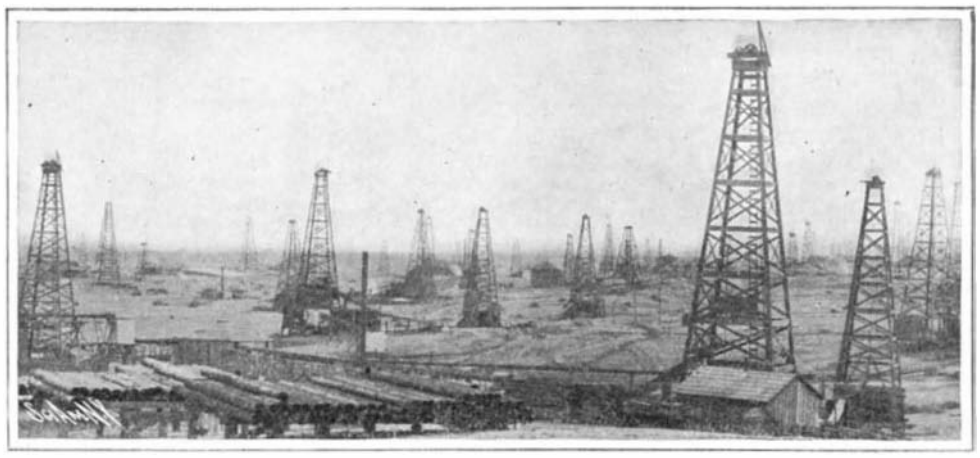
THE OIL FIELDS OF THE WEST.

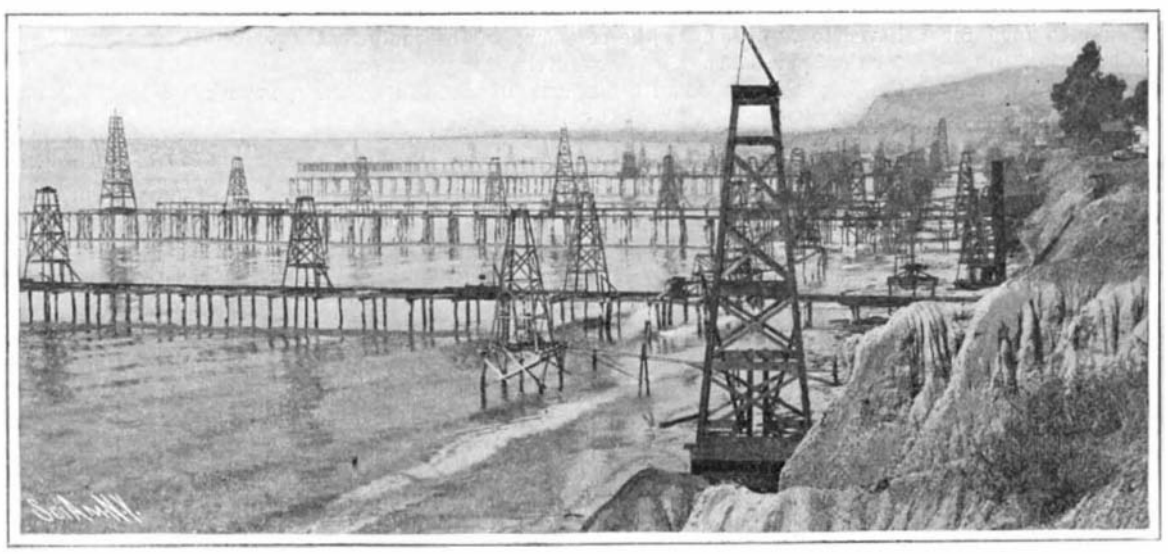
BY DAY ALLEN WILLEY.

For the first time in the history of the American petroleum industry, the center of production of this staple has gone beyond the Mississippi River, wells of the West and Southwest during 1904 yielding more oil than the older fields comprised in Pennsylvania, Ohio, Indiana, and West Virginia. Reports compiled by the United States Geological Survey show that during the year 1904, out of a total production of 119,000,000 barrels, over one-half was represented by the States of California, Texas, Louisiana, Kansas, Colorado, Wyoming, and Indian and Oklahoma Territories. A conservative estimate places the total quantity from the fields of the West and Southwest at 63,000,000 barrels.

