

Sir Hiram Maxim

Sir Hiram Maxim is of Puritan parentage, and was born in Sangerville, Me., February 5, 1840. He was educated at the common schools and at the age of 16 commenced to serve an apprenticeship as a carriage maker at Abbott, Me., working in the summer time and going to school in the winter, up to the age of 20. Here he made a tricycle with bicycle wheels of the present type. These are believed to have been the first wheels ever made in America in which the hub was suspended by spokes in tension.

During the civil war he was employed at the engineering works of his uncle at Fitchburg, Mass., where he worked first as a machinist, then as a brass finisher, and finally as a draughtsman. During the last year of the war he left Fitchburg and went to Boston, where he entered the employ of Oliver P. Drake as a draughtsman. Drake was a very clever philosophical instrument maker, and also a builder of automatic gas machines.

While at Boston, Maxim invented many different forms of gas machines. From Boston he went to New York, where he was employed as a draughtsman at the Novelty Iron Works at the foot of East Twelfth street. At that time this firm had in hand the building of the Pacific Mail steamers.

It had been said by those who pretended to know that there was no possible way of making a machine for carbureting air for illuminating purposes, which would produce a mixture of a uniform density, but Sir Hiram discovered no less than three separate systems of accomplishing this. In one system, the regulating device was operated by the expansion of the air during the carbureting step. If it was carbureted too much, the expansion produced a pressure that opened a valve and allowed air to pass directly from the air pump into the pipe leading to the burners. In another system, the regulating device was operated by the specific gravity of the gas. For this purpose a cylinder was suspended on a scale beam in the gas. If the gas was too rich, the cylinder was buoyed up and by this movement a valve was opened which shunted the air around the carburetor. A very large machine of this type was made at the Novelty Iron Works for the American club in Connecticut, of which Bill Tweed was a member. This was followed by another system in which the gasoline was first converted into a vapor by heat under a pressure of 35 pounds to the square inch. The vapor in escaping was made to force the necessary air into a gas holder.

This machine made gas of an absolutely uniform density and of any density required, and came into general use. One was placed in the New York post office, another in the Woman's Home, New York. All of A. T. Stewart's mills were equipped with such machines, and one with a capacity of 10,000 burners was installed at Saratoga Springs, where it lighted the Grand Union hotel, the St. James hotel, and the Windsor hotel.

Later on, Sir Hiram took up the subject of electricity, made many inventions, and took out many patents. He made all the apparatus and put up the first illuminated fountains at Saratoga Springs, N. Y. He was the true inventor of the system of flashing which made incandescent lighting possible, that is, he discovered a process of building up and standardizing the filaments of electric light by heating them electrically in a highly attenuated atmosphere of hydro-carbon gases. He discovered a new process of making phosphoric anhydride, reducing the cost from five dollars to fifty cents per pound. He made the first regulator for keeping the pressure constant in an electric lighting system quite independently of the number of lights on the circuit. This apparatus was exhibited in Paris in 1881, and Sir Hiram was made a Chevalier of the Legion of Honor.

In 1883 he left France and went to London and commenced work on an automatic gun. Up to that time no one had ever attempted to make an automatic gun. The first gun made was operated by the backward movement of the cartridge in the barrel at the instant of firing, a system which is largely used in automatic pistols at the present day. But this system would not work with the long bottle-neck military cartridge, so the next gun made worked by the recoil of the barrel and breech block, that is, when the gun was fired it was allowed to recoil one inch, and the energy thus developed performed all the functions of bringing the cartridges into position, transferring them from the belt into the barrel, firing them, extracting the empty cases, expelling them, cocking the hammer and bringing the new cartridge into position.

When it was announced in the newspapers that an American engineer having a little workshop in Hatton Garden, London, had made a machine gun that would actually load and fire itself, at the rate of 600 rounds in a minute, from energy derived from the burning powder, the public were incredulous; it was altogether too good to be true. But the little gun was very much in evidence and everyone came to see it, from the Prince of Wales down. Over 200,000 rounds of fully loaded military cartridges were used in showing the gun to visitors. This invention put Sir Hiram in the first rank of scientific men. It was thought that as he had solved such a difficult problem that he might solve others.

