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NEW YORK, SATURDAY, AUGUST 11, 1900.

THE PROTECTION OF AMERICAN GAME.

In our last issue we mentioned the convention which was recently signed in London for the preservation of wild animals, birds, and fish in Africa. It is gratifying to note that America has not been backward in the movement, which may be called international, to protect animals of certain species from wanton destruction.

A careful inquiry recently made by the New York Zoological Society reveals the startling fact that throughout thirty States and Territories the decrease in the volume of bird life during the last fifteen years has reached an average of forty-six per cent. The decrease in the number of edible birds has even been greater than that, and a number of our finest species are now approaching practical extinction and many of our song birds are being killed for food.

The sportsman has long realized the need of protective measures, but the farmer has only recently learned to appreciate the full value of birds as insect destroyers. Cheap guns, lax laws, the mania for collecting and shooting, and more especially the enormous demands for the market and millinery trade, are responsible for this reduction in bird life. The protection of birds is a national not a local question; it deals largely with migratory species which breed in one section, winter in another, and traverse several States in passing to and from the breeding grounds. In the SUPPLEMENT of the current week will be found an abstract of a bulletin issued by the Biological Survey of the Department of Agriculture in which many significant facts are mentioned. There are 1,125 species and sub-species of birds inhabitating North America north of Mexico, and of these only about 200 or 18 per cent can be considered game birds. From this will be seen the importance of protecting birds other than game birds. As an instance of the lack of uniformity in the State laws take the common dove, for example; in twelve States it is protected at all times, in nineteen at certain times, while in the others it has no protection at all. Several protective associations have done excellent work.

The League of American Sportsmen was organized for the purpose of creating in every State and Territory a well organized standing army of game protectors, which shall secure the enactment of more stringent general laws, which shall see that lawlessness is punished, which shall discourage game slaughter, and protect the wild creatures that still remain.

At present the League has working divisions in twenty-four States, and in two provinces in Canada, the membership including the governors of several States, members of Congress, presidents of colleges, judges, etc. The League has been very prominent in securing the passage of the Lacey bill, which is considered to be the greatest victory ever achieved in the interest of game and song bird protection.

The States can now enforce their laws, and wherever they fail the Federal authorities will interpose, and where States do not take measures to prevent the smuggling of game out of their boundaries, the Interstate Commerce Commission, backed by the Lacey law, will come to the rescue. This will prevent the shipping of prairie chickens from Minnesota or other States to Chicago or New York labeled "poultry." There will be no more shipping of venison from Wisconsin or Minnesota to Chicago or New York labeled "veal" and "mutton"; there will be no more slaughter of seagulls on the New England coast or elsewhere in violation of the laws of the State, and shipping them to millinery dealers in New York, no matter how labeled. The League will have a force of detectives at work in all of the large cities watching for any violation of the Lacey law, which imposes a penalty of $200 for every infraction of said law.

The League of American Sportsmen does not wish to curb sport in any way. It believes in a reasonably filled gamebag, but considers that the killing of game and the taking of fish should be limited by law, not only as to seasons, but that the bag for one man for a day and for a season should be defined by law. The league has rendered efficient service in ascertaining the fact that seven of the hotels in New York, and several game dealers, had been selling game in closed season, and has secured from them written pledges to stop violating the game laws. It has also absolutely stopped the selling of game in New York at all times except in open season.

The people of the country are becoming satisfied that some organized measures must be taken to preserve the feathered tribes which inhabit our woods from the wicked and ignorant slaughter which bids fair to render some varieties of our birds extinct species.

HIGH SPEED IN WAR VESSELS—THE "VARIAG" AND THE "VIPER."

