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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

THE HIGH-SPEED MOTOR-BOAT MODEL.

The growing popularity of the high-speed motor boat is shown by the fact that an exhibition devoted entirely to small power-driven vessels of high speed has recently been held in this city in which an excellent exhibit was made of some of the latest and fastest of these craft and of the most approved types of engine used for their propulsion. The cause of the extremely high speed that is developed by these boats is twofold. In the first place, it is due to the introduction and refinement of a new principle of modeling developed during the past few years, which is an entire departure in some respects from the accepted speed lines for fast vessels which have governed designers ever since the modeling of high-speed craft was placed upon a scientific basis. The other cause is to be found in the remarkable development of the gas engine, resulting in the production of a given horse power for a minimum amount of dead weight. It is the simultaneous production of a high-speed model and an ideal motor to drive it that is responsible for the widespread interest in this fascinating form of sport.

The credit for the development of what might be called, for want of a more descriptive term, the motor-boat model, is shared equally by the yacht designers of the old and the new world; and we say this without any disparagement of the work done by the torpedo-boat builders, such as Thornycroft and Yarrow in England, Normand in France, and Schichau in Germany. Mention should be made of the speedy craft built by Herreshoff and Mosher in this country, and the work done by Kretschmer, naval constructor of the German navy. It is difficult to say just who was the originator of the type, and it is probable that it was an evolution that was the outcome of continued experiment and trial. Kretschmer, working on independent lines in Germany, seems to have clear title to originality in his own country, where he was enabled to patent his "tetrahedral construction;" but we understand that his application in this country was denied on the ground that the same principle has been in use for some years in the Mosher boats. In this connection we may mention that in the current issue of the Supplement we publish the plans of one or two fast German launches of this design, together with a description of the principles upon which their lines were drawn.

The main object aimed at in the lines of this craft is to keep down wave-making, which at high speed is the chief cause of resistance. The water lines are practically straight from the bow almost to the stern, and the bow angle at the water line is twice as sharp as that of a boat of equal length and beam modeled on the old speed-line theories. Straight water lines are secured by placing the point of greatest beam at the extreme or almost extreme stern of the vessel, an arrangement which causes the immersed sections to vary from a sharp, deep V at the bow to a broad, shallow U at the stern. The sharp angles of the water line and the gradual change from V to U sections may be regarded as the cause of the inappreciable wave formation, since the currents of displaced water are not subjected to a constant change in direction as in ordinary boats; and when these craft are driven at full speed, only a slight bow-wave is formed and a relatively small stern-wave, while no hollowing of the water at the sides of the boat is perceptible. Another advantage is that in spite of the great sharpness of the lines, the boat has a greater beam than one of equal fineness of line built upon the ordinary model, with a corresponding gain in stability. At the same time, these vessels are extremely sensitive to any disarrangement of their trim, and if the proper trim be not preserved, there is a marked diminution of the speed.

Whether principles that have been so successful in small boats are capable of application to large ocean-going ships is, we think, open to question. This very matter of trimming would, at the outset, present considerable difficulties of a commercial and operative quality. Mr. Kretschmer, however, has been engaged in designing upon his "tetrahedral" principles an ocean-going vessel of the size of "Kaiser Wilhelm II.," and on a length of 690 feet, a beam of 78½ feet and a maximum draft forward of 24½ feet, diminishing toward the stern, he produces a ship which, with an indicated horse power of 20,000, he expects to realize a speed of 24 knots. In this connection it is interesting to note that towing tank experiments carried out by the Russian navy department at St. Petersburg have demonstrated the merits of this form for the attainment of high speed. For low speeds of 12 knots and under, no perceptible advantage is noticeable between the tetrahedral and the ordinary model; from 12 to 14 and even up to 16 knots, the towing tests showed that the tetrahedral form is at a disadvantage, since by reason of the greater amount of frictional surface presented, greater power is required for a given speed than with a ship constructed in accordance with the usual principles; but for speeds above those mentioned, where wave-making is set up, the new design gains in speed at a multiplying rate.

RAISING CARRIER PIGEONS.

