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................................	85.8	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 preeminent. 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.

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.

Name.	Date.	Displacement.	Original Trial Speed.	Remarks.
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.

Name.	Date.	Displacement.	Original Trial Speed.	Remarks.
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.

Name.	Date.	Displacement.	Original Trial Speed.	Remarks.
Soya	1899	6,500	24.6	Ex Russian Variag.
Tsugaru.......	1900	6 630	20.0	" Pallada.
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[illegible]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	

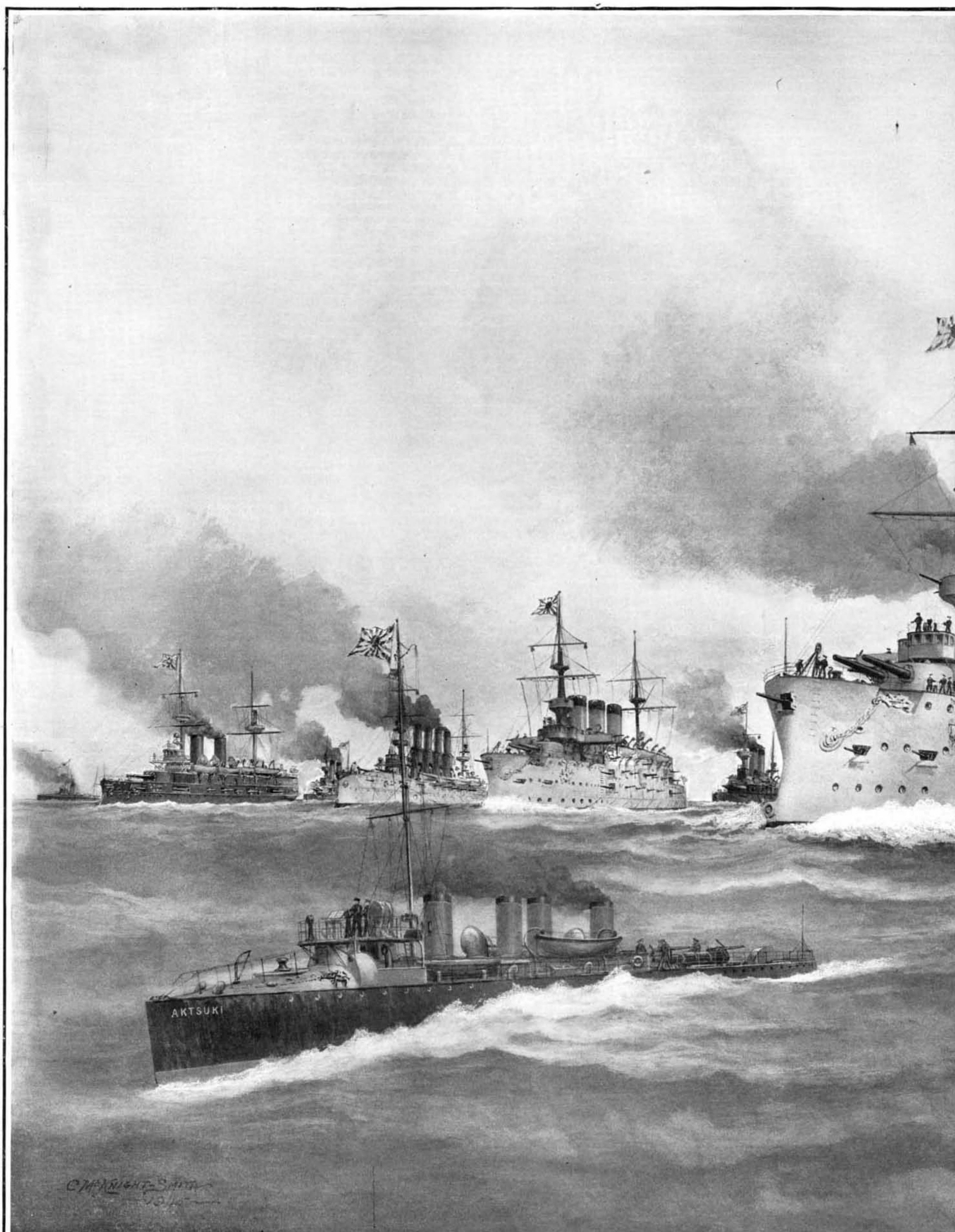
20 Ships of 71,741 tons.