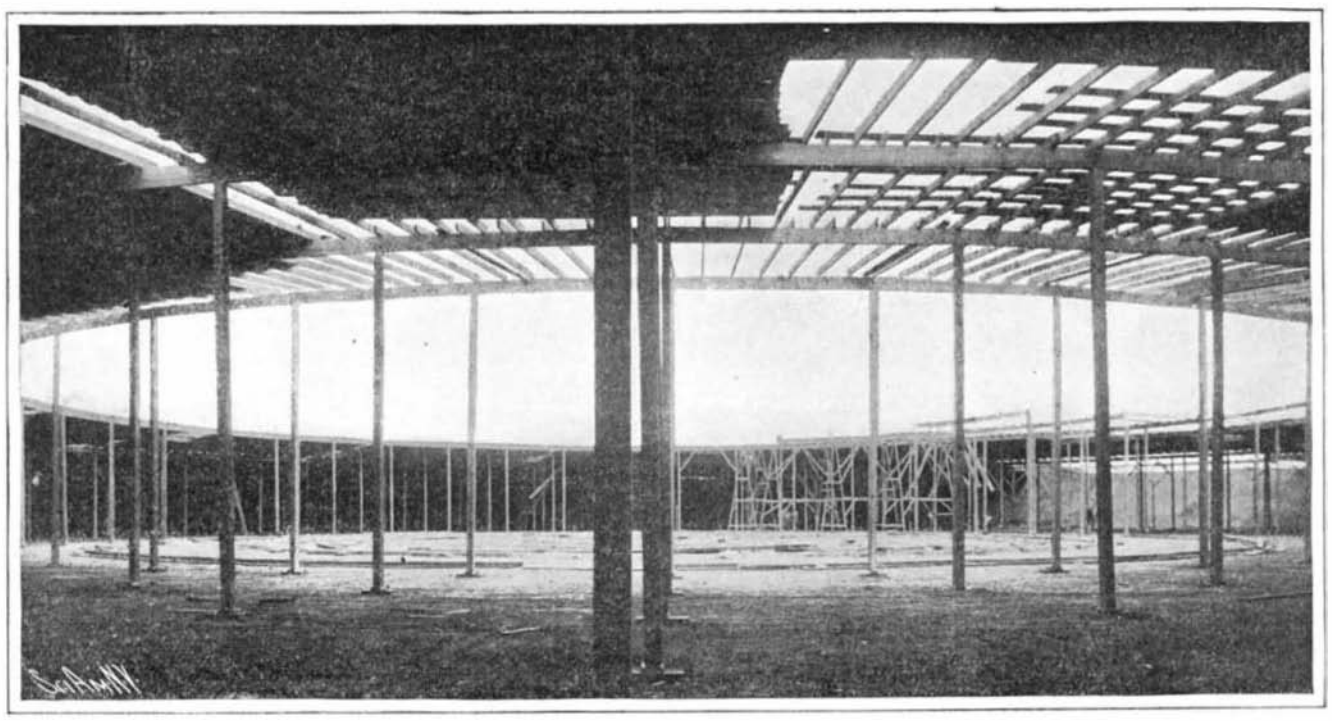
The development of the oil-bearing sands in the West within the last few years has been truly phenomenal, when the records of past years are considered. Until recently the Appalachian and Lima-Indiana deposits have produced such a large percentage of petroleum that the quantity secured outside of this area has been so small as to be insignificant. For example, in 1898 the eastern fields yielded no less than 93.99 per cent of the total, according to the government statistics. The deposits in California in 1897 were comparatively small, for the total quantity represented by this State for that year amounted to less than 1,500,000 barrels. Prior to the "coming in" of the Spindle Top district in Texas, but 4,000 barrels of oil were being secured daily from the 600 wells at that time in operation in this State. In 1903, however, the industry in the West and Southwest had so expanded that it represented nearly 45 per cent of the total yield, a decrease being noted in Pennsylvania amounting to 708,724 barrels. In all, the Appalachian and Lima-Indiana regions decreased during the same year about 4 per cent compared with 1902, so that the total increase for the country came from the newer districts, although it represented nearly 12,000,000 barrels of the total of 100,461,337 barrels. Remarkable as are these figures, the development since then has been far more rapid, as is shown by comparing 1904 with the preceding year. California alone furnished fully one-fourth of all the petroleum during 1904, maintaining its position as the greatest oil-producing State, although in 1903 its record was about 25,000,000 barrels. From the wells of Kansas in 1903 came but 600,000 barrels, although this quantity was 181 per cent more than in 1902. In 1904, however, Kansas and the two Territories adjacent to it furnished no less than 6,000,000 barrels—a greater percentage of increase than any other section of the country, more than quadrupling their output for the previous year. Contrasting these figures with the yield from the principal foreign fields, it may be said that the United States is now supplying 60 per cent of the world's petroleum—fully 34,000,000 barrels more than Russia, estimating the quantity secured from the Baku and other districts of the empire at 85,000,000 barrels annually—the latest calculation. The West and Southwest alone contributed last year a quantity equal to 74 per cent of the total Russian yield, but these statistics do not include many wells which have been brought in during the last four months, and in the estimate one of the most important of the newer fields is entirely omitted, since it has only begun producing in quantities within the last two months. The States and Territories cited form only a portion of the oil-bearing area of the West and Southwest, which indicates its extent. As a matter of fact, however, paying wells have been bored in other sections, and today the traveler may see derricks erected all the way from the Mississippi River to the Pacific coast, while the width of the possible fields from north to south can only be imagined as yet. Predictions have been made, that the present year will have a showing of 150,000,000 barrels for the United States. When the production of the newer fields is analyzed, and consideration given the activity in boring wells and exploiting additional territory, these figures do not appear to be exaggerated. It can be said without contradiction that the industry in California and Texas has never covered a wider area, nor has it been more active. Despite the fact that the quantity from the older fields in Texas has considerably diminished, each is still yielding sufficient oil to maintain the industry on an important scale. True, nearly all the producing wells in the Spindle Top field are