The popularity of the homing, or carrier, pigeon has been greatly enhanced in the last few years by the annual races held in different parts of the country. At the present time fanciers are arranging for a race during the coming summer, which will eclipse anything heretofore attempted. The race will be for 500 miles, from Spartanburg, N. C., to Philadelphia, and over 2,000 birds are expected to enter the contest. It will be held on the Fourth of July, and in all probability most of the pigeons will cover the distance in ten hours. The present record for the flight is 1,603 yards in a minute, which in a 500-mile race should enable birds of ordinary speed to finish within ten or twelve hours.

The event will be one of a series of contests which have been held in the past ten years; but it will be the first 500-mile one in which anything like so many birds have started. In the 200-mile race of several years ago from Orangeburg, Va., 1,500 birds were liberated. In 1896 a smaller number of birds were started in the race. In this race two birds flew 614 miles in one day, and several have covered 600 miles in a day with apparent ease. The pigeons are carried to the starting place in baskets arranged especially for them, and liberated directly from the baskets if the day is favorable for an immediate start. Pigeon sheds are made to accommodate the birds for a prolonged stay in the event of unfavorable weather. The birds are shipped to the scene of the race by special cars under the direct care of the Pigeon-Flyers' Protective Association. Hundreds of birds have been lost in the past races through theft, and many owners of fine homing-pigeons have consequently been reluctant to enter their birds in the contests for fear of losing them. In the present race a uniform style of lock for the baskets will be adopted, and only the caretakers will be provided with keys. If the locks are opened or picked, and pigeons stolen, the association will investigate and prosecute the offenders.

There is no more delightful sport than pigeon racing of this character, nor any more enthusiastic sportsmen than the breeders of the homing pigeons. Clubs devoted to raising and improving the carriers are scattered in every State in the Union, and their memberships are all large; but there are tens of thousands of individual breeders who do not belong to any association. Thousands of these breeders enter their home-raised pigeons in the races and sometimes win prizes which the professionals fail to capture.

The best carrier pigeons are worth several hundred dollars in the market, and some cannot be purchased at any price. During the annual pigeon show at Madison Square Garden last year, $200 and even $300 were refused by the owners for some of their choicest pets. The average exhibited were valued at $25 and $50. Prices, however, do not stand in the way of the pigeon fancier to-day, for excellent homing pigeons can be purchased for $5 and less. One can start a loft with half a dozen breeders, and within a few seasons have all the birds desired. The loft is a simple affair where only a few birds are raised. The breeding quarters are separated from the living quarters, and a place large enough for the birds to stretch their wings is provided. The wonderful instinct of the homers is made apparent at an early age; but it is something that is partly due to training and development. A carrier pigeon that has never been released from its loft until full grown cannot find its way back over a long route. The process of training is necessary when the pigeons take their first flight.

"Home," to the carrier pigeon, is where it was born. There is no other home, although they have been trained to adopt a second home in some instances. When born in the loft, it is an easy matter for the breeder to teach the pigeon to return to it. The process of training consists simply in releasing the bird when first able to fly a short distance from the loft. The pigeon will jump into the air, and after a few circles, fly straight to the loft. In the second flight the distance is increased, and so on until the bird's education is complete. This education must be conducted by the breeder with gentleness and due consideration for the bird's feeling. If the distance for the first flight is too great for the pigeon, it will get confused, and it is liable to prove less accurate in its future flights. Each progressive step must be made for the purpose of establishing the bird's sense of distance and direction, and not to see how far it can be removed from the loft without losing the way in returning. A lost homing-pigeon is never quite the same, even after being rescued and taken home. After the bird gains full maturity and its education has been completed by the process described, it seems capable of finding its way home from almost anywhere. Birds released in Jacksonville have flown a thousand miles north to their homes without being lost.