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%)

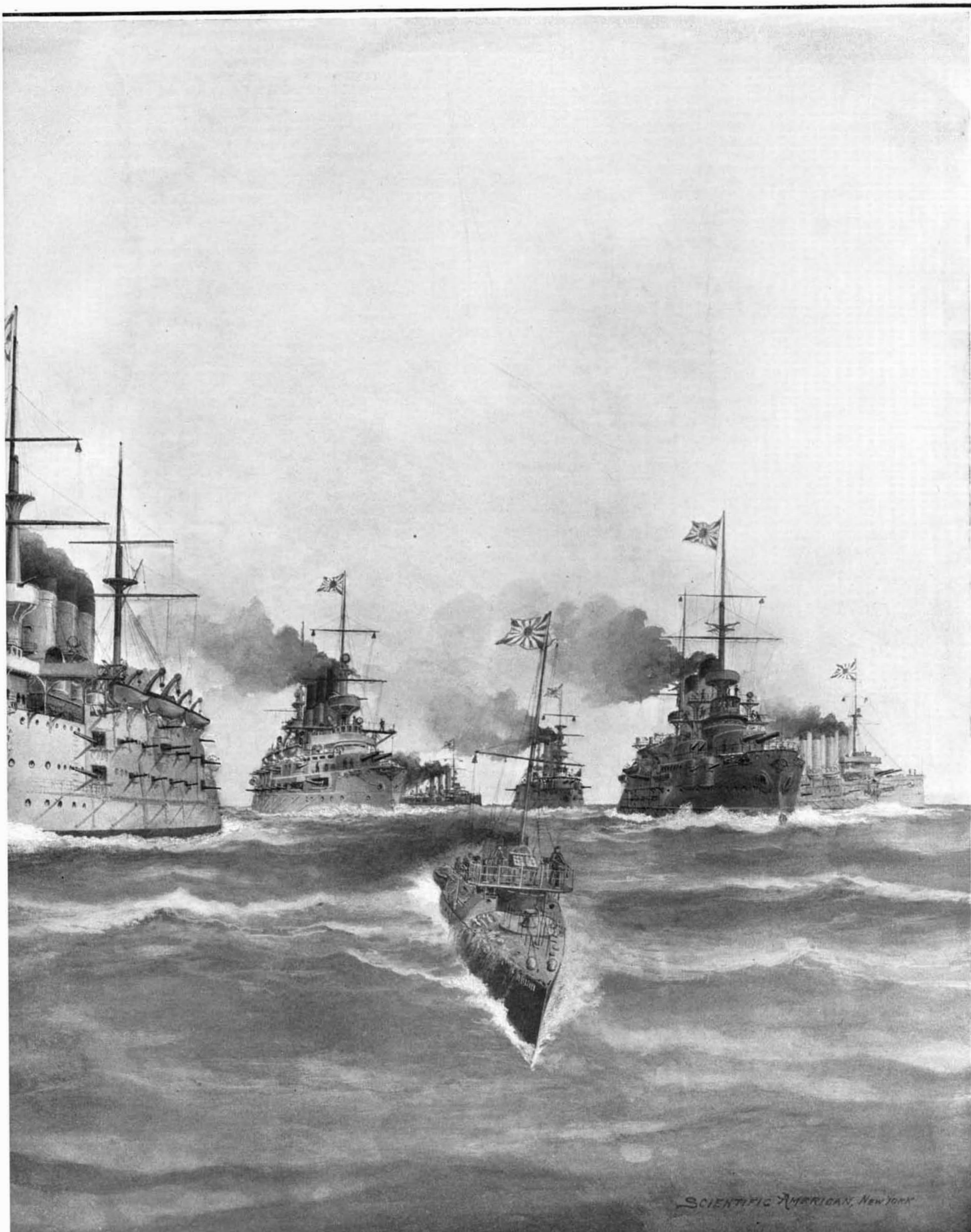
Without disparaging the skillful work done by the Japanese wrecking crews, it may be said that the salvage of the Port Arthur fleet is a splendid tribute to the genius of the naval architect. It is a complete verification of those theories of watertight subdivision and the combination of belt and deck 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



Gunboat "**Gaidamak.**" 400 tons, 22 knots.
Coast defense "**Mishima**" (*ex "Seniavin"*) 4,648 tons, 16 knots.
Battleship "**Suwo**" (*ex "Pobieda"*) 12,670 tons, 18.5 knots.
Battleship "**Sagan**" 12,670 t
Second-class battleship "**Iki**" (*ex "Nikolai"*) 9,700 tons, 14.8 knots.
Protected cruiser "**Soya**" (*ex "Variag"*) 6,500 tons, 24.6 knots.
Coast defense "**Okinoshima**" (*ex "Apraksin"*) 4,126 tons, 15 knots.