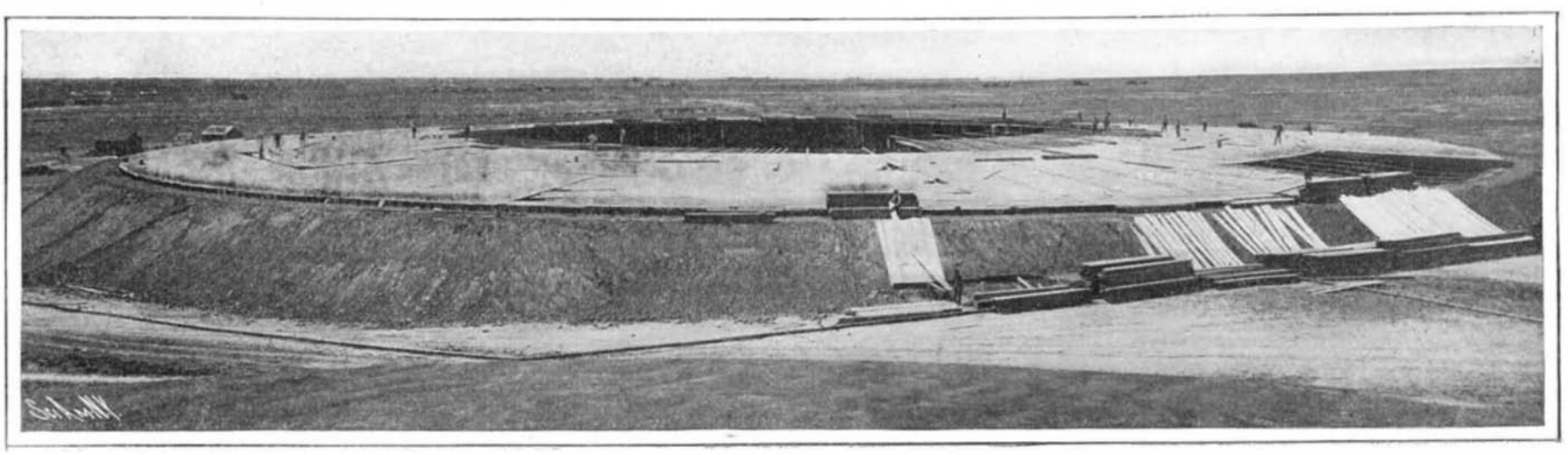
A Few of the Many Oil Derricks in the Field.



A General View of the Oil Field.



Reservoir Partly Covered.



Covering a 500,000-Barrel Oil Reservoir.