When released, a homing-pigeon does not fly continuously unless the distance is short enough to enable it to reach home without stopping for rest. If the distance can be covered in ten or twelve hours, the pigeons apparently take little rest, but fly almost continuously until they reach their loft. In the few 1,000-mile races conducted years ago on the Atlantic sea coast from Florida to New York and Philadelphia, a number of the birds were lost, while others stopped on the way several times to rest; but the choicest birds which finished the long course were apparently on the wing most of the time, stopping possibly a few hours on the way to get food and rest. These long flights are not encouraged to any great extent any more, for the birds are not only frequently lost, but they cannot always get proper food along the route to sustain their powers. The birds have been weakened, and the effect on their health proved permanent. The 500-mile race is the favorite for long-distance birds, and 200 and 300-mile courses for the younger birds that have not yet won their laurels.

Besides being bred as pets and desirable companions, the homing-pigeons are now being used for various services. It looks very much as if their services as war messengers would soon be dispensed with, for wireless telegraphy has made the pigeons superfluous, and the extensive pigeon lofts in the military and naval services of European nations will probably soon become useless.

In peaceful pursuits, however, the homing-pigeons have in recent years become of great service. Country physicians have in many instances adopted them as messengers. A physician raises a loft of carriers for the pleasure of it, and when he visits a patient four or five miles away, he carries with him a basket containing one of his birds. If dangerous symptoms arise in the night or the following day, the pigeon is released with a message. Some physicians with long country routes carry a half a dozen or more of these pigeons on their rounds, and leave one at each place. A daily report of the different cases can thus be obtained by pigeon service at no cost to physician or patient. This service has also been extended on the large Western farms. Some farmers receive daily reports of the markets from the city in this way. There are no telephone or telegraph wires to send the messages; but the pigeons answer the purpose satisfactorily. All that is required is a trip to the city once a fortnight to carry back the birds, and some one in the city to write the reports and release the birds.

ON THE WORKING OF COMBINED COHERERS.

In a paper recently read before the French Academy of Sciences, M. A. Turpain examines the behavior of a set of several coherers connected to the same antenna. The sensitiveness of a coherer is determined by means of the distance over which a radiator is just capable of acting distinctly on the coherer. The distinctness of this action is given by the value of the current, which, after cohesion has been established, will traverse a very sensitive galvanometer. If the coherer be inserted in a closed circuit, its sensitiveness is found to be much higher than when in open circuit; in fact, at the moment of the emission of waves, one electrode only of the coherer is connected to the antenna and to one pole of the cell, the current of which is intended to traverse it, while the other electrode of the coherer is insulated. This is started by connecting the insulated electrode of the coherer to the ground and to the second pole of the battery after the waves have been emitted. If several coherers be connected in shunt, one of the electrodes of each coherer being connected to the common antenna, while the other is or is not connected to the remainder of the circuit, the following facts are stated: 1. The coherers will preserve the same relative sensitiveness, both in open and in closed circuits. 2. In order to ascertain the sensitiveness of several associated coherers, an emission of waves such that one coherer only is acted on, should be produced, all the coherers being in closed circuit. The operative coherer is next put in open circuit by insulating one of its electrodes, when another emission of waves is caused to act on the coherer left in closed circuit. After putting this second coherer in open circuit, the same process is continued until all the coherers to be classified have been dealt with. Experiment goes to show that the sensitiveness of each coherer is the same when used both separately and in connection with neighboring coherers experimented on at the same time. As regards, in the second place, coherers connected in series, if all the coherers be decohered, the circuit (coherers-battery-galvanometer-coherers) will include as many breaks as coherers. In order to ascertain the sensitiveness of each of the coherers, waves are produced by establishing conductive bridges connecting the mercury vessels, the distribution of which may easily be imagined, when each of the coherers taken apart is connected to the circuit (battery-galvanometer), the degree of cohesion produced by the emission of waves being thus ascertained. The connection of an antenna with a coherer electrode will augment the sensitiveness of the latter. The point of contact between the antenna and a circuit, comprising several series-connected coherers, being varied, the sensitiveness of the coherer system is thus found to undergo material alterations. The results of this experimental investigation are applied first to constructing an apparatus for recording the course of thunder storms; and, second, to designing sensitive instruments which may be utilized both in wireless telegraphy and in Hertzian wave telegraphy with conductors.

