

the great cement tank holding 500,000 gallons and excavated in the hillside at the Italian-Swiss winery. The tank is by far the largest for holding wine in the world, and is 80 feet long, 34 feet wide, and 24 feet high, with sides 2 feet thick. The inside walls are glazed. Wine is drawn from it through pipes, flowing by gravity.

The correspondent of the SCIENTIFIC AMERICAN is indebted to Mr. P. C. Rossi, president of the Italian-Swiss Colony, for much valuable information.

GEORGE W. MELVILLE, CHIEF OF THE BUREAU OF STEAM ENGINEERING.

The events of last year have brought into great prominence the work of the various bureaus of the Navy Department. For years the little band of chiefs labored away, and perhaps there was too little known of the men who were building the American navy. Suddenly an emergency arose, and it was found that the competent and conscientious men in charge of the various bureaus had discharged their duties so admirably that when the men who fight ships came to use them, everything was found ready. The importance of the work of these bureaus has long been recognized by those familiar with the subject. We have already given a biographical sketch of Philip Hichborn, Chief Naval Constructor of the United States Navy. Now, proceeding in logical order, we come to the Bureau of Steam Engineering, over which Captain George Wallace Melville has presided since August 9, 1887, as Engineer-in-Chief, U. S. N.

Admiral Melville was born in New York city, January 10, 1841, of Scotch parentage, one of his ancestors being Sir James Melville, who was First Lord of the Admiralty at the time of the expedition of Parry to Baffin's Bay, and whose name has been perpetuated in Arctic lands and waters. Young Melville was educated in the public schools of New York city and then at the Brooklyn Polytechnic. He then entered the engineering works of James Binns, of East Brooklyn, and here he laid the solid foundation on which his future work was based. In 1861 he became an officer of the Engineer Corps of the United States navy. He served in a number of engagements, and when in Bahia Harbor it was decided to ram the Confederate cruiser "Florida," it was mooted that the boilers would be wrenched loose, breaking steam pipes and scalding all below. It is at such a time as this that the true qualities of a man like Melville are shown.

He said, "I do not think the boilers will break loose; but if they do, there need be but one man sacrificed, for after the engines are started I can work them alone and will order all hands on deck." A couple of days later the attempt was made, and Melville and one fireman who refused to leave him struck the "Florida" on the starboard side, cutting her down a foot and a half below the water line. The after broadside gun was hurled down the cabin hatch, and the ship's company was buried beneath the awnings. With the aid of a discharge from the broadside guns, the boarding party of the "Wachusett" was enabled to seize the Confederate vessel. Melville himself was one of the few injured ones. He received an ax stroke across the back of the left hand. The injured vessel was made fast by hawsers and was taken to Hampton Roads, where an "unforeseen accident" caused the "Florida" to sink, thus letting the United States government out of a predicament, for, of course, the capture of the "Florida" was an inexcusable violation of the rights of neutrality. The American people were delighted with the result, and it may be said in passing that neutral countries had very slight regard for their neutrality during this period.