The details of the successful trial of the protected cruiser "Variag," which has been built at the Cramps' Yard, Philadelphia, Pa., for the Russian navy, show that this vessel is well able to live up to her contract requirements of 23 knots an hour. The contract specified that the speed trial should be an extraordinarily severe one. The vessel was to maintain a sea speed of 23 knots an hour for a run of twelve consecutive hours. During a preliminary builders' trial she is said to have logged for a time the remarkable speed of 24·6 knots an hour, covering ten miles at 24·2 knots. This, of course, will not be quoted as the official speed of the vessel, as trials by log are not regarded as fully reliable; but on the official trial, where the times are taken over a measured course, there is no possibility of error, and the fact that this vessel maintained for over seven hours a continuous speed of from 23·6 to 23·7 knots an hour, was considered by the Russian officials to be sufficient evidence that she could have maintained the same speed for the whole twelve hours, had it not been for an accident to one of the high pressure cylinders.

This splendid result is extremely gratifying both to the representatives of the Russian Navy and to the American builders of the ship. The William Cramp & Sons Ship and Engine Building Company had already achieved world-wide distinction in the construction of fast warships by the remarkably high speeds which were attained by the "Minneapolis" and "Columbia," vessels of somewhat the same character as the "Variag," and about 1,000 tons more displacement. The "Columbia" is credited with a speed of 22·8 knots an hour, and the "Minneapolis" with slightly over 23 knots. The "Variag," with her record of 23·7 knots, now takes the place of the "Minneapolis" as the fastest first-class cruiser in the world, although she is exceeded in speed by two second-class cruisers, which, strangely enough, are to be found in the Chinese Navy. The "Hai-Tien," a second-class cruiser of 4,300 tons displacement and 17,000 horse power, achieved a speed on her official trial of 24·1 knots an hour. A sister ship of the "Hai-Tien," the "Hai-Chi," made 24 knots on her official trial. These two vessels, however, are smaller than the "Variag" by 2,200 tons, and it is doubtful if in any but the finest weather they could hold their own with the American-built ship.

The "Variag" is one of the four protected cruisers which are being built for Russia in various foreign shipyards. Two of these, the "Bogatyr" and the "Boyarin," must be about completed at Stettin and Copenhagen, and a fourth, the "Askold," at the Germania Yards at Kiel. All four vessels are required to steam at 23 knots for twelve hours; and while the ships conform to a general pattern in respect of armament, coal endurance and speed, the builders have been given a free hand in matters of detail. When the quartette is completed, it will be interesting to compare the work of American builders with that of the European yards mentioned.

At the close of the trial the officers and naval experts commissioned by the Russian Government to superintend the trial of the "Variag" congratulated the builders on her performance and stated that they considered the cruiser to be one of the great triumphs of naval construction. An illustrated description of the "Variag" was given in the SCIENTIFIC AMERICAN for November 5, 1898; and the "Askold" is illustrated in the issue of June 30, 1900.

Further details at hand of the wonderful speed recently made by the torpedo boats "Cobra" and "Viper" show that the introduction of turbo-propulsion has opened up possibilities in speed, the limits of which it is difficult to predict. It is only five years since the torpedo boat destroyer "Sokol," built at Poplar, for the Russian Government, astonished the world by making a speed of 30 knots an hour; yet today 30-knot destroyers have ceased to excite interest; and the success of the "Viper" in covering a measured mile at the rate of 37·1 knots an hour is already leading us to regard 40 knots an hour as the next goal at which to aim.

The "Viper" is 210 feet long, 21 feet wide, and has a draught of 7 feet. On the recent trial she displaced 380 tons, or 10 tons more than the contract requirement. Six runs were made over the measured mile at the following speeds in knots: 36 6; 35·5; 37·1; 36 6; 37·1, 36·1, the mean speed being 36 58 knots per hour. The highest speed attained is equal to about 43 land miles per hour. The turbines indicated 12,000 horse power at 1,180 revolutions per minute, under a steam pressure of 200 pounds to the square inch.