At that time the British government was about to pay a very large sum of money for the secret of the German slow burning brown powder. Many of the scientific men of Lon-

don had analyzed the German powder and found that it contained no new element; they could make an exact imitation of it, but the German powder produced low pressures and high velocities and the English imitation produced high pressures and low velocities. Everyone had attempted to find out the secret by chemical means, but Sir Hiram attacked it with his microscope, and found that the German powder was slow burning because the crystals of niter, although small, were many hundreds of times greater than in the English powder. The mystery was solved and the money saved.

Sir Hiram followed this up by making a hundred different kinds of powder in a single day, all of different degrees of slow burning. The sulphur and charcoal were put in the mill and thoroughly ground and incorporated; the niter was then added and specimens taken out as the process advanced. The first specimens were very slow and the last extremely violent.

This led to a great number of other experiments with powder.

At the beginning of 1885 many officials expressed their opinion that the Whitehead torpedo could not be relied upon in a heavy sea, and Sir Hiram was requested to design a very large gun for throwing aerial torpedoes through the air instead of propelling them through the water. On May 30, 1885, he patented the gun desired and proceeded to make one. The projectile was provided with a delayed action fuse working on the same plan as the best fuses of today. The experiments with this large gun led to the manufacture of the first cordite, and curiously enough this cordite had the exact diameter and appearance of the British cordite that was made some years later. Chemically, it differed but slightly from the ballistite of Nobel.

In the early spring of 1888 Sir Hiram was requested by some high British officials to turn his attention to the manufacture of a smokeless powder, and experiments were conducted through the summer which led to patents being taken November 8, 1888. This was followed by many other patents on various kinds of smokeless powder. (See Engineering, Jan. 27, 1911.) Among these patents is one for a mixture of nitro-glycerine, gun-cotton and oil. The application for a patent covering this was filed fourteen days ahead of another application for practically the same thing handed in by Prof. Abel and Prof. Dewar. In the end, however, it was found that the original cordite made by Sir Hiram in the apparatus patented in 1887 was a practical smokeless powder. It was a powder made by this process that was exhibited at Springfield, Mass., the first smokeless powder ever known in the United States.

When the French were boasting of a very remarkable explosive that they had discovered and which could be shot through armor plate without exploding from the shock, Sir Hiram set to work and very soon discovered that this much boasted explosive was a modified form of picric acid. He made it in England and it is practically the same as what is known as dunnite in the States at the present time.

When a gun was required for firing on torpedo boats Messrs. Armstrong made a gun that could be fired by four men about ten rounds in a minute. It was a very clumsy affair. Hotchkiss made a much better gun which four men were able to fire nearly twenty rounds in a minute, and this was followed up by Nordenföldt, who produced an extremely light and handy gun that four men succeeded in firing twenty-five rounds in a minute. All of these guns gave a very severe shock to the gunner, and an attempt was made to prevent them from recoiling at all. The next gun to make an appearance was Sir Hiram Maxim's. This gun was provided with a much improved system of mounting which did not give the gunner any shock at all and at the French trials, Sir Hiram, with no assistants, fired forty rounds in fifty seconds, making a record that has never been broken. The mounting of this gun was so much superior to all others that it has gone into use throughout the world on practically every form of gun. The novelty consists in placing the trunnions on a stationary sleeve and allowing the gun to recoil inside of the sleeve with a hydraulic buffer interposed between the buffer and the sleeve. All the apparatus for training the gun is attached to the sleeve instead of the barrel of the gun, thus completely eliminating the shock.

In 1889 Sir Hiram took up the subject of aerial navigation and after conducting a great number of experiments and considering the problem from every possible standpoint, it appeared to him that the best form of a flying machine would be what is known today as an aeroplane. The machine that he developed and made was practically the same as the best machines of today except that it was much larger and was driven by a steam engine instead of a petrol engine. It had the fore and after horizontal rudders the same as the Farman machine of today, and the two screw propellers rotating in opposite directions the same as the Wright machine. This machine was 17 feet wide from tip to tip, and with 600 pounds of water and three men on board, it weighed 8,000 pounds. The engine power was 360 horse-power. The screws were of wood, 17 feet 11 inches in diameter, and collectively gave a screw thrust of 2,200 pounds, which propelled the machine along a railway track at the rate of forty miles an hour, giving a lifting effect of over 10,000 pounds. But the machine was altogether too large to be easily

managed, and there was no room available in the neighborhood. It was, however, the first machine in the world that succeeded in lifting itself from the ground with a man on board.

