

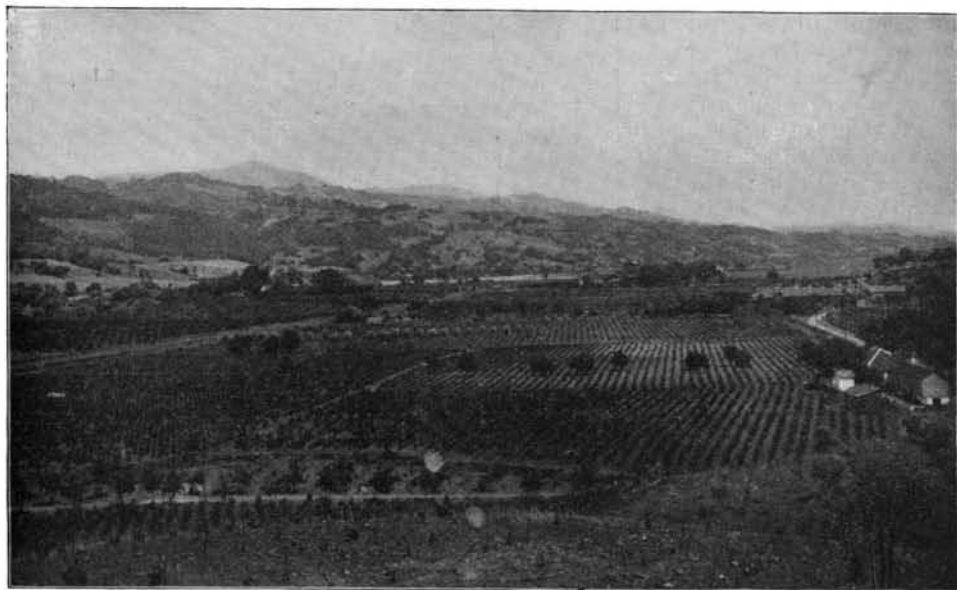
GRAPE GROWING AND WINE MAKING IN CALIFORNIA.

BY ENOS BROWN.

Prior to 1878 wine making in California was only incidental and conducted upon a contracted and unscientific basis—the product, by no means great, of many individuals, of no attainments whatever for wine making, content with quick returns. No attempt at producing first-class wines was considered. The in-

the holding of heavy stocks of wines until matured. Forced sales of new wines are abolished. Wines are not permitted to leave the State in inferior condition. A system of co-operation protects the reputation of brands; in fact, the entire product of the State is under control by competent and financially sufficient hands, whose interests lie in main-

tionality, all from those provinces where grape growing and wine making has been the occupation of the people for centuries, projected an organization for acquiring lands suitable for growing grapes and



VIEW OF VINEYARD.

dustry at that time was conducted without combination or method.

The modern history of wine making dates in California from that year, when, at the instance of a number of persons engaged in the business, Mr. Arpad Haradzthy, a Hungarian and a wine merchant of great experience, was dispatched as special commissioner to Europe to report upon the possibility of manufacturing wines upon a basis admitting of a chance of rivaling the famous brands of that country and also to study the varieties of vines that were best adapted to California soil and climate. The report published after the return of the special commissioner was encouraging to the last degree, and directly the cultivation of the grape was stimulated all over the State. Thousands of acres believed to be worthless and barren were set out in vineyards, and even under the early conditions, before the best methods had been introduced, grape growing was very prosperous. For a number of years grapes brought \$30 per ton, which almost paid the first cost of the land and all improvements. In four or five years hundreds of new vineyards came into bearing, and grapes then began to decline, first to \$25 a ton and gradually as low as \$7 or \$8—a price far below the cost of raising them. The natural result followed. A large number tore up the vines and went out of the business.

In 1893 all attempts to bring the world to an estimate of what California was capable of in wine making seemed futile. Wines a year old sold for 7 and 8 cents a gallon, and the outlook was most discouraging.

In 1898 new wines sold for 12 to 13 cents per gallon and grapes \$12 to \$13 a ton. At these prices there is left a fair profit to the grower and wine maker.

In 1897 the wine made in California reached the highest amount known, viz., 37,000,000 gallons. In 1898, owing to disastrous frosts early in the season, only 20,000,000 gallons were made—an amount equal only to the yearly consumption of the capital of Italy, with its 450,000 inhabitants, who each annually consum 45 gallons.