The remarkable success of turbo-propulsion naturally invites speculation as to the possibilities of the future, not merely in torpedo boats but in the larger field of the cruiser and battleship. Then, again, there is the question of its application to the merchant marine, where the record for speed now stands at 23 knots an hour. There is no doubt that the turbine could be applied successfully to a 25,000-ton liner, and that speeds of 30 knots and over could be realized; but it would be at a cost for fuel that would be absolutely prohibitive. Indeed, Mr. Parsons, the inventor of the turbine, has stated that he could put turbines and boilers in a Transatlantic liner that would drive her across the ocean in three days, if the owners of the vessel would be willing to burn the 10,000 to 12,000 tons of coal that would be consumed in the furnaces.

Although the Parsons turbine, in proportion to its indicated horse power, is remarkably light and compact, it has a voracious appetite for steam; so much so, that Admiral Melville once said that what surprised him in the "Turbinia" was not so much the indicated horse power of the turbines as the enormous quantities of steam supplied by the boilers. So that, if we are anxious for a three-day crossing of the Atlantic, we must make up our minds to pay for an enormously expensive luxury; so costly, indeed, that the three-day boat, using coal as its fuel and steam in its motors, will probably never pass from the theoretical to the practical stage.

AMERICAN ENGINEERING COMPETITION.

In the current issue of the SUPPLEMENT will be found the fourth article of a series on the subject of American engineering competition, recently contributed to The London Times by a special correspondent of that journal, who made an extensive trip through the manufacturing States of this country with a view to furnishing himself, by personal observation, with the necessary data. The present article deals with the steel works of this country and the methods employed by our iron masters as contrasted with those which prevail in Great Britain. The article brings out some facts of special interest tending to show why it is that steel manufacturers in this country have been able to compete with such remarkable success against the older established industries of Europe. The enormous works of the Carnegie Steel Company are selected as typical of the best American practice, and from the figures given in the article to show the vast extent of the plant, we select the following:

There are three principal works, the Edgar Thomson, the Duquesne, and the Homestead Steel Works, which included, when they were visited by The Times correspondent, seventeen blast furnaces, whose aggregate annual capacity was 2,200,000 tons. The Edgar Thomson Works produced 650,000 tons of rails a year. The Duquesne Steel Works have an annual capacity of 650,000 tons of steel ingots, while that of the Homestead Works is 400,000 tons of Bessemer steel ingots and 1,400,000 tons of open-hearth steel ingots. There is also at the Edgar Thomson Works a foundry which turns out 50,000 tons of iron, steel, and brass castings per year. The Upper Union Steel Mills of this company annually produce structural steel, steel bars, and plates to the extent of 250,000 tons; while at the Lower Union Steel Mills 150,000 tons of plates, car forgings, bridge work, angle iron, etc., are turned out annually. Another property is the Howard Axle Works, with a capacity of 100,000 tons per year. The company also possesses most extensive coke works, and a natural gas field of 206 square miles. They have built their own line of railway from Lake Erie to Pittsburg, at the Lake Erie end of which is a well-equipped dock and ore handling establishment; and they operate also their own line of steamers. These transportation facilities serve to bring 5,500 000 tons of ironstone from the company's own Lake Superior mines to the great system of forges and mills above mentioned near Pittsburg. As to the capital invested and turned over in these vast operations it is sufficient to say that, in a recent threatened litigation, it transpired that the profits of the company in 1898 were estimated at $21,000,000, and in 1899 at the enormous figure of $40,000,000.

It seems that the American blast furnace is not, as a rule, any larger than those used in Great Britain, and, of course, the process of reducing the ore is, broadly speaking, the same. But there is one respect in which the practice of the blast furnace managers is radically different; and this is, that in the United States it is customary to force the production much more than it is elsewhere. The larger output per furnace in America is, of course, due, in some measure, to the superior quality of the ore, but the extremely high yield is to be mainly credited to the American practice of driving the furnaces, as they expressively put it, "for all they are worth."

