An Electrical Method of Testing Mineral Waters.

Mineral waters can be tested easily by the new electric method which consists in finding the electrical resistance of the water. D. Negreano, of Paris, shows that this resistance is almost always a physical constant and has a given value for each kind of water, thus showing the difference between it and other mineral waters. This method may prove to be a valuable one in practice. The following are some of the values which he found for some of the leading mineral springs of the Continent, giving the values in ohms per cubic centimeter at 18 deg. C. Caciulata spring, Roumania, 328; Slavic No. 1, 114; No. 3, 48; No. 6, 27.5; Vichy Celestins, France, 140; Vittel, Grand Source, 500; Evian, Cachet, 1,280. Other tests showed that the resistance diminished with the temperature, and provided the interval is not too large, the resistivity R_t at a given temperature, compared with the resistivity R at the standard of 18 deg. C. can be expressed according to the following equation $R_t = R\ [1 - a\ (t—18)]$, in which a is a coefficient of temperature variation which is found for each specimen. Generally a is near 0.02. For the above series of mineral waters, the values of a are as follows: 0.019; 0.24; 0.023; 0.024; 0.023; 0.027; 0.026. The important point about the above researches lies in the fact that the resistivity of natural mineral waters seems to be constant at a given temperature and it is also different from the value of artificial or imitation mineral waters stated to be obtained from the same springs. As an example, Vichy Celestins water showed 140 ohms per cubic centimeter at 18 deg. C., while artificial Vichy water showed 112 ohms. With Evian water the results were 1,280 and 1,120 ohms respectively. These results show that the method can be easily applied in detecting mineral waters and guarding against imitation.

Origin of the Pearl.

The origin of the pearl in the shell of the oyster, or other bivalve or mollusk, has been the object of a considerable amount of investigation and speculation. Among the more recent studies of the subject may be noted those of M. Seurat, recorded in the Comptes Rendus. This naturalist finds that in pearl oysters from the Gambia lagoons, in the South Pacific, the pearls are due to a small worm—a sort of tapeworm. In cysts on the body and mantle of the oyster he has found true pearls surrounding a nucleus which he has shown to be one of these worms. Like other tapeworms, this one, concerned in the production of pearls, requires a second host in which to complete its development. And M. Seurat considers that the ray is the second host in this case, for he has found in the spiral intestine of this fish small tapeworms, which he regards as the adult form of the larval worm of the pearl oyster. The author has named this new species of tapeworm *Tylocephalum margaritiferae*. The view has been held that the pearl is a secretion formed, as it were, in self-defense for the surrounding and isolation of an injurious foreign body.

Suggestions for the Deaf.

In the apartment of Mrs. Anna M. Town, of Utica, N. Y., is an arrangement of electrical lights that is of practical service to those who cannot hear the ringing of the door bell and telephone bell. When the telephone bell rings in the rear of the apartment, a brilliant light flashes up in the front room and remains lighted until turned off.

This light is so arranged that it flashes into the looking-glasses of three rooms. A light can be placed in every room if desired. The electric door bell is arranged in a similar way, the light being of another color. The arrangement has been in use two years, proving satisfactory and inexpensive. Most deaf people can hear over a telephone. By adopting this plan a telephone is quite as useful to a deaf person as to one who can hear. In case of illness, when the ringing of bells is to be avoided, this arrangement seems an admirable one. When the lights are used, the bell is also retained. A movable bulb that can be taken to any part of the house is a great convenience. The door bell in that case is silent.

Marconi Stations in Canada.

The Canadian government is still further extending the organization of the Marconi stations, which they have established for communication with ships, and from point to point along the coast. When two new stations at Father Point and Seven Islands are completed, there will be a continuous Marconi system from Quebec right up to Labrador on the one side, and to Cape Race on the other.

According to the Engineering and Mining Journal manganese bronze has practically driven aluminium bronze out of the market, or to such an extent that the disparity in the quantities used is very great. This condition has taken place not because of the superiority of manganese bronze over aluminium bronze, but because it is cheaper—containing nearly half zinc—and may be more easily cast.

THE BATTLESHIPS "DREADNOUGHT" AND "SOUTH CAROLINA."

Popular interest in naval affairs varies greatly with the events of the hour. Just now it is particularly keen, having been stimulated by the recent and very successful trials of the battleship "Dreadnought"—the first battleship designed and built since the Japanese war to embody the lessons of that famous struggle. Moreover, a few weeks prior to these trials, the contracts were let for the construction of two United States battleships, the "South Carolina" and the "Michigan," which also have been planned to meet the modern conditions of naval warfare as exemplified in the same war. On the following page, these two types are shown in a spirited picture, which affords an excellent opportunity of comparing their likenesses and very marked differences. The "Dreadnought" was completed in September of the present year, and the "South Carolina" and "Michigan" are to be completed in the spring of 1910.