THE OIL FIELDS OF THE WEST.

being pumped, but there is no question that a very large deposit still underlies this portion of the State. Where in 1901 Spindle Top was its only field of any consequence, to-day Texas contains no less than five districts, the others being Sour Lake, Saratoga, Batson, and Humble, named in the order of their development. The Humble field was unknown at the beginning of the year, but the latest estimate puts its daily yield at between 80,000 and 85,000 barrels, although at the time of writing less than seventy-five flowing wells have "come in." Should these figures be maintained, the Humble will furnish more petroleum than all the others in the State. In Kansas and the Territories rigs have been erected in so many portions that it may be said that the industry is general in this part of the country, and it would not be surprising if even the present remarkable figures were greatly exceeded. In the State alone but 735 wells were producing oil in June, 1903. In six months the number had doubled, and at present it is estimated that fully 2,500 are flowing sufficiently to pay for their operation. The Chanute, the most important field, contains nearly one-half of this number, yet is still being exploited on an extensive scale.

Apparently California promises to remain at the head of oil-producing States, despite the wide range of territory which has already been covered. The beginning of the industry was in the suburbs of the city of Los Angeles, when in 1892 the first paying well was sunk. A year later the Newhall district, as it is called, supplied about 100,000 barrels. Since that time important deposits have been found not only in Los Angeles County, but in Ventura, Santa Barbara, Kern, King, and Fresno. The activity in Kern has assumed very large proportions. During 1904 it contributed fully 20,000,000 barrels of the California output, but the supply which exists in the original field is such that over 1,000 wells have already been bored in Los Angeles County, and this number will be considerably increased during the present year. Another important territory which added to the western and southwestern contribution during 1904 is the Jennings field in southern Louisiana. This is undoubtedly a portion of the oil-bearing sands which have been reached in Texas, and as it is located no less than 200 miles east from Humble, there is reason to believe that more or less petroleum exists all the way between these points. At present the output in the vicinity of Jennings averages 1,000,000 barrels monthly alone.

In considering the supply of petroleum from the West and Southwest as compared with the East, an important factor to be remembered is the wide diversity in the quality of the product. Thus far none has been found in California or Texas which is of as high grade as that secured from the Appalachian or the Lima-Indiana region. As is well known, the Pennsylvania oil yields the most value. One hundred gallons of the crude represents about 76 gallons of fair grade illuminating oil, 3 gallons of lubricant, and 11 of the naphtha grades. The quantity of waste seldom exceeds 5 per cent. As yet practically all of the petroleum having a paraffine base comes from the eastern district, while the asphalt represents a large proportion of the western product. To a certain extent sulphur is also found, especially in the Texas oils, which further reduces its value for commercial purposes. As refining in the West and Southwest is principally by means of intermittent distillation, the cost of purifying the crude oil is considerably greater than in the older fields. By the present methods about 20 per cent of the California and Texas oils can be obtained for illumination—nearly 50 per cent less than the paraffine grades of the East. To extract the sulphur it is usually necessary to redistill the liquid, treating it with copper oxide—an expensive process. For these reasons the great bulk of the Western oils are marketed in their crude state, being used chiefly for fuel, although kerosene and naphtha for local consumption are obtained both on the Pacific coast and in Texas, while the manufacture of lubricating oil is rapidly increasing. Since the construction of pipe lines from the principal fields, and the erection of tanks and other reservoirs at convenient points, the economy of this liquid fuel has been so appreciated that the majority of the railroad companies, especially in the Southwest, have substituted it for coal. It is also being supplied to sugar refineries and other industries for use in connection with stationary engines, and a large fleet of steamers plying from Pacific coast ports are burning it exclusively. Apparently the quality of the Western and Southwestern oil is not deteriorating, and as more and more sources of consumption are being found for it, the demand is rapidly increasing, although not in the same proportion to the supply.

The following table, showing the carbon and hydrogen in oils from the American districts, will assist in giving an idea of the quality of the several products:

	Carbon.	Hydrogen.
West Virginia heavy oil	83.5	13.3
West Virginia light oil	84.3	14.1
Pennsylvania heavy oil	84.9	13.7
Pennsylvania light oil	82.0	14.8
Texas oil	86.8	13.2

THE JAPANESE NAVY AFTER THE WAR.