The deciding factor in the economics of blast furnace operation is the wear and tear of the interior lining of the furnace, which, as soon as it has been burnt away to a definite minimum thickness, has to be renewed. The work of lighting one of these huge furnaces is so costly that they are run continuously, night and day, from the time they are started until the interior lining is worn out, and the furnace has to be "blown down" to receive a new lining. Since the stopping of a furnace and the building up of the inner lining are extremely costly, it becomes a question whether the best economical results are obtained by driving the furnace at a moderate speed, and thereby prolonging its life, or driving at extremely high pressure, with a view to securing a very large annual output, and making repairs at correspondingly frequent intervals. British practice favors the first method, American the second; our ironmasters believing that since "a lining is good for so much pig, the sooner it makes it the better." The difference in practice is shown by the fact that whereas the largest Middlesbrough furnaces, with a capacity of 36,000 cubic feet each, produce only 950 tons of pig iron per week per furnace, the Duquesne furnaces, with a capacity of 25,000 cubic feet, have produced 4,200 tons per week. Of course, the life of the American furnaces, working under this terrific pressure, is very much shortened, lasting on an average only four years, as against one case where the lining of a British furnace lasted eighteen years.

Another broad distinction between British and American furnaces is sententiously expressed by The Times correspondent, when he says "nothing seemed to me more notable at the Duquesne Works than their loneliness." He further says: "Had it not been for the subdued hum, characteristic of a furnace in blast, one might have thought that the works were shut down,"—so completely had mechanical appliances taken the place of hand labor. In the production of steel ingots, rails, plates, etc., from the mine to the mill, the American instinct for labor-saving has been followed even to detail. From the iron mine in Minnesota to the shipment of the finished product on the cars at Pittsburg, the American ironmaster does not expect any hand labor to appear in the whole process of manufacture, the single exception being the filling of the buckets which take the ore out of the ship on the lakes, for which spadework is employed.

Of course, as has been suggested above, one great advantage enjoyed by American steel manufacturers is the extraordinary richness and accessibility of the iron ore in the Lake Superior region, immense masses of which lie on the slopes of the hills, covered only by a thin layer of surface soil. A railway track, quickly laid over the surface of the ground, brings into operation a steam shovel which, digging up the ore at the rate of five tons to the shovelful, at five strokes will fill a 25-ton ore car, and will load a train of cars at the rate of 600 tons an hour. The significance of such work as this, in connection with mines so extensive and rich, will be more fully appreciated when we remember that in the Mesaba range alone there are in sight 400,000,000 tons of iron ore.

PETROLEUM FUEL FOR WARSHIPS.

BY ALTON D. ADAMS.

The speed and steaming radius of fighting ships is of the highest importance. Unfortunately, however, the requirements for high speed and for a long steaming radius are conflicting, both as to equipment and operation. The higher the speed to be maintained the greater must be the weight of driving machinery in a given case. The greater the actual rate of speed for a ship, the shorter its steaming radius. Both of these conditions result from the fact that the power required to force any vessel through the water varies approximately as the cube of its speed. A very large part of the tonnage or carrying capacity of a modern warship is taken up by its driving machinery and fuel, so that the constant effort of designers is to lighten the engines and boilers and extend the coal spaces. In so far as the fuel capacity of fighting vessels can be increased, the steaming radius can be lengthened, or the speed over a given distance raised. As far as can now be seen, the capacity for coal in war vessels has been pushed to nearly its utmost limit, unless some important modifications are made in the structure of their hulls or in the weights of the contained machinery. The tendency seems to be toward heavier instead of lighter armor in the most important classes of battleships, and while some gains are being made in the weights of engines and boilers, the net result in this latter direction can hardly be very important. At present the great naval powers of the world are nearly abreast of each other in the adoption of improvements as to the construction and equipment of ships of war. The foregoing makes it quite evident, however, that any great power, applying means to largely increase the fuel capacity of its ships, without impairing their efficiency in other respects, would gain a decided advantage.