By the courtesy of the Japanese government the British Admiralty was allowed to have a representative on several of the Japanese warships during the whole series of operations. They were present on the battleships that fought on August 10 to repel the great sortie at Port Arthur, and they were also present in the conclusive battle of the Sea of Japan. They brought home with them a large amount of valuable data, which was placed at the disposal of the Chief Naval Constructor, Sir Philip Watts; and it was this information that determined the salient features of the "Dreadnought." The novel characteristics of the ship, then, are based upon the following lessons of the war:

First, the enormous superiority of the 12-inch gun when used at the long ranges at which future battles are likely to be fought.

Second, the advisability of mounting the battery so as to obtain a maximum concentration of fire in every direction.

Third, the guns must be so positioned with regard to each other that the blast of one gun shall never inconvenience the crew of any other gun.

Fourth, the advantage of mounting all guns behind heavy armor, and, if possible, within turrets.

Fifth, the advisability of as wide a separation as possible of the gun positions, so as to limit the destructive effects of a well-placed shell.

Sixth, the necessity of reducing to a minimum all top hamper, such as masts, boat cranes, stays and shrouds, and superstructures built of light shell plating, which serve merely to intercept and burst high-explosive shells.

Seventh, the marked advantage of large displacement in affording lofty gun platforms and superior stability in a seaway.

Eighth, the undisputed advantages, both strategical and tactical, of high speed and generous coal supply.

Lastly, and perhaps most important of all, the necessity of providing several armored positions (conning towers), from any one of which the fighting of the ship may be carried on.

Let us now see in what way provision has been made in the "Dreadnought" to meet these requirements.

First, the armament consists of ten 12-inch, 45-caliber guns of a new pattern, with the unprecedented service velocity of 2,900 feet per second, capable of penetrating 22 inches of armor at 3,000 yards and 17½ inches at 5,000 yards.

Second, by mounting three of the turrets on the center line of the vessel and one on each broadside, and cutting down the forecastle deck to the level of the main deck in the line of dead-ahead fire of each of the turrets on the broadside (the decks and bulkheads being specially strengthened to resist the blast), the "Dreadnought" can concentrate six 12-inch guns dead ahead or dead astern and eight 12-inch guns on each broadside.

Third, the turrets have been so situated with regard to each other, that in no position in which the guns can be brought to bear will their blast inconvenience the gun detachment in any of the other turrets. When the guns of the two turrets on the beam are firing dead ahead, the detachment in the forward gun turret on the forecastle deck will be well up above the line of blast. When these guns are firing astern, the two after turrets on the main deck will be too far removed to be seriously affected.

Fourth, all the 12-inch battery is mounted within revolving turrets protected by 11 inches of sloping Krupp armor, equivalent in its resisting qualities to at least 15 inches of vertical armor. Throughout all the engagements of the Japanese war the gun detachments that were housed within the heavy turrets were practically immune from the effects of shell fire.

Fifth, the principle of wide separation, which has proved to be so advantageous in land operations as, for instance, in the advance of an attacking body of infantry, is of equal importance as a defensive element in the placing of the guns and their gunners on a warship. The principle has been admirably worked out on the "Dreadnought," where the 12-inch turrets, as viewed from the broadside, are separated by fully 100 feet of distance from center to center of turrets. The chances of a single shot doing injury to two turrets is very remote. Similarly, shots aimed at the ship as a whole must be limited in their destructive effect to a single turret, its guns, and its gunners.

Sixth, the masting of the "Dreadnought" is self-supporting, that is to say, it does not depend upon shrouds and stays to be held in place; and it is of enormous strength. Each mast consists of a tripod made up of three steel tubular legs of great stiffness, and this tripod arrangement renders it impossible for a single high-explosive shell to bring the mast down. One of the legs might, indeed, be entirely shot through, and the structure yet retain sufficient strength to stand erect. Moreover, stays and shrouds, which are particularly vulnerable to high-explosive shells, are done away with, even the smokestacks being unstayed and self-supporting; and, except for a short superstructure at the after end of the forecastle deck, the ship is free from light deck houses and structures which, as the Japanese war showed, merely served to intercept and burst the shells.

Seventh, the large displacement of 18,000 tons and the broad beam of 82 feet enable the "Dreadnought" to carry her guns at a great elevation, the axis of the forward pair being 34 feet above the water line, and the axis of the other guns from 26 to 28 feet above the sea level. Moreover, her great size conduces to slow movement and long easy roll in a seaway—most important considerations for the gun pointer.