The disastrous year 1893 will be ever memorable in the history of the wine industry of California as the period marking the abandonment of the custom wineries and the rise of those great establishments which now control the far greater portion of the product of the vineyards.

Their unlimited resources permitted the employment of the highest expert talent and



GATHERING GRAPES.

taining a high standard of production. The day of the subterfuge that compelled the sale of California wines under foreign labels has passed.

The largest winery in operation in California is that of the Italian-Swiss Colonies at Asti, Sonoma County, located about 100 miles north of San Francisco. The valley of the Russian River at Asti narrows to about three miles in width, the sides consisting of low rolling hills covered to a great depth with red ferruginous soil in which vines especially delight.

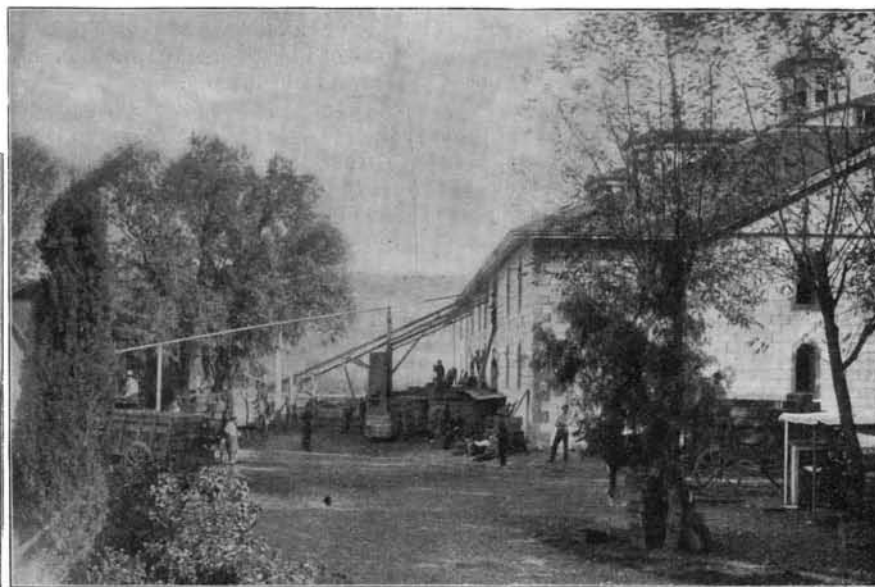
In 1881 a company of men of Italian and Swiss na-

neighboring hills. The soil itself is rich in evidences of volcanic influences. The climate is that of Italy. Frosts are of the rarest occurrence and the orange, lemon, fig, pomegranate, and all the fruits incidental to a climate semi-tropical flourish in native luxuriance. Irrigation is never required, the rains of winter supplying ample moisture. The grape thrives and reaches its highest perfection at Asti.

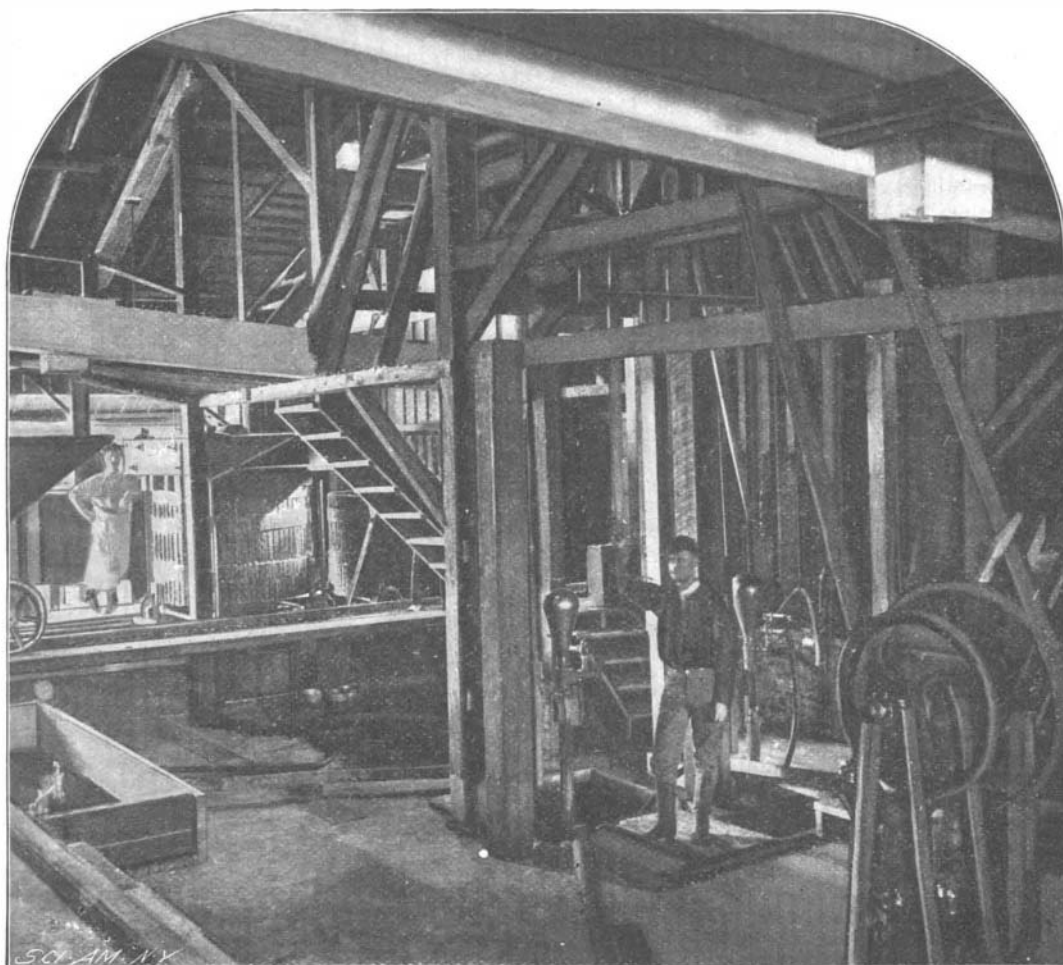
Eighteen years ago the colony purchased 1,600 acres and have since acquired 600 acres more. Grapes were planted the first year and every year thereafter new