RUSSIAN WARSHIPS RE-FLOATED AT PORT ARTHUR AND CHEMULPO AN



al" (*ex* "*Peresviet*")
ons, 19.1 knots.

Protected cruiser "**Tsugaru**" (*ex* "*Pallada*").
6,630 tons, 20 knots.

Battleship "**Iwami**" (*ex* "*Orel*")
13,566 tons, 18 knots.

Battleship "**Hizen**" (*ex* "*Retvizan*")
12,700 tons, 18.8 knots.

Battleship "**Tango**" (*ex* "*Poltava*")
11,000 tons, 16.5 knots.

Armored cruiser "**Aso**" (*ex* "*Bayan*")
7,800 tons, 21 knots.

D CAPTURED IN THE SEA OF JAPAN THAT NOW FLY THE JAPANESE FLAG.

bottom and the protective deck, and 101 above the protective deck, making a total of 327 in the whole ship.

In salving these vessels, the Japanese divers first went down and closed all holes in the shell of the ship with timber, canvas, and cement, or other material; shut all the watertight doors that were accessible; and then put powerful pumps at work to empty the water from the hull. In the case, for instance, of the battleship "Peresviet," two salvage steamers were placed one on each side, and their powerful pumps were assisted by a centrifugal pump and three pulsometers which were on board the ship itself. When all these pumps were working together, the enormous amount of 13,000 tons of water per hour was pumped out of the ship. This is more than the total displacement of the ship at her normal draft. The "Peresviet" was immersed 7 feet in the mud, and, as she lifted, the divers, of whom there were twelve squads, went carefully around the ship, closing all openings into the hull. From June 30 to July 2 the ship lifted 3½ feet; on July 3 she lifted 3 feet more, at which time she was immersed only about 3 feet below her normal draft. In spite of the fact that twelve holes made by 11-inch mortar shells were visible in the upper deck, of which four pierced the protective deck, and although four large holes were reported by divers as existing below the armor deck, one of which was 18 inches deep by 7 feet long, it is evident that no vital injury was done to the ship; for after being raised she was taken to Sasebo, Japan, under her own steam.

The same feat was performed with the armored cruiser "Bayan," and the battleship "Poltava" was also found to be navigable under her own engines.

As a matter of fact, the condition of these ships, as revealed by the Japanese, confirms the statement made to the Editor of this paper by several Russian officers, that the effect upon a warship of high explosives, whether exerted by the shell, the torpedo, or the submarine mine, is strictly local. The plating, framing, or what-not, that comes within the immediate radius of the explosive gases, is blown in or torn asunder by the energy of the gases or the flying fragments; but the structure of the ship as a whole is not affected. Neither the vessel itself, nor its engines, are thrown out of line, or wrenched, or twisted; and hence, the best answer to make to the increasing range of gun and torpedo, and to the hidden menace of the submarine and the mine, is to multiply the subdivision and still further localize the effect of the blow.

In conclusion, we draw attention to the enormous gain in strength of the Japanese navy, due to the inclusion of these captured and refloated Russian ships. The work of new construction was carried on during the war to an extent that more than offsets the Japanese losses. The battleships "Kasuga" and "Katori," the most powerful afloat, each carrying four 12's and four 10's, and twelve 6's, will be completed early in 1906, or say two years from the beginning of the Russian war; and the Japanese themselves completed three 20-knot cruisers of about 3,000 tons displacement. Five battleships, three coast-defense ships, one armored cruiser and two large protected cruisers of the late Russian fleet have been added to the navy; and it is probable that, in the case of the battleships, the Russian armament will be replaced by much more powerful guns of the wire-wound type of Japanese manufacture. The speed of these ships is high, and they may be considered, when re-armed, as being well up to date. The increase of the Japanese navy by accretions, during and after the war, is as follows: In battleships there is an increase of 67,456 tons, or 80 per cent; in coast-defense vessels an increase of 16,624 tons, or 178 per cent; in armored cruisers there is an increase of 7,800 tons, equal to 10 per cent; and in protected cruisers there is an increase of 16,440 tons, or 30 per cent. The total increase of the whole navy in tonnage alone is 108,320 tons, which is an increase of 48 per cent on the total tonnage with which Japan went into the war. This places her ahead of Italy, and brings her into fifth place, or next in rank to the United States.

Amundsen and the Northwest Passage.