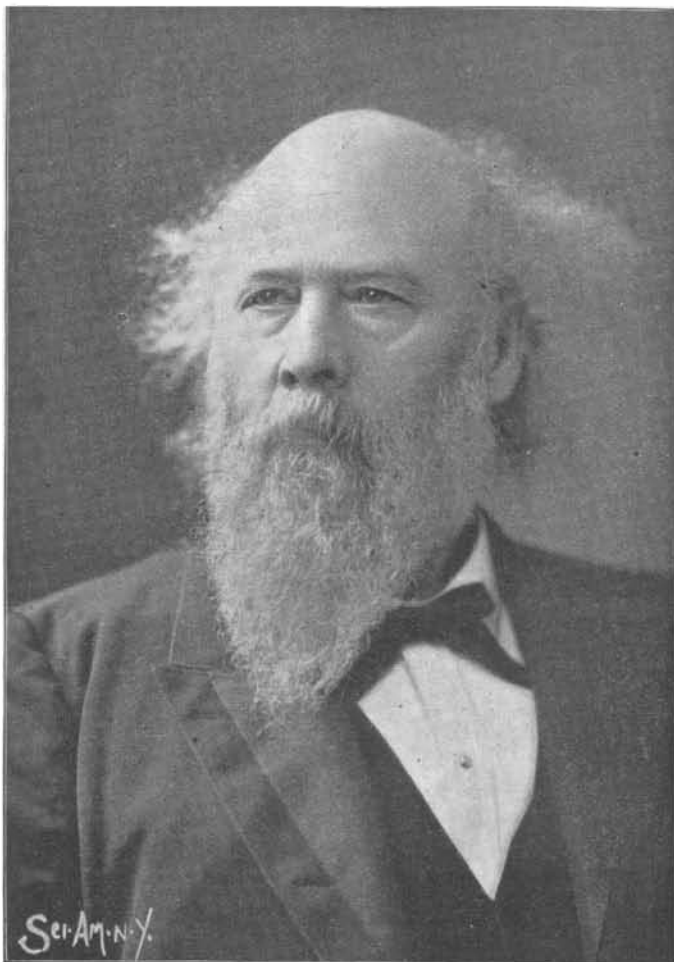
After the civil war Melville served on various vessels and made trips to the Arctic regions in the "Jeannette" and "Thetis." In 1873 Melville volunteered as engineering officer on the "Tigress," and, notwithstanding the miserable condition of the engines and boilers, he succeeded in finding the camp of the "Polaris." Six years later we find Melville again leaving for the icy North in the "Jeannette" with De Long. The expedition was almost unparalleled for its suffering. They left San Francisco on July 8, 1879, and ice was met early in September a short distance northwest of Behring's Straits. The vessel was soon pinched in the ice-floe and after drifting for two years she was crushed and sunk, leaving the crew shelterless in midocean. The expedition was embarked in three boats. Melville's boat reached land and the crew completed a retreat of over 2,200 miles in 100 days. At last they succeeded, after unparalleled exertions, in reaching a Russian village. The daring and endurance exhibited by Melville in his search for De Long and his men forms one of the most noble examples of devotion and self-sacrifice which has ever occurred in the Arctic regions, the home of brave deeds. Finally, on March 23, 1882, he found his dead shipmates. In 1884 we again find him going northward with a squadron dispatched to the relief of the "Lady Franklin Bay Expedition," and

he was among the first to reach the dying men at Cape Sabine, and this closes the glorious part of his career as an Arctic explorer.

While Chief Engineer of the United States Bureau of Steam Engineering, vessels have been constructed whose aggregate machinery amounts to over 350,000 horse power, and varies from torpedo boats to battleships. The term of office of chief engineer is four years, and he is now serving his third term. By the Navy Personnel Law he is now a Rear-Admiral.

The technical press of the country has always upheld Chief Engineer Melville in his efforts to obtain high speed for warships. He is a strenuous advocate of large boiler power and ample bearing surface, and that he is right in his position is shown by the splendid work which was accomplished by the "Oregon" when the squadron of Admiral Cervera was destroyed.

Chief Engineer Melville is resourceful, and adds to engineering training and vast experience the inventive genius of the American. He has been particularly anxious to secure a higher degree of recognition for the engineers of the navy, and his annual reports are read with interest and widely quoted and favorably commented upon. In the course of his lifetime Chief Engineer Melville has been the recipient of many honors, both at home and abroad, but we doubt if any was



REAR-ADMIRAL GEORGE W. MELVILLE, CHIEF OF THE BUREAU OF STEAM ENGINEERING.

more pleasing than his election as president of the American Society of Mechanical Engineers, at its recent meeting in New York city.

Rear-Admiral Melville is about six feet in height, and has the stalwart frame which suggests his Caledonian ancestors. His massive head shows us the man of genius and of character. He is a man of whom all Americans should be proud.

Paris Exposition of 1900.

BY A. H. MATTOX.

Major Fred Brackett, secretary of the United States Commission to the Paris Exposition of 1900, who has charge of the New York offices of the Commission, reports that rapid advancement is being made on the buildings and grounds of the Exposition in Paris.