Eighth, on the high seas just as much as upon land, mobility is of prime importance; for mobility means the power not only of concentrating in force and quickly at some desired point in the enemy's country, or upon the high seas, but it also means the ability to make a rapid change of formation while the tactics of the actual fight are being developed. In this respect the "Dreadnought," which has recently shown a sea speed of 21½ knots an hour on a continuous run of 172 knots, is most favorably placed. She is driven by quadruple turbine engines; and the fact that her coal consumption is probably about 1.5 pounds per horse-power hour, coupled with her large coal capacity of 2,700 tons, will give her an unusually wide radius of action at cruising speeds.

Lastly, at least one great naval battle of the Japanese war, the sortie of August 10, was lost by the Russians at a time when matters were going pretty evenly between the contestants, because at a critical moment the conning tower and bridge were wrecked by a single 12-inch shell, the admiral killed, and the ship left without a controlling hand. The "Dreadnought" is provided with three separate conning towers, each provided with a complete set of telephones, telegraphs, etc., from each of which it will be possible to fight the ship. One of these is immediately below the navigating bridge at an elevation of about 45 feet above the water line; the other is just forward of the aftermost smokestack, and the third is located between the two after turrets.

Altogether, it must surely be admitted that, considering how soon after the war the plans of the "Dreadnought" were decided upon, Sir Philip Watts has turned out an exceedingly powerful and effective ship.

Our own battleships, the "South Carolina" and "Michigan," are equally creditable designs. When we consider that they are of 2,000 tons less displacement than the "Dreadnought," it must be admitted that in offensive quality, at least, they are, in proportion to their tonnage, fully the equal of the British vessel. On the other hand, the "Dreadnought" is already in commission, having successfully completed her speed and gunnery trials; whereas it will be over three years before the "South Carolina" goes into commission. The armor on our ships is slightly heavier, and, being smaller vessels and shorter, they present smaller targets, and therefore are less liable to be hit; although this is somewhat offset by the fact that the bigger ship takes longer to sink, and can stand a proportionately larger amount of hammering. Taking the military features of the "South Carolina" seriatim, as in the "Dreadnought," we find that:

First, she carries eight 12-inch, 45-caliber guns, having a service velocity with nitro-cellulose powder of 2,700 feet per second, and that her shells are capable of penetrating 19 inches of armor at 3,000 yards, and 15 inches at 2,000 yards.

Second, by mounting one of each pair of turrets, forward and aft, some 8 feet higher than the adjoining turret, a maximum arc of training is obtained for all of the guns, four guns firing dead ahead and dead astern and eight on either broadside.

Third, the above system of mounting serves also to obviate all difficulties from blast interference; for our naval designers are satisfied that, even when one pair of guns is fired directly across the roof of an adjoining turret, there will be no serious inconvenience caused to the gun crews. The excellent character of

the port shields which are mounted on the chase of the guns, and the new method of constructing and locating the sighting slits, is depended upon to prevent the entrance of the blast into the turrets.

Fourth, all of the main battery is mounted within elliptical turrets protected by 12 inches of inclined armor.

Fifth, the one serious criticism which can be made against these ships is due to the bunching of the turrets and their guns in two positions with the two conning towers closely adjacent. Each of these positions offers a very tempting mark to a gunner who has once got the range to a nicety. This is a feature, however, which was doubtless thrust upon our designers by the limited displacement allotted by Congress for these ships, and it is a defect which will doubtless be corrected in our next and larger battleships.

Sixth, to the same controlling element of limited displacement is to be attributed the crowding of the masts, boat cranes, and smokestacks into a limited position amidships. High-explosive shells would be liable to produce pretty bad wreckage on this portion of the ship. However, the main battery is sufficiently far removed forward and aft to escape any danger of the turrets being jammed by falling debris of masts or smokestacks.