FLEETS IN THE FAR EAST—AN ENGLISH REVIEW OF THE POSITION OF RUSSIA AND JAPAN.

BY ARCHIBALD S. HURD, OF LONDON, ENGLAND.

(*Concluded from page* 171.)

As the two powers are at present, Japan had the advantage at the opening of the war, and this has been greatly enhanced by her initial success. She possesses more ships, such as her six battleships and her eight armored cruisers, of first-class fighting power, while the value of one or two of the Russian battleships and armored cruisers is problematical. Moreover, the Japanese ships are well manned with officers and men of the highest intelligence and training, while Russia has hurried her ships out to the Far East inadequately manned, especially as to mechanical ratings, which are of supreme importance. This is the present situation.

What will be the position six or eight months hence? Unless the present war is to be an unbroken succession of disasters, which is scarcely probable, Russia should at least hold her own on land, until the arrival of the five powerful battleships which are nearing completion in the Baltic yards. Her programme of shipbuilding of 1898 included seven first-class battleships. At present only two of these ships have been completed and sent to the Pacific, the "Retvisan" and the "Czarevitch," together with several armored cruisers. The five other battleships are nearly ready for sea. It is officially announced that they will be finished this year (1904) and unless the early disasters have caused a change in the Russian plans, all these vessels are to be dispatched at the earliest moment to strengthen the Far Eastern squadron. According to the official programme the following reinforcements will be sent from the Baltic to Port Arthur to join Admiral Alexieff's command in the course of this year:

Five battleships—"Imperator Alexander III," "Borodino," "Orel," "Slava," and "Kniaz Souvarow."

Two cruisers of the second class—"Jemtchug" and "Izumrud," of 3,200 tons displacement and 22½ knots speed.

Eleven torpedo boats.

The five battleships are of a most powerful type, displacing 13,500 tons of water, well armored, and armed with the following weapons of the latest manufacture:

20 12-inch breechloaders.
60 6-inch quickfirers.
100 3-inch quickfirers.
100 3 pounders.
40 1 pounders.
20 torpedo tubes.

These fine ships are improvements upon the "Czarevitch," which was illustrated recently in the SCIENTIFIC AMERICAN. It must be confessed that these ships represent most substantial reinforcements. Stated in the fewest possible words, their arrival at Port Arthur will signify that if she can repair her damaged battleships Russia has won, on paper, at least, the game she has played so skillfully for the past eight years. The "Imperator Alexander III." will be completed this spring and the others during the year. It is officially announced that the three battleships and most of the cruisers injured at Port Arthur can be repaired; and the damages as detailed in Alexieff's report are not necessarily irreparable. If Port Arthur and Vladivostock can hold out and the fleets remain under their guns until the five battleships arrive Russia will have an overwhelming superiority in battleships.

But it may be asked what will be Japan's position six or eight months hence. As she is to-day, so she will be then. Her shipbuilding programme, undertaken at the close of the war with China, has been completed, and she has commenced the construction of no more armored ships. A project has been under discussion for two years, but financial difficulties have interposed to cause its postponement. Time can render this newest member of the concert of the powers no aid, and meantime Russia will be reaping the full advantage of the colossal naval expenditure on which she embarked in 1898.

Should the Russian reinforcements succeed in reaching Port Arthur, she would have at least eleven and possibly thirteen battleships, and five armored cruisers to oppose the six battleships and eight armored cruisers of Japan, and against such odds, unless the Russian personnel is hopelessly incapable, Japan could not fight with any hope of success. The Russian fleet will be far superior numerically at this date to the British Mediterranean squadron in armored ships, though not equal to it in fighting power.