The vast carcasses of iron and steel and masses of stone that a few weeks ago had a meaning alone for architects, builders, and engineers are beginning to take form and shape and appeal to the public eye with their symmetry and beauty.

The roofs of both palaces of fine arts are about completed, and for the next few months the decorators, sculptors, and artists will have full swing in the work of painting and the embellishing of the interiors of these buildings. There should really be no doubt as to the Exposition being in readiness by April, 1900.

Work on the Trocadero grounds is progressing rapidly; the greater part of the masonry for the various palaces to be erected on the Place des Invalides has been completed, and work on the Alexander Bridge across the Seine, which is to connect the Champs Elysées with the Place des Invalides, is advancing rapidly under the supervision of its engineers.

The funds invested so far in the Paris Exposition

amount to six million six hundred thousand dollars. Of this sum about five million dollars was expended in 1898. The city of Paris has already contributed two million four hundred thousand dollars of the four million dollars promised, and a half million dollars has been contributed by the Western of France Railway.

The space to be occupied by the Exposition is about three hundred and sixty acres. Of this amount the French government has allotted about sixty per cent for all other nations, reserving about forty per cent for themselves. The space thus far secured by Commissioner-General Peck for the United States is about two hundred and twenty-two thousand square feet.

The main entrance to the Exposition will be located at the extreme northeast corner of the grounds, at the place where the Quai de la Conference adjoins the Place de la Concorde. The main entrance to the Exposition is now being rapidly constructed. It takes the form of a triumphal arch, surmounted with a frontal bearing the arms of the city of Paris, which serves as a pedestal for a colossal statue of Liberty. M. R. Binet is responsible for this triumphal entrance, which will be a masterpiece of decorative architecture. The two friezes on either side of the arch represent workmen carrying the produce of their labor to the Exposition, and are designed by M. Guillot. By an ingenious device the ticket office to this main entrance will be arranged to admit sixty thousand persons per hour. The cost of this magnificent monument will be about three hundred thousand dollars.

On the quai which extends along the north bank of the Seine lies the Champs Elysées, in a part of which was held the Exposition of 1855. The Palais de l'Industrie, which was the principal building of that Exposition, has been demolished to make room for the two art palaces which are to be known as the Great and Little Palaces of Fine Arts. They will cost about four and a half million dollars, and will remain as permanent embellishments to the city of Paris. These new palaces of fine arts will be two of the most modern and useful buildings of their kind in existence. The Grand Palace will be utilized during the Exposition as the Palace of Fine Arts. In the way of painting, sculpture, architecture, and drawing it will probably surpass anything the world has ever seen. The masterpieces of fine arts of the century will have a place in this palace. In the smaller building will be displayed the retrospective exhibition of art. Work is now being pushed on these palaces night and day.

Across the Seine, joined by the new Alexander III. Bridge, lies the Esplanade des Invalides. This tract extends from the Seine to the Hotel des Invalides, and here will be located the great building of General Manufactures. This building will be the largest at the Exposition and in architectural design most elaborate.

Near the Manufactures Building will be the Education Building and numerous minor structures. On the south bank of the Seine is the Quai d'Orsay, on which will be the pavilions of all foreign nations, also the Army and Navy Building. On the north bank of the Seine will be located the building of Horticulture, also of Agriculture. In the Trocadero grounds will be located the Colonial exhibits both of France and other

nations. The building devoted to electrical industries will probably play the most important part of any at the Paris Exposition. It will be located across the river Seine from the Trocadero Park. In this building there will be a huge central generating plant, with thousands of motors distributed all over the Exposition in every department.

The building, a capacious one, is designed for both ornament and usefulness. It is square shaped, with a cupola at each corner, and the main part is a mass of delicate ornamentation. At night, when ablaze with electric light, it will be the center of attraction and will present a scene of great beauty. In the central courtyard of the building will be an electrical fountain with a series of cascades all brilliantly illuminated by varicolored lights. On the exterior of the palace will be innumerable electric lights of various shades, colors, and devices. Crowning all, on the topmost pinnacle of the building will be a mass of flashing electrical flame forming a statuesque group, designed by a famous European artist.