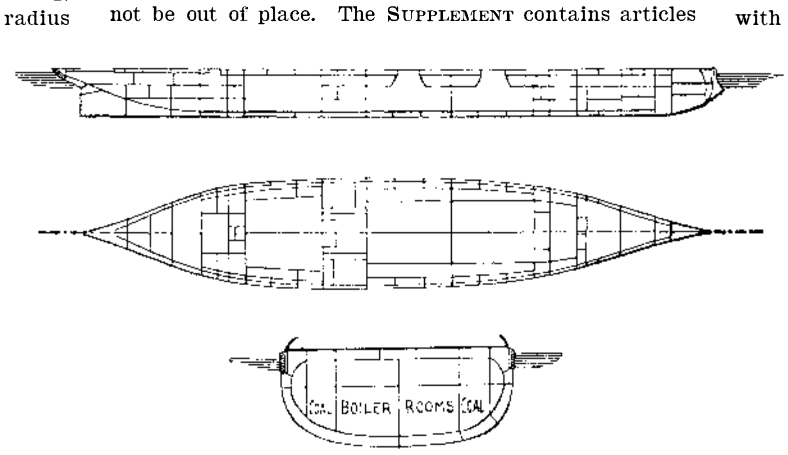
The recent reports that Capt. Roand Amundsen, of Norway, has succeeded in finding and traversing the historic Northwest Passage, and has, furthermore, definitely located the north magnetic pole, have aroused great interest in scientific circles; and while the statements are not absolutely authoritative, it is believed that the accounts cabled from Fort Egbert, Alaska, are trustworthy. The search for the Northwest Passage began almost as soon as it was established that America was not a part of Asia, but it appears, nevertheless, that Capt. Amundsen is the first to force his way around the northern edge of the continent. Notwithstanding that the accomplishment of this feat did not take place until the present day, we have known of the existence of the passage for a comparatively long period, for points which were located by travelers from the east were recognized by those from the west, or *vice versa*.

Capt. Amundsen left Norway on June 1, 1903, in his 46-ton sloop, the "Gjoa," with a crew of eight men. Crossing the Atlantic, a first stop was made at Godhaven, Greenland, and from there the party went to the island of North Somerset, near which the first base station was established. In 1904 extensive magnetic observations were undertaken at Leopold Harbor, and during the spring of the present year these investigations were carried out on King William Island, which, it is said, resulted in the location there of the north magnetic pole. It will be remembered that Capt. Ross, relying upon a single observation, claimed to have found this pole on the peninsula of Boothia, in 1831. It appears, too, that the party found on King William Island a monument erected by the ill-fated expedition under the leadership of Sir John Franklin.

Capt. Amundsen has had considerable experience in Arctic exploration work, and has received unstinted praise from his associates in former expeditions. The "Gjoa" is wintering near Kay Point, Herschel Island. The account of the expedition's successful completion was received from Fort Egbert, Alaska, and it is thought that the explorer reached that locality by an overland journey from the winter quarters of his vessel.

To Our Subscribers.

We are at the close of another year—the sixtieth of the SCIENTIFIC AMERICAN'S life. Since the subscription of many a subscriber expires, it will not be amiss to call attention to the fact that the sending of the paper will be discontinued if the subscription be not renewed. In order to avoid any interruption in the receipt of the paper, subscriptions should be renewed before the publication of the first issue of the new year. To those who are not familiar with the SUPPLEMENT a word may not be out of place. The SUPPLEMENT contains articles too long for insertion in the SCIENTIFIC AMERICAN, as well as translations from foreign periodicals, the information contained in which would otherwise be inaccessible. By taking the SCIENTIFIC AMERICAN and SUPPLEMENT the subscriber receives the benefit of a reduction in the subscription price.



Only the portion of the hull below the protective deck is shown. In the United States latest battleship "Connecticut" there are 101 watertight compartments above and 226 below the protective deck.

DIAGRAM SHOWING THE MINUTE SUBDIVISION INTO WATERTIGHT COMPARTMENTS OF THE "CHARLES MARTEL," A MODERN FRENCH BATTLESHIP.

Science Notes.

The interrelations of parasites and hosts, or of symbionts, are of such great physiological interest that some of the most significant problems may not justly be omitted in this connection. It has long been assumed that the conditions of nutrition of a host plant determine to a considerable extent its immunity to parasitic attack. Ward was unable to detect in the bromes any modification of resistance due to either high cultivation or to lack of sufficient mineral nutrients.