Other powers do not maintain their navies for the express purpose of guarding their interests in the Far East, and it is unlikely that any of them will make any considerable additions to their squadrons in the Pacific in the next few months. Great Britain, it is true, has sent out an additional battleship, the "Centurion," but it is impossible that with the claims on her resources for the defense of the Mediterranean, the English Channel, and the North Sea, she can strengthen her squadron in the Far East much more. There is also little likelihood that either the United States, Germany, or France will materially weaken their position at vital points nearer home to add to the squadrons they now maintain in Chinese waters. It may be taken for granted that six or eight months hence the naval representation of the other great powers will be much the same as to-day. The strength of the several fleets is set out below in summary, the British and Russian reinforcements being included:

	Russia.	Great Britain.	Japan.	U. S.	Germany.	France.
Battleships	13*	5	6	3	..	1
Cruisers—						
Armored	5	2	8	2†	1	2
Protected....	11‡	8	16	4	6	5
Torpedo craft...	40	13	97	..	1	14

* Three of these battleships are temporarily disabled.
† These two ships are coast service monitors.
‡ This is exclusive of the four cruisers sunk; but includes four that are temporarily disabled.

These brief details indicate inadequately the relative strength of the squadrons, but they serve to bring into relief the strong position which Russia will hold should she be able to maintain her position until her fleet has been reinforced. In St. Petersburg it is realized that while in Europe Russia must continue to be at considerable disadvantage, she can dominate Chinese waters with little fear of any other power interfering with her designs. Whatever the outcome of the present war, the eventual result of Russia's action cannot be prevented by the Island Kingdom because it has not the requisite staying and financial power and natural resources which will enable it to continue indefinitely its opposition to Russian designs.

It may be of interest to append a complete list of the fleets of the great powers in the Far East.

GREAT BRITAIN.

Glory........	(Admiral Sir Gerard Noel)	Sister battleships of 12,950 tons.
Albion........	(Rear Admiral the Hon. A. G. Curzon-Howe)	
Ocean........		
Vengeance....		
Centurion......	Battleship, 10,500 tons.	
Cressy........	Armored cruiser, 12,000 tons.	
Leviathan......	Armored cruiser, 14,100 tons.	
Amphitrite.... / Argonaut.....	First class cruiser, 11,000 tons.	
Blenheim.......	First class cruiser, 9,000 tons.	
Eclipse....... / Talbot.......	Second class cruiser, 5,600 tons.	
Sirius..........	Second class cruiser, 3,600 tons.	
Thetis..........	Second class cruiser, 3,400 tons.	
Fearless........	Third class cruiser, 1,580 tons.	
Phœnix....... / Algerine...... / Esplegle......	Sloop, 1,050 tons.	
Rinaldo...... / Rosario....... / Vestal........ / Mutine.......	Sloop, 980 tons.	
Bramble...... / Britomart....	First class gunboat, 710 tons.	
Kinsha.........	River steamer, 331 tons.	
Moorhen...... / Teal.........	Second class gunboat, 180 tons.	
Robin........ / Snipe........	Second class gunboat, 85 tons.	
Sandpiper....	River gunboat, 85 tons.	
Woodcock..... / Woo dark.....	Second class gunboat, 150 tons.	

Six torpedo boat destroyers.

UNITED STATES.

Kentucky.......	(Rear-Admiral R. D. Evans, commander-in-chief), battleship, 11,540 tons.
Wisconsin......	(Rear-Admiral P. H. Cooper, commanding Northern Squadron), battleship, 11,565 tons.
Oregon.........	Battleship, 10,288 tons.
Monadnock.... / Monterey.....	Monitor, 4,005 tons.
Albany....... / New Orleans..	Second class cruiser, 3,769 tons.
Raleigh....... / Cincinnati....	Second class cruiser, 3,213 tons.
Isla de Cuba....	Gunboat, 1,125 tons.
Wilmington... / Helena.......	Gunboat, 1,397 tons.
Annapolis..... / Vicksburg....	Gunboat, 1,000 tons.
Don Juan of Austria......	Gunboat, 1,130 tons.
Villabos........	Gunboat, 347 tons.
Callao..........	Gunboat, 250 tons.
El Cano........	Gunboat, 600 tons.
Alhoy..........	Gunboat, 51 tons.
Samar.........	Gunboat, 210 tons.
Frolic..........	Converted yacht, 607 tons.
Rainbow........	(At Cavite, Rear Admiral Yates Stirling), distilling ship.