At the last Paris Exhibition Sir Hiram was given the Personal Grand Prix in Artillery. He has also received high decorations from many governments. He was a director first in the Maxim Gun Company, then in the Maxim Nordenfeldt Company, and afterwards for twenty-seven years in Vickers Sons & Maxim, Ltd., from which he resigned at the age of seventy-one.—Hiram S. Maxim in the Scientific American.

WILL THE MANCHU SURVIVE?

Among those subjects concerning which the popular conception is erroneous must be included the Manchus. Manchuria, their original home, has been of late years so often on men's lips; the long and successful reign of the Empress Dowager Tzu Hsi, with its many and remarkable developments, has kept in view evidences of such masterful statecraft that the average man is wont to assume that the Ta Ching dynasty will continue, like other threatened empires, to survive somehow. To those who are conversant with the facts, however, it is known that the relatively few Manchus remaining in Manchuria are extremely rude and ignorant. Writing in the National Review (London), Mr. J. O. P. Bland says: "Today the purebred Manchu stock of Manchuria amounts to less than 10 per cent of the inhabitants, and preserves little or nothing of the attributes of a dominant race. The Manchu language has also died out . . . so that the race has neither literature nor enduring traditions capable of arousing it from its lethargic decay."

Tzu Hsi realized the rottenness of the Manchu state. She ruled China for half a century not because of any help from her ignorant and effete kinsmen, but by the sheer force of her own courage and intelligence, "instinctively solving the problems of government by a mastery policy of divide et impera, preserving its equilibrium by the shrewdest use of all available resources, and by the constant diversion of hostile elements." Toward the close of her day, the Empress Dowager realized that the future of China must depend upon the immediate adoption of a policy of radical reform. She realized that Manchu rule in its present form was surely doomed. She realized that if China was to be preserved as a sovereign state, it must be by means of Chinese energy and intelligence grafted on to the Manchu stock. In 1905 she sent out a high commission to study the institutions of civilized countries east and west, and to report on the adoption of such as they deemed desirable. She also appreciated the fact that, as compared with that of European powers, the military capacity of China was significant. She therefore set about putting the house in order, equipping its defences on Western lines. But education and administrative reform were in her opinion the surest foundation on which to build up a regenerated empire. She therefore brought to her aid the Chinese viceroys Yuan Shih-kai, the ablest and strongest man about her, and on his advice authorized a programme of constitutional government. But Tzu Hsi is dead, Yuan Shih-kai is living in forced retirement, and chaotic intrigue reigns.

The Empress Dowager's death has in fact completely changed the whole situation. The South has viewed with increasing resentment and alarm the evidence and results of Manchu inefficiency and disorganization. The proceedings of the National Assembly have revealed the hopeless rottenness of the metropolitan administration; and only the certain fear of Japanese intervention has prevented the anti-Manchu movement from reasserting itself with renewed force. According to Mr. Bland, some of the natives themselves are becoming aroused over these conditions: "For some time past it has been apparent that the elite of Chinese patriotism and political energy is profoundly disgusted with the middle-and-drift methods of their so-called rulers and with the notorious corruption and women-led factions of the court. . . . Two years ago, before the real object of Prince Ito's mission to Manchuria was suspected, before it had been realized that America's loudly trumpeted role in Manchuria was Knox et praeterea nihil, and that England had tacitly abandoned her part in the long-drawn farce of the 'open door,' there still appeared to be some hope of keeping the Chinese empire together, pending the necessary work of reform. That hope is now finally extinct. Manchuria, Mongolia, and the New Dominion are irretrievably doomed to that 'amalgamation' which overtook Korea, to division at the hands of the Russian and Japanese 'guarantors' of the status quo in those regions."