vineyards have been set, until at this time 1,000 acres are in vines, which take four to five years after being set out before bearing crops. In a few years the whole 2,200 acres will be cleared and planted. Those vines planted eighteen years ago are quite as prolific as any, and will continue to thrive for a full generation longer. There are now 1,000,000 grapevines on the lands of the colony, and the average yield is from 2½ to 3½ tons per acre on the hillsides and 4 to 5 tons in the valley. There are growing in the highest perfection the Sauvignon, Chablis, Chateau Yquem, Sauterne, Cabernet, and Burgundy, of France; the Barolo, Barbera, Chianti, and Grikolino, of Italy; besides the Riesling, Traminer, and other varieties from the Rhine; and all these delicate vines bear their transplanting well, yielding wines of the same character and flavor as on their native hillsides. The product of the vineyards of the colony in 1898 was 3,500 tons, and an equal amount was purchased from neighboring farmers, which yielded 1,000,000 gallons of wine, each ton of grapes yielding 160 gallons.

In all California there are



VIEW OF WINERY.



INTERIOR SHOWING WINE PRESSES.

200,000 acres devoted to raising grapes, 140,000 acres for making wines, 60,000 acres in raisins. Sonoma County has 24,000 acres in grapes, which produced in 1897, the most prolific year known, 10,000,000 gallons of wine. In cultivating the grape the land is first plowed deep, and in preparation for setting out cuttings the soil must be frequently harrowed after plowing and freed of weeds. From the first these new vines, though bearing no grapes for five years, have to be cultivated with as great care as the most prolific. The cuttings are planted in rows about four feet apart, 800 to the acre. Weeds, which grow rapidly in warm climates, must be kept down. New cuttings are set out in March, during the rains of the early spring.

Pruning begins with the year, when the vine is dormant, and is over before the middle of February. Every vine is then cut so that all of the woody growth of the previous year is taken away down to two buds for each branch left. Gangs of men with pruning knives attack each field in turn, others following gather up the severed stalks in bunches and burn them. The plowing of the vineyard begins in the early spring, March and April, after the rains have softened the soil; plows are run across the fields in both directions. In another month the harrow follows, and this is repeated two or three times in order to pulverize the soil and exterminate weeds. After harrowing, gangs of men appear with hoes and carefully pile the soil around the roots of each plant and cut down the fast growing weeds.

In May every vine is treated to a light sulphuring applied with bellows in order to arrest mildew and destroy insects. Grapes in low vineyards require at times a resulphuring to counteract the effects of fog, which induces mildew.

In early June comes the summer pruning, which consists in topping the too rapidly growing branches and stunting the growth, with the object of economizing the labor of the vine and of throwing all its strength into the newly formed branches which are now beginning to appear. After this the vine is left to itself, without further cultivation being necessary until the grape picking season arrives.