Especially would this be true if the means by which the large increase of fuel capacity is attained, is not generally available for the other powers. The ships having longer radii of operation, because of fuel capacities, beyond others of their class, would have still another advantage if the increase extended to the possible speed with given equipment. Important as are the advantages just pointed out, they are to-day within the grasp of two of the greatest powers, Russia and the United States. Petroleum is the fuel whose substitution for coal on warships will largely increase their steaming radii and to a smaller extent their speeds. As by far the most important deposits of this substance, thus far developed, are in the United States and Russia, the advantage of these countries in its use is plain. The ability of petroleum to largely increase the fuel capacity of fighting ships, without changing their present dimensions or machinery equipments, lies in its greater heating power over coal per unit of weight and volume. Steam coal of the best grades develops approximately 14,000 heat-units per pound, on perfect combustion. The high grades of petroleum yield 21,000 units of heat per pound, when fully burned. With these two fuels in actual use under steam boilers, the results in the evaporation of water are more favorable to the petroleum than the figures just named indicate, because it is practicable to get more nearly perfect combustion of the oil than of the coal. In present ships, therefore, devoting the same tonnage to petroleum that is now devoted to coal, the fuel capacity with the former is more than 50 per cent greater than with the latter. This increase of fuel capacity gives the ships with oil fuel one and one-half times the steaming radius at any speed, the ability to attain a greater maximum speed and to continue it for a longer period.

Not only is the heating power of petroleum 50 per cent greater than that of coal for the same weight, but the same relation holds good for equal bulk. The weight of petroleum is very nearly 54 pounds per cubic foot, and this figure is also a fair average for a cubic foot of steam coal. Fighting ships may, therefore, increase their fuel capacities by one-half the present values with coal, without adding to either the present tonnage or bulk, by using oil. In the matters of rapid steam raising, long continued operation at maximum capacity, the removal of refuse from the furnace, and the labor of firing, the oil fuel is at a great advantage. Petroleum is fed to the furnace through pipes under pressure, and the heat of the fire is changed at once by regulating the flow of oil and supply of air. Much less than one per cent of the weight of petroleum remains as ash after combustion, while the ratio of ash in coal is 5 to 10 per cent. With oil the labor of firing is to a very large extent avoided, not more than one-fourth of the number of men required for coal are necessary, and their duties are much less exacting. This last point is seen to be of no small importance, when the great strain on the stoking force of war vessels on long and fast runs are considered. Petroleum fuel implies no material change in the steam power equipments now in general use on ships. The oil can be burned under any kind of boiler and its use may even alternate with that of coal. To apply the petroleum it is only necessary to introduce a pipe carrying it, and another pipe with compressed air or steam, into the furnace, and arrange suitable nozzles to insure a mixture of the oil in a finely divided state with the air or steam. Thus far the fuel properties of crude petroleum, as it comes from the earth, have been pointed out, but the heavy oil called refuse, that remains after the more volatile parts are extracted by distillation, has practically the same heating power per unit of bulk. This petroleum refuse constitutes 10 to 15 per cent by weight of the crude oil and is extensively used as fuel by ships on the Black and Caspian Seas and on locomotives in Southern Russia. The great Caspian oil fields and their refineries account for cheap petroleum refuse at the ports of the seas named.

Great as are the advantages to be derived from petroleum fuel on warships with steam power plants, still more favorable results seem possible if internal combustion motors are adopted. Steam boilers and their contained water form a large item in the weight of warship equipments, and the space and tonnage they require would be of the highest value for the storage of fuel. Oil engines require no boilers and consume less fuel than the best steam power equipments per unit of effective work. A fair approximate figure for the weight of ship boiler plants and their contained water is 150 pounds per horse power capacity, where the best class of steam engines is used. In the petroleum engine ·75 pound of oil will develop a brake horse power hour, so that if the boilers are replaced by an equal weight of fuel oil the radius of action for the ship is increased to correspond with 200 hours of operation for its engines at full capacity. It must be said, however, that the development of very large oil engines, such as would be required to drive warships, is in the experimental stage, and the hopes now held for them may not be realized. Concerning the advantages of petroleum fuel for steam boilers there remains, however, no doubt whatever. It may be mentioned here that the so-called petroleum engines do not use the crude oil, but usually those products of distillation that are obtained at temperatures of 340° to 476°F. This part of petroleum, known as the illuminating oils, constitute about one-half of its total weight. The amount of coal consumed by navies is known to be very large, and it may be questioned whether the supply of petroleum is sufficient to permit its use for fuel under their boilers.