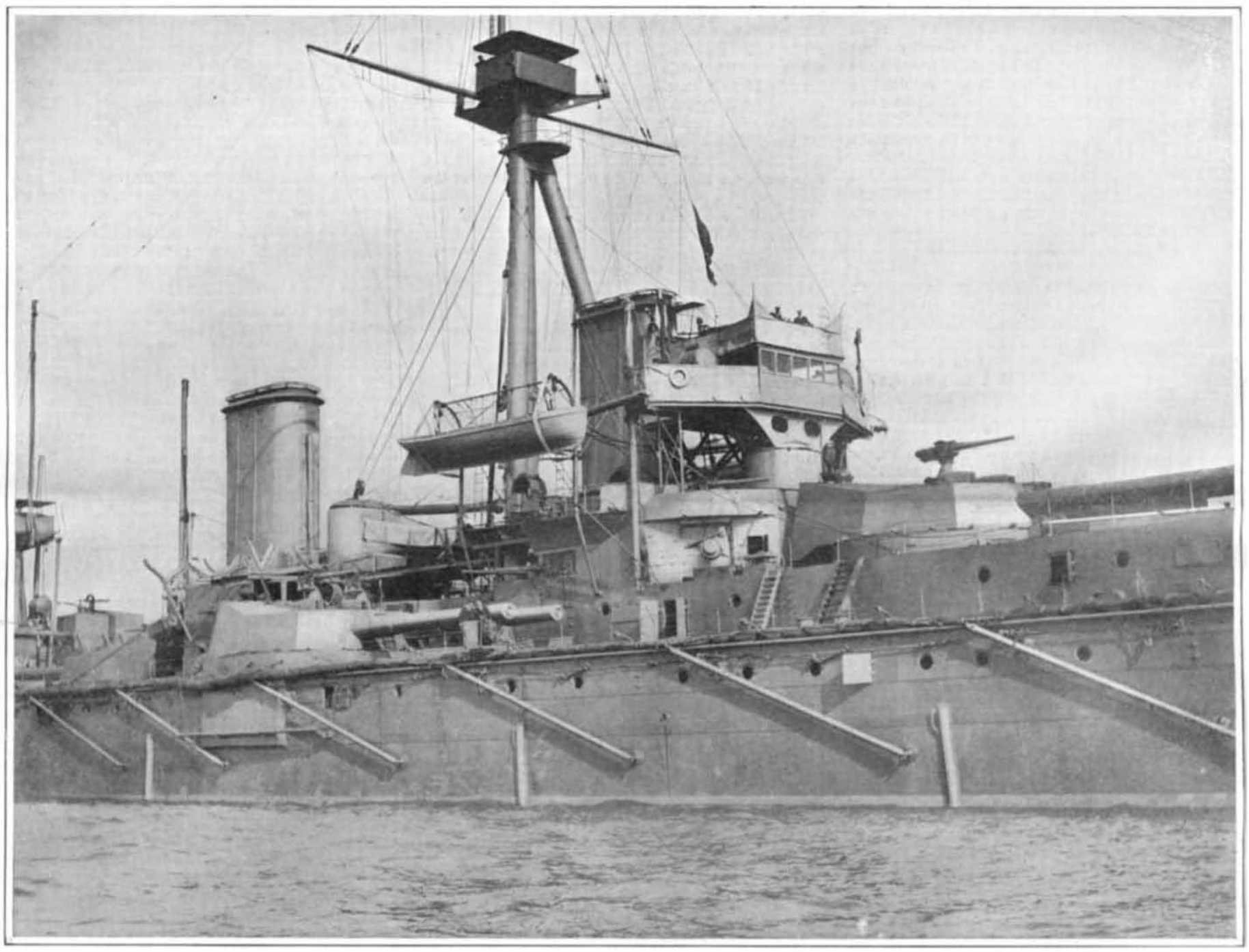
Seventh, the gun command, forward, is excellent, the foremost pair of guns being fully 24 and the adjacent pair 32 feet above the sea level. The smaller size of the "South Carolina" necessitated cutting down the quarter deck, so that the aftermost pairs of guns are respectively 8 feet lower than the corresponding forward guns.

Eighth, the proposed speed of the "South Carolina" is 18½ knots, and she has a maximum coal supply of 2,200 tons, both of which features, having in view the excellent offensive and defensive qualities of the ship, are all that could be reasonably expected in a 16,000-ton vessel.

Lastly, the "South Carolina" and "Michigan" are provided, each of them, with two separate conning towers, one at the forward and one at the after end of the superstructure.

As regards the future, there can be no doubt that the big battleship has come to stay, and that she will be a vessel of high speed. Further indication of this is seen in the three new, so-called armored cruisers "Invincible," "Inflexible," and "Indomitable," of the British navy, which are to carry the same number of 12-inch guns and to have the same all-round concentration of fire as the "South Carolina" and "Michigan," but are to be of over 17,000 tons displacement and are to have a speed of 25 knots an hour.

Our future battleships will undoubtedly be true to the traditions of our navy in mounting an exceedingly powerful battery; but we believe that this tradition should not be carried to the extent of preventing their speed being brought up considerably nearer to the 21½-knot mark, as now set by the "Dreadnought." The value of speed was established beyond all question by the events of the Japanese war.



View Showing Forward and Starboard 12-Inch Gun Turrets, Forward Conning Tower, Bridge, Tripod Mast, and the Midship Conning Tower Forward of the After Smokestack. The Ship Was Built in Eighteen Months.