It is in June that a vineyard in California displays its greatest beauty; the leaves are then greenest and the spreading branches interlock with neighboring vines. The whole field is covered with a moving mass of luxuriant foliage. In January, after pruning, a vineyard is most desolate in appearance, nothing is to be seen but rows of misshapen roots. At picking time the heavy bunches pull down the branches and destroy the symmetry of the vine. The leaves at this time are turning brown.

The time for grape picking is in September and October. There is no romance about the California vintage. The steady force must be augmented by a hundred men, who work from early morning until daylight disappears. They earn from \$1 to \$1.25 a ton for picking, and some of them can pick from one and a half to two tons a day. The vineyards are divided by lanes, along which are driven teams carrying boxes

which hold about 60 pounds of grapes each and are dropped at convenient points. Each man gathers up a box and starts to pick a certain row, returning the full box to the road and taking another empty. Teams

chanical means. Into these primary tubs the juice and skins remain for seven or eight days or until settled, when the wine is drawn off into another tub. The residue is then conveyed to hydraulic presses, where the remaining juice is extracted, and what is left is then taken to the brandy distillery.

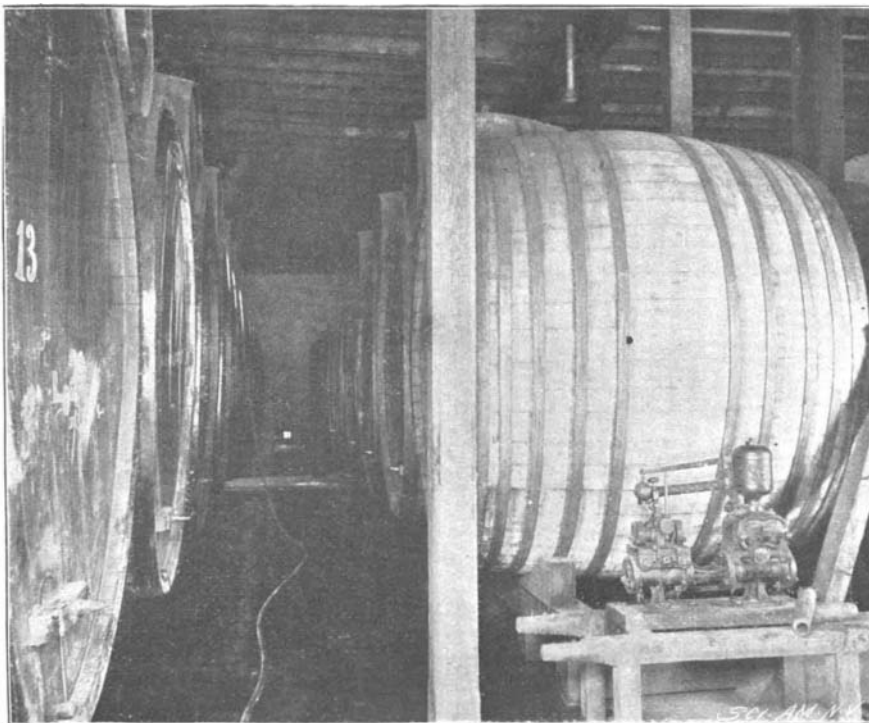
The Italian-Swiss Colony winery has a yearly capacity of 3,500,000 gallons of wine and brandy, and a part of its equipment consists of 55 tubs, each having a 35,000 gallon capacity. After the wine is taken from the first tub, it remains in the next one for about four months, when it is again pumped into a successive one, where it remains the same length of time. This racking process occurs about four times a year. In each case a considerable amount of sediment results, which is commercially valuable and is known as argols and cream of tartar. In making white wines the skins of the grapes are not allowed to mix with the juice in any stage, being separated by machinery.

During the time the juice remains in the tubs, dependent upon the age and character of the wine to be produced, it is estimated that fifteen rackings are necessary; by that time all sediment is deposited and the product is ready for bottling. In the older wineries all this pumping was by hand, but in the Italian-Swiss winery all the tubs are connected by

iron pipes with a steam pump which operates, fills or empties, all over the entire winery.

A brandy distillery is part of the equipment of this winery, having a capacity of 4,000 gallons a day.