The task that confronted the little Japanese navy at the outbreak of the recent war was simply stupendous. By the book, and on paper, it was simply impossible of accomplishment. Theoretically, by all the laws of naval strategy, that navy should have been at least three times as large as it was to accomplish with certainty the work that confronted it. At the outbreak of the war the naval forces of Japan and Russia in eastern waters were approximately equal; but for Japan successfully to accomplish what she set out to do, what it was absolutely necessary she should do if she were to win on sea and land, required a navy, and this without any reference to the fleet in reserve in the Baltic, practically double the size which she had at command. To blockade a superior fleet of battleships in Port Arthur and a squadron of armored cruisers at Vladivostock; to provide transport for nearly three-quarters of a million of men from Japan to Manchuria, convoy that transport, and maintain its lines of communication so secure that the fresh reserves, the wounded, the hundreds of thousands of tons of provisions, ammunition, guns, and general army supplies, might pass to and fro without fear of interruption—all this was a task for which a navy double the size of that of Japan would have been considered by the naval strategist none too strong. Furthermore, the seemingly insuperable task (we are now weighing the question as it was weighed before the events of the war had opened our eyes) confronting the Japanese navy was rendered doubly discouraging by the fact that the waste of war in ships and general war material would be, for the Japanese, irreparable, whereas the enemy possessed in the Baltic reserves a fleet that was approximately equal in power, and in its principal units more modern in type, than the one with which Japan had immediately to deal in eastern waters. So that it was necessary, not merely to defeat and destroy an enemy who by virtue of his strategical position was stronger than themselves, but the victory must be accomplished with the minimum of loss of ships—that is, if the Japanese remnant was not to be overwhelmed when the Baltic fleet reached the scene of conflict.

It is easy to be wise after the event; but at the opening of the war of 1904, the naval strategists would have told us that if Japan won out "by the skin of her teeth," and with but a pitiful remnant left of her own navy, it would be a most brilliant feat of arms. We doubt if even among the Japanese themselves, well informed as they were as to the actual efficiency of the enemy, it was expected that the successful termination of the war would leave their navy anything but sadly wrecked.

All the more splendid, then, are the results as they are recorded in the tabular statement which is herewith presented to the readers of the SCIENTIFIC AMERICAN; for not only did the Japanese navy cheerfully accept and patiently bear the double burden imposed upon it, but it has emerged from the struggle actually 50 per cent stronger than it was at the outset.

Of late, this Oriental race has shown to the western world some new and better ways of doing certain things in which the western world supposed itself to be pre-eminent. Japan has proved that it is possible for the personnel of a navy to be so perfect in skill, discipline, and dauntless courage, that it can not only win out decisively against an enemy numerically superior, but that it may emerge from the conflict more powerful in ships and material than it was when the opening gun was fired. The Japanese navy performed many brilliant feats during the progress of the war; but not one of them was, in its way, more remarkable than the skill with which they recovered a whole fleet of Russian warships from the mud at Port Arthur and Chemulpo, took it over sea to Japan, and pushed forward the repairs so successfully as to make it possible for every battleship and cruiser before many months to go into commission under the flag of the Rising Sun.

Interest in the conflict, at least in the United States, died out so quickly and absolutely with the signing of the Treaty of Portsmouth, that the American people have failed to realize the profound significance of those occasional telegrams from Tokio which have appeared during the past few months, stating that this battleship or that cruiser had been refloated and taken to Japan. As a matter of fact, every such announcement meant that the Japanese navy was receiving an addition of strength and taking a higher stand among the navies of the world which, under ordinary circumstances, would have required four or five years for its accomplishment. We are informed by Japanese naval officials that the damage done to the sunken fleet by Japanese mortar fire, and by explosives applied by the Russians themselves, is surprisingly small in comparison with what would naturally have been expected. Every one of the eleven battleships and cruisers that has been captured or refloated is capable of thorough repair. Although many of them are badly knocked about between wind and water, the amount of damage below the waterline is unexpectedly small, and not one of the heavy blows struck by the mine or the torpedo, or the large high-explosive shell, has impaired the integrity of the structure of the ship as a whole. Protective decks and waterline belts have done their work most effectually. Instances of penetration of the vitals of the ship are few; and the shells that did enter have wrought no damage that cannot readily be made good.