It is evident that as Manchuria ceases to be a part of China the Manchus also must abdicate as rulers of the dismembered empire. In the tea-houses of the capital, men today talk openly of an ancient prophecy to the effect that the Ta Ching dynasty will come to its end in the "Keng Shen" year (1920); and an extraordinary number of anti-Manchu books have lately appeared and been freely circulated, even in the North. Press and politicians, however, alike recognize the fact that it is to the interests of Russia and Japan to keep the Manchu government in its place; and the commercial powers of Europe naturally prefer the status quo, however rotten, to the tremendous possibilities of a Chinese revolution; and this knowledge imposes caution on Young China. It cannot be doubted, however, that the "hand-writing is on the wall" as regards the passing of the Manchu.

"I like to go to church."

"Why?"

"Well, it's comforting to see one man keep so many women quiet for an hour."

Rival Fleets in Solent

First and foremost among the impressions which appear to be common to all our foreign visitors is the immensity of the fleet collected in the Solent. All other impressions seem dwarfed in this. The formal review itself is merely an exercise with which all are familiar. To the active participants it means little save a good deal of standing about, a strong curiosity to see the King, and a particular hope that their own particular ship will shine a little better than its neighbors.

The next general or semi-general impression is one of less awe for us than formerly. It is somewhat difficult to touch on this subject without seeming to strike a jarring note. Time was when all foreign naval officers held their British counterparts in somewhat the same kind of esteem as the small boy in the third form has for his schoolfellow in the sixth. Today, if Germany and the United States are not in the sixth, they are near enough to it no longer to feel any particular inferiority.

This is most noticeable with the Americans years ago when the United States navy was of small account, and mainly remarkable for the absurd appearance of some of its ships, you could not be with an American naval officer very long before you heard something about how the American fleet could whip creation! "Yankee bluster" this was always put down as; but there are indications today that it was the American way when in the presence of British ships. Today the men from the biggest ship at the review no more think of talking about whipping creation or bragging in any way than they do of trying to use the Delaware as an aeroplane. They are quiet and self-contained, associating with British naval officers on terms of complete professional equality.

The Germans keep more to themselves. They have always the air of being somewhat surprised at not finding themselves objects of personal dislike and hostility. They are generally reserved, especially on Service topics. Back in the old days the Germans never had quite that respect for the British navy that other navies had; today, either in imagination or in fact, one seems to see a touch of sense of superiority. They are, of course, trained to believe that the "invincibility" of the British navy is a myth. They are far too polite to do or say anything to hint at this, but one feels that it is there. Certainly, of all the nations gathered, it is the Germans who have what a Frenchman described to me as "the air to be cockshure." Well, it is a useful feeling to have, provided the foundations for it are assured. In conclusion, they take the deepest interest in our ships, and are obviously proud that the Von der Tann makes an excellent showing against any of our Dreadnought cruisers.

The Austrians, considering their nationality, are wonderfully different from the Germans. It is difficult to put one's finger on the difference, but there it is. They are smart and well set up; they have the military air of Germans, in contrast to the peculiar nautical type of British, Americans, and French. It is, or was, a tradition of the British navy that Austrians are the jolliest and nicest of all foreign naval officers; they have not lost their popularity.

The Japanese we all know. They wander round, keenly interested in everything. Dreadnoughts and clockwork aeroplane models, forts and photographs, all are objects of delight to Japanese bluejackets. There are not the remotest signs of hostility between them and the Russians. Weird folk are these Russian sailors; they go about with broad smiles and none of the inquiring spirit so characteristic of their late enemies.

The Russians, as owners of the only ship present that has ever been in action (for both the Japanese ships are later than the war) are objects of peculiar interest. The ship shows no signs worth mentioning of what she has been through. Her officers are mainly typical of the happy-go-lucky souls who have no overwhelming love for the sea and do not pretend to it. They believe in making the best of life, and Tsushima has left no mark upon them.

The French are the ultra nautical looking folk. By no stretch of imagination could one take the average French officer for anything but what he is. Beside him even a British naval officer loses something of the sea air. It is a quaint thing, but a true one, that the French are generally more interested in the Victory than in the Neptune. This is not due to professional slackness. But in these days of photographs and naval annuals people get so familiar with modern ships that the actual seeing of them is more spectacular than anything else. As a spectacle the Victory means more to a Frenchman. The French were handsomely beaten at Trafalgar, but they have nothing to be ashamed of for their share in that. The glory of the Redoubtable is not dimmed by the fact that the French fleet was defeated, and there are plenty of Frenchmen who believe that the death of Nelson was a heavier blow to England than all she gained by the destruction of Villeneuve's ships. What Napoleon is to us, Nelson is to the French—the figure of central interest in past history. I should put the French as the "dark horse" of the review squadron of foreign ships. As "possible enemies" to any one they are either the least dangerous or the most. It just depends on circumstances. It is the navy of "possibilities," which may never

come off, but the material for something otherwise is there.