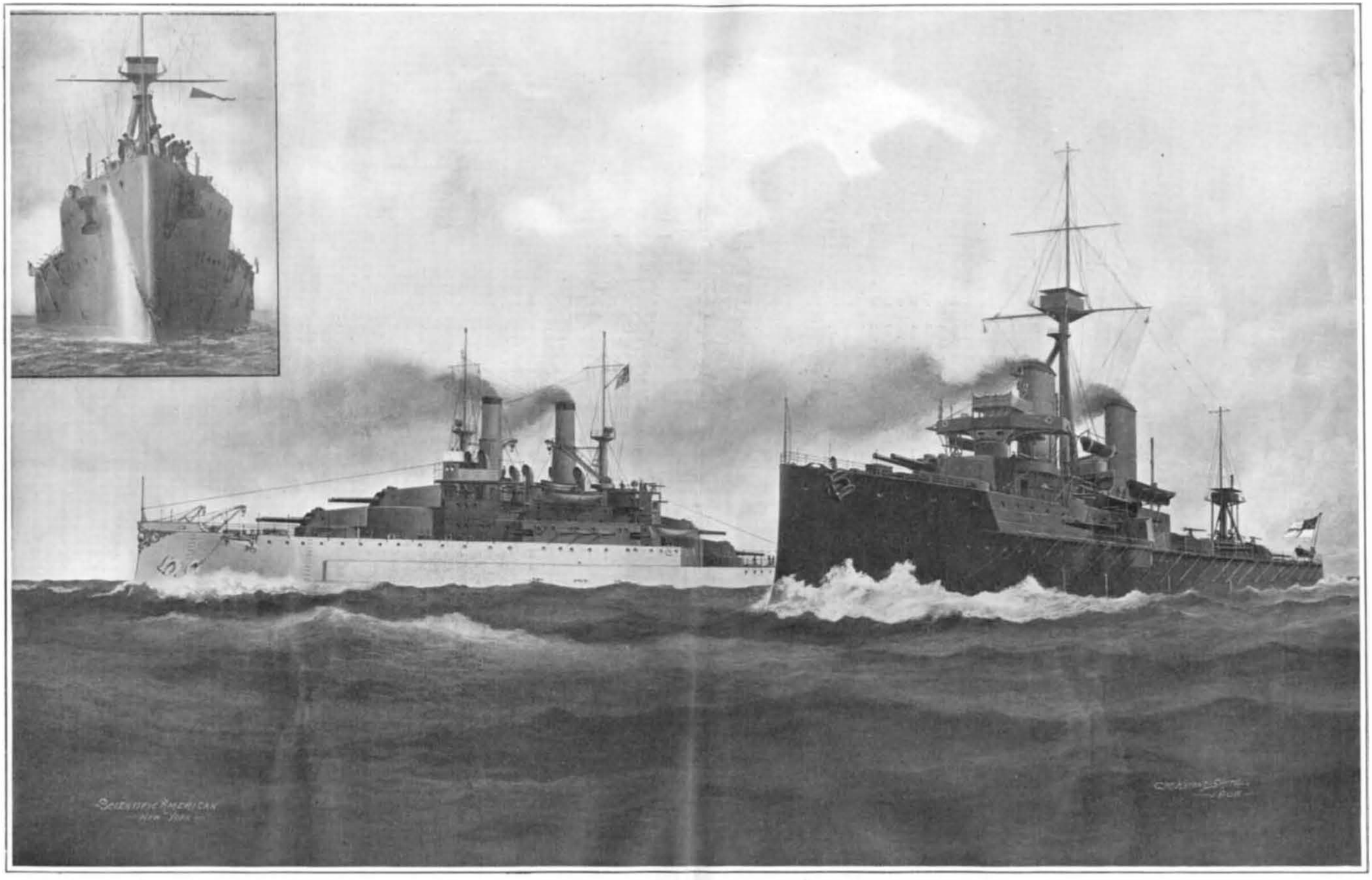
THE "DREADNOUGHT" LEAVING PORTSMOUTH FOR HER TRIAL TRIP.

A New Process of Color Photography.

A new process for color photography has been brought out by Prof. Lippmann. In order to reproduce the colors of the object we must first have the sensitive plate keeping the trace of the differences which are found in the radiations coming from the same incident beam, thus analyzing the beam, and second, the incident light must afterward give the corresponding color effect. He proposes to use the principle of the prism, and this may give the desired solution. A photographic spectroscope is composed of a slit, prism, lens, and sensitive plate, and the light which falls on the plate is here separated into its component parts. It remains to show that the apparatus is reversible and that we can re-form the light which entered the slit. Suppose the plate to be developed and then put back in place. If red light had fallen on the slit, there would be a red image of the slit on the screen. Making a positive plate of the image we form as it were a second slit which corresponds to the first slit. We must now make the action reversible, and such is the case, for when we light the positive plate by white light, we have only the red light at the other end. Thus the red light of the first instance corresponds to the red of the second case. The same applies to other colors. When the positive plate is exposed to white light, the slit receives a light which has the same composition as what was given during the first exposure. When the positive plate is replaced by the negative, all the other colors now pass, and we receive the complementary color at the other end. Here the place which the color has in the spectrum is shown by an opaque line, and such a ray could not now fall on the slit. To resume, when the positive plate is put in place in the spectroscope, it only lets pass the light which fell during the first exposure of the plate. With the negative plate, we have the complementary.