The Palace of Electricity will be devoted to the exhibit of electrical machinery and the thousand and one inventions to which electricity has been utilized. The demand for space from the United States for the department of electricity far exceeds that which Commissioner-General Peck will be able to give.

To the west of the court on which will stand the Palace of Electricity will be located the buildings devoted to chemical industries, transportation, and civil engineering, liberal arts and instruments, letters, arts, and forestry.

On the east side of this same court will be the Machinery Building, the buildings of Mines and Mining, of Navigation, and the Textile Building. American

electricians will be much in evidence at the Exposition, and it is estimated that the manufacturers of American electrical machinery will expend over one million dollars in their exhibit in 1900. American artists, too, will be well represented, and the products of the earth—agricultural, horticultural, forestry, fisheries, food stuffs, textile fabrics, placer mining, and metallurgy—will all receive complete attention from American exhibitors. The United States will also have an immense department of hygiene and one of public and organized charities.

The need of space is so great that two and a half acres of ground have been made by the French commissioners by filling along the banks of the Seine. The gardens and terraces on both sides of the river will be utilized and exhibits will be made on each side of the river Seine.

As the Exposition will occupy so much space on the Seine, it will be necessary to build several foot bridges across the river. One foot bridge will be situated near the Pont des Invalides, which will be built entirely of iron, decorated with electric lamps disposed in groups, forming luminous flowers. The pillars supporting the bridge will also be brightly lit up, adding a fine effect to the Fair at night.

Another foot bridge will cross the Seine near the Pont de l'Alma. It will be constructed of barges supported by pilasters decorated with maritime symbols. The entire bridge will be covered with a large awning. Still another foot bridge—a suspension bridge—will cross the river in front of the Palais des Armées de Terre et de Mer.

The municipality of Paris will do all in its power to make the city more beautiful than ever in 1900. The Municipal Council has already sanctioned the outlay of large sums of money for the rearrangement of many public gardens and squares and for the brushing up and cleaning of numerous monuments. The Bois de Boulogne, one of the finest promenades in the world, will be improved at great expense.

It is more than likely that horse traction will disap-

THE NEW AMERICA CUP DEFENDER.

When it was announced last year that another challenge for the "America" cup had been made and accepted, the hearts of all yachtsmen were greatly rejoiced, for there is no event in the annals of yachting that approaches these international contests in respect of the amount of care, skill, expense, and enthusiasm with which they are arranged and carried out.

When the two rival cutters cross the line for the first race, on October 3 next, four years will have elapsed since "Defender" and "Valkyrie III." contested for the historic cup. It was feared that the unfortunate squabbles that characterized the last attempt of Lord Dunraven to secure the trophy had killed the sport for at least a decade to come, and it was therefore in the nature of a pleasant surprise when Sir Thomas Lipton opened negotiations for another series of races.

The "Shamrock," as the new challenger is to be called, will, like the "Valkyrie," be owned by an Irishman; for Sir Thomas, although he has long been resident in England, is Irish by birth. It was originally intended that the "Shamrock" should be Irish not merely in name and ownership, but in design, materials, and workmanship, and, accordingly, the construction was to have been intrusted to the famous yard of Harland & Wolff, at Belfast. For some reason or other, a change of plans occurred, which resulted in the yacht being built by the torpedo boat builders Yarrow & Company, of Poplar, London. The plans, moreover, have been drawn up by Fife, the noted Scotch designer, whom many Englishmen believe to be superior to Watson, the designer of "Thistle," "Britannia," and the "Valkyries." So that the "Shamrock" will be truly British, with an Irish name, Scotch in design, and English in materials and construction.

Very little has leaked out as yet regarding the new vessel, but it is known that she will be built fully up to the limit of length (90 feet on the water line), and that she will be largely constructed of nickel steel.