Something akin to the French are the Italians—another naval power unduly discounted in this country. On board an Italian ship they talk nineteen to the dozen, and the talk is of everything except "shop." You hear the buzz of conversation, and contrast it badly with the comparative silence of Northern wardrooms, and without further ado jump at conclusions with the Northern mind. But when you wander round the ship you find the latest British or American detail, improvement, idea installed as an everyday object, and you begin to think. How much of it is Charles de Grave Sells, the English engineer resident in Italy, and how much pure Italian, you cannot determine. You remember a little later that it was the Italian Cuniberti who invented Dreadnoughts, and Sells who, as it were, put them on the market. Ultimately you come away with the idea that Lord Charles Beresford saw further through the milestones than most men when he implied that our future depends upon the attitude of Italy.

The surprise packet of the review goes to China. Ten years ago on board a Chinese ship you met pigtail and a uniform on dressing-gown lines. Today you find a mighty, clean ship, European uniforms, perfect cleanliness, and perfect discipline. The ship is nowhere with the principal Japanese representative, but the personnel are in no way behind the premier Asiatic competitor. The fact is well worth noting.

Reviewing the whole in a general way, I give first place in what may be called "the field" to China, the second to Sweden, and the third to the South American Republics. These minor navies have been hopelessly underestimated in the past as regards personnel. Their ships, which are easily assessed, go for nothing—but I am here merely considering the human element. Whether or not fate be working for Armageddon on the water, no conscientious observer can avoid one main conclusion, and that is, that since "specimens" were sent to the last Coronation review, every navy has got nearer into our form, and that things are more and more reverting to the dictum of Sir Cloudesley Shovel, two hundred odd years ago, "Where ships and men are equal, 'tis, without a miracle, numbers that gain the victory," or Nelson's "Only numbers can annihilate." It may serve political purposes of the moment to claim for our own navy special qualifications which will be a set off against superior numbers. But "despising the enemy" has ever been a risky game, and never more risky than now. To the impartial observer nothing is plainer than the great advances made in efficiency by practically all the foreigners present.—Fred J. Lane in London Standard.

PLENTY OF DUCKS IN CHINA

Those traveling in foreign lands are apt to note with interest many peculiarities of the people of different nations, and of course are apt to notice the different kinds of fowls and animals found in different countries.

There are more ducks in China than in all the rest of the world. Their voices are a familiar sound in every town and country spot of the seacoast and the interior of the vast empire. Even in the large cities ducks abound. They dodge between the coolies' legs; they fit squawking out of the way of the horses. Their indignant quack will not unsend down the roar of urban commerce. Children herd ducks on every road, on every pond, on every farm, on every lake, on every river. There is no back yard without its duckhouse. There is no boat, little or great, without its duck quarters.

All over the land there are great duck-hatching establishments, many of them of a capacity huge enough to produce 50,000 young ducks every year.

Duck among the Chinese is a staple delicacy. It is salted and smoked like ham or beef. It is served as a delicacy prepared in many ways, and a number of travelers declare only the Chinese know how to cook and serve a nice fat duck.

In royal households and among the very wealthy the duck is served in a particular style in honor of any distinguished guest, and those fortunate enough to have eaten it say it is far beyond anything they get elsewhere in the way of prepared fowl.

Many ducks are exported from China, and it promises to be a growing industry.

REALISTIC

Tommy came home the other evening with his clothes full of holes.

"What have you been doing to yourself?" asked his mamma, quite alarmed.

"We were playing 'shop,'" replied Tommy, "and I was the cheese."

COULDN'T DO IT

"No use," growled Mr. Smith to his wife from the bathroom, "I can't do it."

"What is it dear?" his wife asked.

"Oh, the doctor told me to drink hot water an hour before dinner. Here I have been drinking about fifteen minutes and haven't got a quart down yet."