To apply this principle to color photography, M. Lippmann devised the following apparatus. The slit is replaced by a closely-spaced set of narrow slits, the whole resembling a set of fine lines, ruled to 125 per inch. This screen is fixed at the opening of a photographic enlarging apparatus, carrying at the other end a plate-holder, while in the center is a converging lens. In front of the lens is a small-angle prism with its edge parallel to the lines of the screen. The image to be reproduced is thrown on the screen. Then the plate is developed and the negative (or positive) put back in place. With the positive plate, when the latter receives white light at the back, we have the original image, with its natural colors, seen on the screen. Each line of the ruled screen acts like a spectroscope slit, and at a distance the eye does not see the separation, so that the image seems continuous. In the experiment, a spectrum was thus reproduced by means of the positive plate. A red and green glass screen was placed over the ruled screen, and it was reproduced again, and also with its complementary colors. The prism must have a small enough angle so that each spectrum has a smaller length than one space between the lines of the screen. As to the negative or positive plate, it appears like a series of white and black lines, but when examined by a glass we see the zones between the lines, corresponding to each small spectrum.

In an article on "Prehistoric Iron," the Industrial World states that during Roman occupation from the middle of the first century to 411, England had a commercial iron industry, which has been continuous to the present time. The Swedish industry has been continuous from the thirteenth century, or earlier. In America the first successful attem" at iron making was at Lynn, Mass., in 1645.



Bow View of "Dreadnought." Forecastle Deck Cut Away for Forward Fire of Guns on Beam.

	Year of Completion	Displacement.	Speed.	Coal Supply.	Motive Power.	Maximum Freeboard.	Minimum Freeboard.	Number of Guns.	Fire Ahead.	Fire Astern.	Broadside Fire.	Least Distance Cen. to Cen. of Turrets.
"South Carolina,"	1910	16,000 tons	18½ Knots.	2,200 Tons.	2 Reciprocating Engines.	22 Feet.	14 Feet.	Eight 12-inch.	Four 12-inch.	Four 12-inch.	Eight 12-inch.	35 Feet.
"Dreadnought,"	1906	18,000 "	21½ "	2,700 "	4 Turbines	30 "	22 "	Ten "	Six "	Six "	" "	100 "

UNITED STATES "SOUTH CAROLINA" AND BRITISH "DREADNOUGHT"—DESIGNED ON RESULTS OF JAPANESE WAR.

Tame Trout.

BY CHARLES F. HOLDER.

Among the interesting localities of the Pacific coast the Bay of Monterey is pre-eminent. I believe Dr. Jordan states that here are found more distinct varieties of fishes than in any one locality on the coast.

Certainly this is not confined to fishes, as a few days ago when angling for salmon in their sea run in the bay, I saw a strange assortment of invertebrates, among them the physalia or Portuguese man-of-war, so common in the tropics.

In a recent article I described some tame sea-lions at Santa Catalina. At Santa Cruz, in the St. George Hotel, one of the proprietors is much interested in fish culture, and in the office of the hotel he has a small tank containing perhaps fifty trout ranging in size from five to eight inches in length, some possibly longer. They are rainbows, brook trout, and steelheads, and are absolutely tame. I first noticed that when I went near the tank they crowded to the front and lined up, facing me, eager for something, and I found this to be due to the fact that at this time the owner fed them. He was kind enough to extend this prerogative to me, and handing me some chopped meat, red and inviting, asked me to hold it over the tank.

I have seen the rainbow rise to the lure in its native wilds; seen it leap for the fly; but this was the first time I ever saw one leap at myself. No sooner did my fingers appear over the water than half a dozen fishes surged up, and one big fellow almost cleared the water and seized the meat, while the others fought to take it from my hand. It was a strange and extraordinary spectacle. I had often in wading down a trout stream for this same game, approached a pool or riffle with the greatest care, maneuvering to make the right approach to get the wind behind me so that I could make the longest cast and have my fly literally appear to drop out of a clear sky or come down stream naturally to the fish heading up; but here were the same fishes fighting to nip my fingers, and absolutely as tame as cats. I say cats, as these trout rubbed their sides against my hand, and seemed pleased at the attention I was giving them.

Even more interesting was the exhibition given by the owner. He would indicate certain fishes that were a certain age and say that they were not so tame as others, though I could see but little difference. All were marvelously tame; indeed, the owner had raised them from "fry," and had always handled them. As he placed his hands in the water they crowded about, and appeared to enjoy being lifted up, and the spectacle—to me, at least—of a big trout lying complacently in his hand *out of water* and perfectly at ease and comfortable, was remarkable. I tried the same experiment with a wild trout later, and the performance did not appeal to the trout.