In addition there are two colliers, the Justin and Pompey; two tugs, the Piacalagua and Wompatuck, and the supply ships Zaffro and Nanshan.

FRANCE.

Redoubtable.....	Battleship, old, 8,767 tons.
Vauban.........	Armored cruiser, old, 6,150 tons.
Montcalm.......	(Vice-Admiral Marechal), armored cruiser, 9,516 tons.
Chateaurenault..	First class cruiser, 8,018 tons.
Bugeaud........	Second class cruiser, 3,722 tons.
Pascal.........	Second class cruiser, 3,985 tons.
Styx......... / Acheron......	Armored gunboat, 1,640 tons.
Surprise........	Gunboat, 627 tons.
Vigilant........	Gunboat, 123 tons.
Decidee.........	Gunboat, 646 tons.
Argus..........	Gunboat, 123 tons.
Comete.........	Gunboat, 473 tons.
Caronade.......	Gunboat, 140 tons.
Bengali.........	Dispatch vessel, 547 tons.
Alouette........	Dispatch vessel, 506 tons.

GERMANY.

Furst Bismarck..	(Rear-Admiral von Prittwitz), armored cruiser, 10,650 tons.
Hansa..........	(Rear-Admiral Graf Baudissin), second class cruiser, 6,100 tons.
Bertha.........	Second class cruiser, 6,100 tons.
Thetis.........	Third class cruiser, 2,645 tons.
Grier..........	Third class cruiser, 1,776 tons.
Bussard...... / Seeadler......	Third class cruiser, 1,580 tons.

ITALY.

Vettor Pisani...	Armored cruiser, 6,500 tons.
Elba...........	Second class cruiser, 2,730 tons.

SCIENCE NOTES.

A Russian naturalist has made a series of measurements, by a thermo-electric method, of the temperature of insects. A few of his results are noticed below. The temperature of the human body, it will be remembered, is essentially the same in the tropics and in the polar zones. Insects at rest have a temperature essentially the same as that of the surrounding air in ordinary conditions of heat and of humidity. Under usual conditions the temperature of an insect rises with that of the surrounding air, only more slowly. When the air is very moist the insect's temperature may rise more rapidly than that of the air. When the insect begins to move, its temperature rises and continues to rise until the motion ceases. This rise of temperature continues till at about 38 deg. C. (102.2 deg. F.) a heat paralysis sets in. The paralysis is only temporary; it ceases as the temperature falls once more. Below —0.5 deg. C. (31 deg. F.) insects are perfectly without motion. The temperature must, in general, be raised to 12 deg. C. (53.6 deg. F.) before the wings are moved. For one species—*Saturnia pyri*—the highest temperature compatible with life is 115 deg. F. This is about the temperature that is fatal to vegetable life.

For some time past prussic acid has been considered to be the most deadly poison extant. Mr. Lascelles Scott, of Little Ilford, England, however, has now discovered a far more deadly poison—the substance scientifically known as di-methylarsine cyanide, or more familiarly as cyanide of cacodyl. Three grains of this substance diffused in a room full of people would kill all present, so powerful is it. So deadly is this poison, that it is highly dangerous to handle it. It is a white powder melting at 33 deg. and boiling at 140 deg. When exposed to the air it emits a slight vapor, to inhale which is death. Mr. Lascelles Scott has experienced the deadly nature of this poison, for while he was assisting Sir B. W. Richardson in the compilation of his work "On the Causes of the Coagulation of the Blood," he tried its effect upon animals. One-millionth part of cyanide of cacodyl in the atmosphere of an air-tight cage killed a dog almost instantaneously, and then its power was by no means exhausted, for a second, third, and fourth dog placed in the same cage, instantaneously died from the effect of that single infinitesimal dose. Although so little of the properties of this poison are known, it was first made many years ago. Cadet, the famous French chemist, by combining acetate of potassium with white arsenic, produced a fuming liquid which, although he did not know it, was oxide of cacodyl. The German chemist Bunsen combined this with cyanogen, a radical of prussic acid, and made cyanide of cacodyl, the formula of which is $AsMe_2Cy$.