The new "Defender" is being built from plans of

to produce a more powerful boat without making any great increase in displacement, the new boat carrying nearly 14,000 square feet of canvas, against 12,640 square feet for the "Defender," although her displacement is only 6½ tons more. The "Defender's" strongest point was reaching, her weakest, running with the wind dead aft. In windward work she was not quite up to expectations, and it is a question whether in this respect "Valkyrie III." was not superior. Running with spinnaker set, she was inferior to "Vigilant." In reaching she was unapproachable, and if in the new "Defender" Herreshoff has succeeded in retaining the magnificent reaching qualities of the 1895 champion, at the same time bringing up her windward and leeward work to the same level, there is very little probability of the cup being carried to England at least for another year.

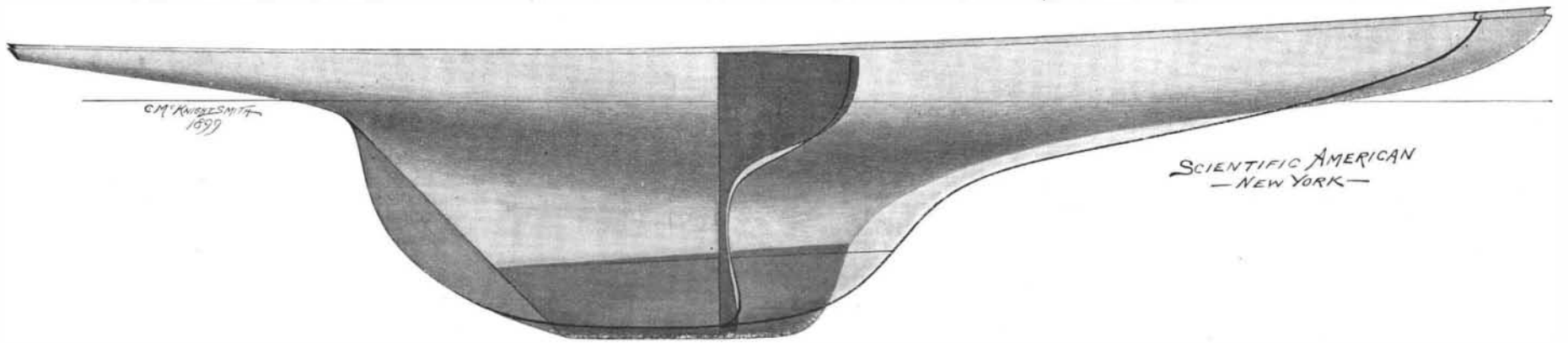
A Victim of Automatic Gas Meters.

The automatic gas meter or prepayment meter, as it is termed, has claimed its first victim. A grocery clerk in Brooklyn went out leaving his gas burning, and the one jet exhausted the small remaining quantity of gas which had been paid for and the meter cut off the flow of gas. The man returned and went to sleep. Another member of the household dropped another quarter of a dollar in the meter, and the gas poured into the man's room, asphyxiating him. He had been dead over an hour when the accident was discovered.

An Electrical Cooking School.

At the Oread Institute, Worcester, Mass., there is an electrical cooking school. The current for the purpose of heating and lighting is furnished by the 37½ kilowatt Westinghouse direct 110-volt dynamo, driven by a belt from a Westinghouse engine.

The practice kitchen where instruction is given is a circular apartment 35 feet in diameter. In the center there is a fountain and around this is a circular slate-topped bench upon which the students can work at gas or electrical stoves. Each pupil has an independ-



THE NEW CUP DEFENDER.

Heavy line shows old Defender; shaded hull and section show new Defender.

pear in Paris during the Exposition year, in the way of omnibuses, tramways, cabs, and carriages—electric motors taking the place of the horse. It is estimated that more than ten thousand horseless vehicles will be in use in Paris in 1900.