At Brookdale, about five miles above Santa Cruz in the mountains, the county has established a large trout hatchery from which the streams of the neighborhood are stocked. Here one may see trout of all sizes and ages, an attractive spectacle. It was interesting to note how quickly they felt or heard a noise. I happened to be standing by a large tank of big rainbows when the little narrow-gage train came down the mountain. I could hear it a mile or two distant, and the trout noticed it at once, and their fright increased until the train reached the hatchery, when they displayed every evidence of alarm and fear.

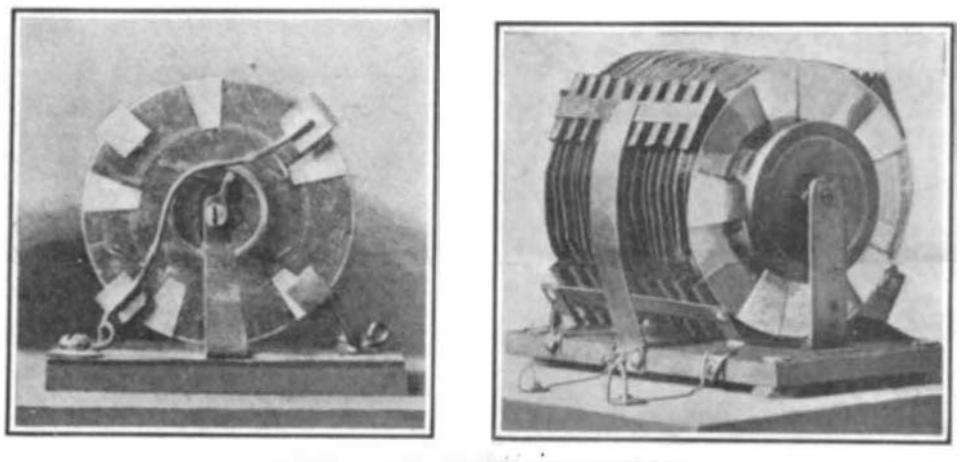
Geodetical observations have shown that the density of the earth's crust is variable, but they have not given any positive indications of the depths to which these observed variations extend. All calculations of the depths of subterranean variations in density and of the mountain compensation have, therefore, to be based on arbitrary assumptions of depth. The fact that the plumb-line seems generally to respond readily to the results given by the pendulum perhaps justifies the inference that the observed variations in the density of the earth's crust are not deep-seated. If an abnormal amount of matter exists in the crust near the surface, it will exercise direct effects upon plumb-lines and pendulums in the vicinity, but if it lies at a great depth its effects, especially on plumb-lines, will be less perceptible. Col. Burrard has taken several instances of abnormal pendulum results from the table, and has found in each case direct response from the plumb-lines at neighboring stations. This conformity could hardly ensue if the variations in density extended to greater depths than thirty or forty miles. Our results do not justify us in asserting that no deep-seated variations in density exist, but they do justify the belief that the variations in density which have been discovered are apparently superficial.

A MOTOR THAT RUNS BY LIGHTNING.

BY C. FRANCIS JENKINS.

When a glass rod is rubbed with a silk cloth, it acquires the property of attracting light objects. It is electrically charged with a charge of high tension and small quantity. A stick of sealing wax acquires like properties, but on proper investigation it will be noted that the charges are dissimilar. If a pith ball be suspended between the glass rod and the rod of sealing wax it will oscillate, contacting with the rods in turn, taking first a positive charge from the one and exchanging it for a negative charge from the other. The pith ball, after taking up a positive charge, for example, swings away from the rod because it is repelled by the like charge of that rod, and at the same time it is attracted by the unlike charge on the other rod. So the oscillations continue until the charges on the two rods are again in natural equilibrium.

The machine illustrated herewith is based on this phenomenon, and in its simplest form consists of a thin glass or mica disk supported on pivotal points and well balanced. This disk has five armature sections of tinfoil overlapping the edges of the disk at five equidistant points. Enveloping the disk also at equidistant points are four metal field poles, each field pole electrically connected with the field pole diametrically opposite. Each pole has a thin brush mounted thereon, which contacts with the armature sections as they pass thereunder. As there are five armature sections and but four field poles, some one of these brushes is always in contact with an armature section. If, now, one pair of opposite field poles be positively charged and the other pair be negatively charged, some one of the armature sections receives a charge of like sign with the field pole enveloping it. The armature section is, therefore, immediately repelled, and moves away from the field pole and toward the next field pole, to which it is attracted for like reason. As it passes under the brush of the latter field pole the charge is given up for one of unlike sign, and the armature section is in turn repelled by this field pole. Similar phenomena are taking place at each of the other field poles, and continuous rotation at high velocity is maintained.



A MOTOR THAT RUNS BY LIGHTNING.