White wines are made from white grapes and such varieties of colored grapes as have practically colorless juice, the color being in the skin of the berry. The making and handling of white wine is very similar to that of red wine. The chief difference consists in the fact that, instead of allowing the crushed grapes to go through fermentation in the fermenting vats, when made from white grapes they are either allowed to remain there only a limited time (usually not more than twenty-four or thirty-six hours), or (as is most common) they are pressed at once and the juice is filled into storage cooperage and fermented by itself, the receptacles being only about three-fourths full. When white wine is made from colored grapes, in order to prevent the juice taking color from the skins, the grapes, after being crushed, must be pressed immediately. White wines, therefore, are usually not only free from the coloring matter contained in the skins, but also from the ingredients found in red wines, which are extracted from the pomace during fermentation.

A New Process of Dry Galvanizing.

At a recent meeting of the Society of Engineers in London, the new process of dry galvanizing, called "Sherardizing," was described by the discoverer of the method, Mr. Sherard Cowper-Coles. The most remarkable feature of this process is that iron and zinc can be coated with metallic zinc by the simple operation of bedding it in zinc dust in a drum, immersing it in a furnace, and then raising the zinc to a temperature which is several degrees below the melting point of that metal. Zinc dust, it may be pointed out, must not be confounded with zinc oxide, since the former consists of small particles of zinc coated with a film of oxide, and is produced by zinc distillation processes.

After immersing the articles to be galvanized, together with the requisite charge of zinc dust, in the drum, the latter is placed in the furnace. The temperature is then raised to 500 or 600 deg. Fahr.—a point some 200 deg. below the melting point of zinc. When the drum is withdrawn from the furnace and opened, the articles under treatment are found to be covered with a silvery film or coating of zinc, alloyed or amalgamated with the iron surface of the articles. The thickness of the coating can be determined as required, being simply dependent upon the length of time the drum is maintained in the furnace and the temperature employed. The advantage of this system of dry galvanizing is that the work is not only better done, but that it is considerably cheaper than hot or electro galvanizing, owing to the main fact that there is no waste of material, while the expenditure of fuel is small. Furthermore, the plant required for the purpose is both simple and inexpensive.

Another valuable characteristic of the discovery is that it can be utilized for a variety of purposes in connection with art metal work. It can be applied for the inlaying and ornamentation of metals. In this ramification of metal work the articles to be inaid are first submitted to a priming operation, being coated with a stopping-off composition, those portions where the inlay or onlay work is to be applied being removed. The articles are then packed in an iron box containing the metal to be applied in a finely-divided state, and then subjected to the furnace. Highly attractive effects are produced by inlaying steel plates with zinc, the steel being coated with magnetic oxide to render it proof against rust. Copper plate can also be inlaid with zinc, the stopping-off composition being so manipulated that a considerable portion of the copper is converted into a golden-colored brass, the effect being very unconventional and attractive. By skillful treatment and adjustment of the temperature and length of time in the stoving operations, a very extensive assortment of effects can be produced. Beautiful color schemes are obtained, ranging from silver white to yellow brasses and bronzes of a variety of shades, graduating to red copper.

For more practical and commercial operations, the process is capable of highly useful and valuable applications. It constitutes an excellent and efficient medium for case-hardening copper, and for coating aluminium preparatory to electro-plating or soldering. Iron and steel can also be rendered noncorrosive by treatment with the process. It has proved especially suitable for coating nuts and bolts, since owing to the even manner in which the zinc is deposited, the threads do not require recutting.

The Current Supplement.

Day Allen Willey opens the current SUPPLEMENT, No. 1563, with an excellent description of modern methods of extracting low-grade ores as practised at Tacoma. Mr. Ernest A. Dowson continues his excellent discussion of the use of gas for power and heating. "Why Castings Curve" is the title of an article which will undoubtedly be of interest to the foundryman. Mr. John Richards recently read a splendid paper on simple steam turbine engines, before the Society of the Pacific Coast. The first installment of this paper is published. Theodore P. Shonts, of the Panama Canal Commission, writes on the work now in progress at the Isthmus. The domestic life of animals has been made the subject of an instructive article by Dr. Zell. S. F. Emmons historically considers the theories of ore deposition. A good chemical article on Porcelain is contributed by Dr. Eduard Berdel. "Thermometers, Pyrometers, and Thermo-Regulators Operated by the Pressure of Saturated Vapors" is made the subject of an exhaustive illustrated discussion. The fascinating idea that matter of all kinds has a common substratum and is subject to evolutionary laws as well as animals is advanced by Prof. George H. Darwin.

The German telegraph administration has authorized the use of portable telephones, supplied by current taken off the general circuit where required, this arrangement being specially convenient for communications with vessels at anchor in the ports.