Inferior and unripe grapes, besides all the pressed wine and the lees and even the pomace and residue of the grapes, are thus used. The product of this distillation is called "grappa," a pomace brandy. It takes from two to three years to manufacture a good article, and is a valuable adjunct to a large winery, as all by-



TUBS IN THE STORAGE CELLAR.

follow each other in gathering the boxes in the lanes, and, when loaded, start for the winery and await their turn at the receiver. To pick the grape crop of the Italian-Swiss Colony in one day, 1,500 men would be required.

The grapes, as they are gathered by teams in the fields, are then taken to the winery and in turn are driven to the hoppers, into which the ripe grapes are dumped. An endless rack, extending from the roadway to the cupola of the winery, receives the grapes



CEMENT TANK HOLDING 500,000 GALLONS.



DANCE HELD IN CEMENT WINE TANK.

and carries them to the stemmer and crusher at the top. Here the stems are separated from the bunches, and the skins (in the case of red wine) and juice fall into a box below and thence flow by conduit to the great tubs situated on the floor underneath. When one tub is full a gate is opened to the conduit leading to another tub, and so on. During this operation the handling of the grapes is only by me-

products, which otherwise would be wasted, can be thus utilized. The residue of all this waste is returned to the soil as a valuable fertilizer. The perfect amalgamation or blending of wines is a highly scientific process, and the success and reputation of the production of a winery depends upon it. Some varieties of grapes produce a wine of too great body, strength, or flavor. The blending of all these good qualities with lighter, or with wines lacking flavor or strength, produces an approach to the accepted standard of the perfect wine.

In this winery manual labor is dispensed with as far as possible, steam and mechanical devices taking its place. Subterranean vaults excavated into the hillside afford storage for wines, and are always uniform in temperature.

The wines produced at Asti are largely what are known as dry, containing a lower percentage of alcohol than the sweet wines. In the San Joaquin Valley grapes averaging from 30 to 34 per cent of saccharine matter are grown, while in the coast counties of California, where fine, dry wines are produced, the percentage of sugar is not over 24 per cent.

The emergency of having to provide for the unexpectedly large crop of 1897 compelled the erection of

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.

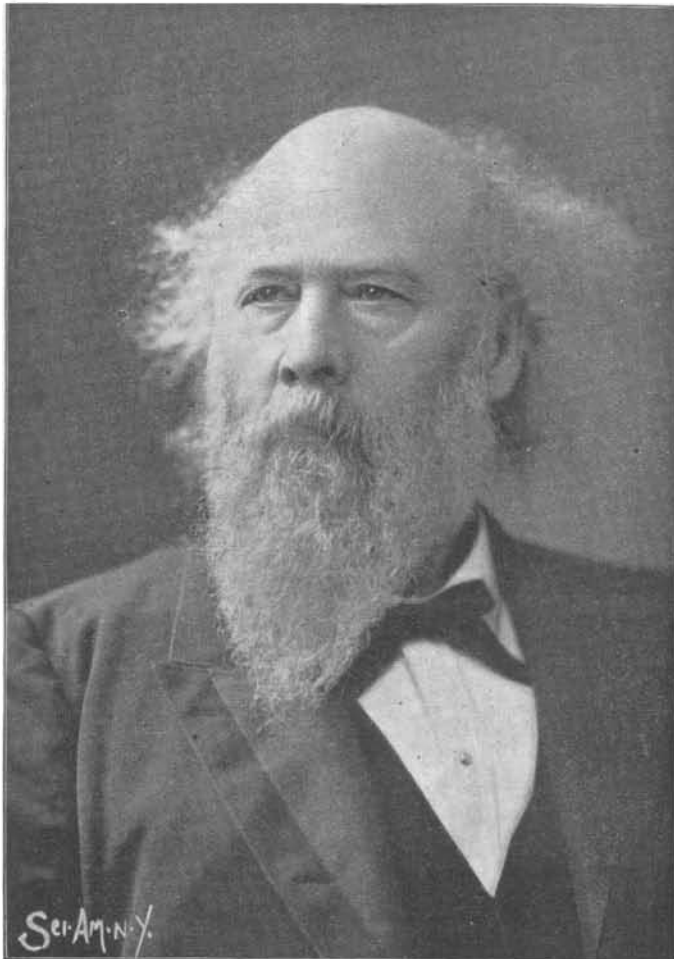
After the civil war Melville served on various vessels and made trips to the Arctic regions in the "Jeannette" and "Thetis." In 1873 Melville volunteered as engineering officer on the "Tigress," and, notwithstanding the miserable condition of the engines and boilers, he succeeded in finding the camp 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