The United States will have the largest and most important display at the Paris Exposition of any foreign nation. The Hon. Ferdinand W. Peck, U. S. Commissioner-General, in an interview says:

"The United States exhibit is not to be made for the French people. The eyes of the whole world will be upon us on that occasion in the great metropolis of France. There will then be assembled in Paris the exhibits of fifty-seven nations and the representatives of five hundred million consumers. Millions of people coming from all parts of the world will visit the Exposition. It will be the great opportunity in our history to present our resources and products to all these people with a view to increasing our export trade. In my judgment every hundred thousand dollars expended in the creation of our display will bring millions in return to our producers and manufacturers.

"Our national pride, as well as our material interests, demand that the United States, the greatest of all, should be a prominent participant among other nations at that International Exposition.

"Our national pride also demands that the great United States of America, recently splendid in war, should stand alongside of her sister nations grandly displaying her arts of peace, and the world expects this of us."

The Exposition is to open April 15, 1900.

Probable Opening of the Chicago Drainage Channel.

The Drainage Board officials are trying to have the channel opened by October 9. The contractors have been instructed to increase their forces in every unfinished section and to push work night and day. The entire channel is practically finished with the exception of the two sections at Joliet, where the Desplaines River empties into the canal. 1,800 men are at work night and day in two sections.

the Herreshoffs in their yard at Bristol, R. I. This famous firm has been identified with yacht construction from the very first, and in the year 1893 they became prominently identified with international yacht racing by designing and building three famous singlestickers—the "Navahoe," which crossed to England in quest of the Brenton's Reef cup, which was carried home by "Genesta" in 1885, and the "Vigilant" and "Colonia," the former of which was the successful cup defender in 1893. In 1895 the Herreshoffs designed and built the "Defender," and it was inevitable that in the present instance the genius of the Bristol yard should again be invoked to guard the coveted trophy.

"The new 'Defender' will be built upon the general lines of the 1895 boat, with such improvements in the way of model, materials, and sail plan as were suggested by her performance in the trial and the cup races. The changes in dimensions, etc., are shown in the table herewith given, and the form of the two boats is shown in the accompanying drawings. It will be seen that the beam and draught have both been increased by one foot, while the water line length is greater by about a foot and a half. Looking at the midship section, it will be seen that the new boat, in addition to greater draught and beam, has a fuller bilge, the area of the section being greater by about a dozen square feet. The lead keel, while not so long by several feet, is deeper, and there is more of it; in shape it is less bulbous than 'Defender's' and approximates more nearly that of the 'Valkyrie III.'

THE OLD AND NEW CUP DEFENDERS.

	"Defender."	"Valkyrie III."	New "Defender."
Length over all	126 feet.	130 feet.	131 feet 4 inches.
Water line length	88 feet 5¾ inches.	88 feet 10¾ inches.	89 feet 10 inches.
Beam	23 feet 3 inches.	26 feet 2 inches.	24 feet 2½ inches.
Draught	19 feet.	20 feet.	20 feet.
Displacement	143 tons.	158 tons.	149½ tons.
Sail area	12,640 square feet.	13,028 square feet.	13,940 square feet.

Altogether it is evident that Mr. Herreshoff has aimed

ent stove, and the teacher can walk around in the space between the fountain and the bench and inspect the work of each pupil. There are twenty-four plug sockets connecting with the stoves and heaters by flexible cords. In another part of the room, against the wall, is a slate-topped table on which various special heating devices are arranged. There is also an electrical oven, a chafing dish, and other culinary appliances. Two adjoining demonstration classrooms and a special laboratory are also provided. The cooking appliances were furnished by the American Electric Heating Corporation.

The Current Supplement.

The current SUPPLEMENT, No. 1211, is a very attractive number. The first article is the new Japanese cruiser "Chitose," built by the Union Iron Works, of San Francisco, Cal. It is fully illustrated with views showing the construction and the completed vessel. "Submarine Surveying" is an article by Charles Bright. "Concerning the Theory of Evolution" is a lecture by Charles Shaw. "Paris Metropolitan Railroad" describes the new rapid transit system of Paris. The second installment of "Trade Suggestions from United States Consuls" is published in this issue and consists of eleven interesting announcements of opportunities for American trade. "Cast Iron" is an important paper by Dr. Moldenke.

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