER.

Following the test between the two cruisers, "Hyacinth" and "Minerva," of the British navy, from Gibraltar to Portsmouth, to ascertain the respective advantages and disadvantages of the Belleville and cylindrical boilers, the results of which we published in the SCIENTIFIC AMERICAN of October 5, another contest has been carried out between these two ships, and again the Belleville has been defeated. The course was from Cape Finisterre in Spain to Berehaven in the southwest of Ireland. Both vessels started level, but the "Hyacinth," equipped with Belleville boilers, at first forged ahead. After two hours' steaming the "Hyacinth" was traveling so well that she soon left the remaining vessels of the Channel Squadron, which was accompanying the test, far in the rear. It was considered in view of the speed at which the "Hyacinth" was traveling that she would establish a steaming record. The cylindrical boiler vessel, "Minerva," however, although she was at first left behind, when once she had got full steam up rapidly drew level with the "Hyacinth," and easily contrived to keep up with her, even with her engines eased down. The "Minerva"