Without disparaging the skillful work done by the Japanese wrecking crews, it may be said that the salvage of the Port Arthur fleet is a splendid tribute to the genius of the naval architect. It is a complete verification of those theories of watertight subdivision and the combination of belt and deck armor, which have produced the many-compartmented modern warship. To be convinced of this, recall for a moment the prodigiously rough treatment to which this Port Arthur fleet has been exposed in the last two years. Torpedoed in the first night attack; pierced at the waterline in the offshore engagement next day; patched up temporarily by the use of wooden cofferdams; struck repeatedly by mines (in the case of one ship twice in the same spot); again repaired under emergency conditions; taken to sea and put through a fleet engagement of seven hours' duration; brought back to Port Arthur, to be finally sunk under a four days' bombardment by 11-inch shells; wrecked by heavy charges of gun-cotton applied within and without by the Russian officers themselves—these ships, after spending six to eight months at the bottom of Port Arthur harbor, are floated, and some of them taken under their own steam across the stormy Sea of Japan to be repaired and put in first-class shape at Japanese dockyards.

That the ships were raised at all was due largely to the elaborate system of watertight compartments. To illustrate how complete this is, we show several views of that portion of the French battleship "Charles Martel" which lies below the protective deck. This vessel is selected because the later Russian ships are either of French construction or follow French designs. We do not know the total number of compartments in such a ship as the "Pobieda," but how complete is the modern system of subdivision may be judged from our own battleship "Connecticut," now building at the Brooklyn navy yard, which has 71 separate watertight compartments in the double bottom, 155 between the double

Japanese Navy After the War.

Battleships.

Name.	Date.	Displacement.	Original Trial Speed.	Remarks.
Kasuga	1906	16,400	18.5	Nearly completed.
Katori	1906	15,9 0	18 5	Nearly completed.
Mikasa	19.0	15,200	18.6	
Asahi	1899	15,200	18.3	
Shikishima	1898	14,850	18.8	
Iwami	1904	13,566	18.0	Ex Russian Orel.
Hizen	1900	12,700	18.8	" Retvizan
Fugi	1906	12,500	18.5	
Suwo	1900	12,670	18.5	" Pobieda
Sagami	1898	12,670	19.1	" Peresviet
Tango	1895	11,000	16.5	" Poltava

11 Ships of 152,706 tons.

Coast Defense Ships.

Iki	1892	9,700	14.8	Ex Russian Nikolai
Okinoshima	1898	4,126	15.0	" Apraksin
Mishima	1895	4,648	16.0	" Seniavin
Chin Yen	1882	7,350	14.5	

4 Ships of 25,974 tons.

Armored Cruisers.

Kasuga	1904	7,700	20	
Nisshin	1904	7,700	20	
Aso	1902	7,800	21	Ex Russian Bayan
Asama	1898	9,750	22	
Tokiwa	1898	9,750	22.7	
Izumo	1899	9,800	22.0	
Iwate	1900	9,800	21.8	
Adzuma	1900	9,436	21 0	
Yakumo	1899	9,850	20.7	

9 Ships of 81,686 tons.

Protected Cruisers.

Soya	1899	6,500	24.6	Ex Russian Variag.
Tsugaru	1900	6 630	20.0	" Pal'ada.
Chitose	1898	4,760	23.8	
Kasaji	1897	5,416	22.8	
Akasi	1897	2,657	20.0	
Suma	1895	2,657	20.0	
Akitsushima	1892	3,150	19.0	
Idzumi	1884	2,800	18.0	
Chiyoda	1889	2,450	19 0	
Hashidate	1891	4,277	16.7	
Itsukushima	1889	4,277	16.7	
Matsushima	1890	4,277	16.7	
Naniwa	1885	3,700	18.7	
Takachiho	1885	3,700	18.7	
Niitaka	1904	3,4.0	20.0	Completed during war
Tsushima	1904	3,420	20.0	" "
Otawa	1904	3,000	20 0	" "
Miyako	1901	1,800	20.0	Sunk and re-floated
Yayeyama	1891	1,600	20.0	
Chihaya	1901	1,250	21.0	

20 Ships of 71,741 tons.

Japanese Navy Before and After the War.

	1904	1906	Increase.
Battleships	85,250 tons	152,706 tons.	67,456 tons (80%)
Coast defense	9,350 "	25,974 "	16,624 " (178%)
Armored cruisers	73,886 "	81,686 "	7,800 " (10%)
Protected cruisers	55,301 "	71,741 "	16,440 " (30%)
Totals	223,787 tons	332,107 tons.	108,320 tons (48%)