To increase the torque, a battery of armature plates were mounted on a single shaft, and all the like armature sections in a row (parallel to the shaft) were connected together. Thus a larger capacity in each of the five armature sections was secured. The field poles were likewise connected together. But one set of brushes were required. These brushes were arranged to contact with the armature sections only just after each had passed the median line of each field pole. Therefore the motor always turned in the same direction. Any suitable source of high-tension current sufficed for power, as, for example, an induction machine. A charged glass rod held to one and a charged sealing-wax rod held to the other of the field posts was sufficient to cause considerable rotation of a single-disk motor.

In experiments in wireless telephony a pole supporting wires fifteen feet above the roof of a two-story frame house was used. It was noticed that on the occasion of storms there would be sparking at the gap in a plug cut-out block on the instrument table. It was found that on connecting the motor between the points, that is, so that one field pole was in metallic communication with the earth and the other with the aerial, the motor would run, beginning some little time before the rain began to fall. It was also noticed that the motor did not always behave similarly; sometimes it would revolve rapidly, while upon the occasion of other storms the torque would be weak.

As the force of attraction and repulsion is in proportion to the capacities of the opposed surfaces, it would seem that a motor of considerable power might be constructed to run by static current taken from the passing clouds, and this is suggested as a line of research of not unpromising results.

Vaccine for Tuberculosis.

Drs. Calmette and Guerin of the Pasteur Institute of Lille have finally discovered a vaccine which will render humanity immune from the dreadful scourge of tuberculosis.

Dr. C. Guerin, with regard to infection from tuberculosis and its remedy, says:

"Many experiments having demonstrated that tuberculosis bacilli destroyed by heat or other agents pass through the walls of the intestines as readily as living bacilli and are found in the mesenteric ganglions and lungs, we experimented with the object of discovering whether young animals, such as calves and kids, that had been made to swallow two doses, the second forty-five days after the first, of from 5 to 25 grammes of dead bacilli or bacilli whose virulence had been modified, could endure with impunity the injection of a meal of 5 centigrammes of fresh tuberculous matter taken from a cow, matter which would be surely infectious under ordinary conditions. We are now convinced that bovine bacilli destroyed by boiling for five minutes or simply heated during the same period will, for five months and even for a longer time to which it is not now possible to fix a limit, vaccinate perfectly against virulent infection through the digestive organs.

"We shall before long make known a detailed account of our experiments as well as others in progress, for which we have used treated bacilli from various sources and bovine bacilli treated by iodine and by hypochlorite of lime. Our belief, founded on experiments, now is that young calves may be vaccinated by a simple intestinal absorption of bacilli subjected to heat, and that this method of vaccination is not dangerous.

"If further careful experiments should justify the application of this method as a preventive against bovine tuberculosis, nothing can be urged against its application in the case of human beings. We think it will be possible to guard children against natural infection by giving to them a few days after birth, and again a few weeks later, a very small quantity of tuberculous bacilli of human and bovine origin subjected to heat and mixed with a little milk. The only precaution absolutely necessary, and one not always easy to apply, would be to guard children thus vaccinated against all tuberculous contamination for a period at least of four months. Special nurseries might be founded for new-born infants of tuberculous parents, where they might be protected against all tuberculous germs until they had acquired immunity through vaccination. We believe that these difficulties would be readily overcome in order to insure such immense advantages as those gained by rendering humanity refractory to tuberculosis contagion."

The World's Paper Consumption.

The Revue Scientifique recently discussed the consumption of paper by the principal nations of the world as reflecting modern progress of civilization because of its extensive use for printing purposes. It places the United States in the front rank as the greatest paper-producing country of the world, with an annual output of 639,734 tons (avoirdupois). Germany follows with an annual production of 393,683 tons, England 246,051, France 196,942, Austria 147,706, and Italy 123,026.

One American corporation is declared to be the greatest paper manufacturing enterprise in the world, possessing 31 factories with 96 continuously running machines, the company using almost as many machines as are operated in Italy and the Netherlands altogether, and its annual production exceeds that of all the paper factories in Austria-Hungary and almost equals that of all the British ones. Its capital amounts to more than $110,000,000. While America leads in production, Germany has become the largest exporter of this article, with 51,000 tons annually, England following with 49,210, the United States 16,880, and France 13,090. The United States export goes principally to South America, but also to Canada and Australia. Notwithstanding its large production England remains a good buyer, having imported 147,706 tons last year.

Regarding the direct consumption of paper it is an interesting fact that the United States leads with an annual figure of 38.6 pounds per capita, England coming next with 34.3, Germany 29.98, France 20.5, Austria 19, Italy 15.4, Servia showing the lowest European figure, 1.1; India shows only 0.22 and China 1.1 per capita. Nearly half of the paper manufactured in the world is used for printing purposes. Twenty per cent is absorbed in the trades and industries. Almost an equal proportion is applied for official and school purposes. The remaining 10 per cent serves the demand for private use.