During the year 1898 there was produced in the United States petroleum to the amount of 8,500,000 tons. Allowing a large warship to consume 7,000 tons of coal per year on an average, the 8,500,000 tons of petroleum, with a heating power equal to 12,800,000 tons of coal, would supply 1,800 such ships. As it would be impracticable to devote the entire output of petroleum to naval purposes, the number of war vessels that could be supplied from present production in the United States would be a mere fraction of that just named. Unless the rate of petroleum production is very largely increased, it is quite evident that this desirable fuel cannot be generally and constantly used by the navies of the world. The great advantages to fighting ships of petroleum, in times of war, seems to indicate that naval powers will come to regard large natural deposits of this fuel with jealousy, and accumulate great stores of it at their coaling stations. Since petroleum may be used alternately with coal under the same boilers, it may well be that coal will continue to be the principal fuel for navies during times of peace, while petroleum is held in reserve for actual war. The commercial demands for petroleum are already tending to develop new fields of production, and its recognition as the most effective fuel for warships is sure to hasten this process. Petroleum is now produced on a very large scale in only the United States and Russia, and the export trade is carried on almost exclusively from these countries.

Deposits of petroleum in greater or less amounts seem to be almost as generally distributed as are those of coal. Most of the countries of Continental Europe produce small quantities of petroleum for home consumption, and in Germany and Austria the supply is quite large. The oil from Scotch shales is sufficient for only a small part of the demand in Great Britain, where the annual import of the distilled products of petroleum is nearly 200,000,000 gallons. China and India have long produced some petroleum and are believed to have large deposits. Several islands of the Far East, as Japan, Borneo, and Java, are said to promise future supplies of petroleum. In the Western Hemisphere vast quantities of petroleum are believed to exist in Canada, Mexico and several of the countries of South America. When these undeveloped fields are in operation, the supply of oil may be as plentiful as that of coal, but this seems improbable. Meantime petroleum fuel is being applied in some recent war vessels of Russia and the United States, with a decided increase of speed over that attained with coal. So long ago as the time of Admiral Selwin, petroleum was shown by the British Navy to be a superior fuel. But it yet remains for Great Britain to take any definite steps for its general use. Merchant ships do not find the advantages of petroleum so important as do vessels of war, because steaming radius or rate of speed in the latter may determine the result of a battle or the fate of a nation For the same cost of equivalent heating power, crude petroleum at 4 cents per gallon equals steam coal at $7.32 per ton. Petroleum must, therefore, be materially reduced in price before it becomes the general fuel for merchant ships.

OPERATION ON THE XIPHOPAGES.

We have already mentioned the fact that the xiphopage twins whose portraits were published in the SCIENTIFIC AMERICAN for February 24, 1900, have been separated by a surgical operation. We give a full account of this operation in the SUPPLEMENT for the current week. One of the most distinguished physicians in Brazil, Dr. Prevost, separated the eight-year-old twins, Rosalina and Maria, but we regret to say that one of the twins, Maria, died from the effects of the operation. The operation was performed on May 30 in the operating room of the St. Sebastian Hospital.

Before the operation, while under the inspection of the surgeon, Rosalina had an attack of grippe which lasted eight days, while Maria remained well. This confirmed the surgeon's opinion that there was no psychological condition which forbade their separation. The children were chloroformed separately and the operation, which is fully described in the SUPPLEMENT, was performed. It required two hours, and when they came out from under the influence of the anæsthetic, each asked where the other was and when they realized that they were separated and still alive they exclaimed, "Oh, Doctor, how good you are." On the seventh day Maria died and the post-mortem examination showed that death was caused by inflammation of the pleura. Rosalina continues to improve.

THE Roentgen Society of the United States will meet in New York City, December 13 and 14, 1900, at the Academy of Medicine. Addresses have been promised by eminent men at home and abroad, and a successful meeting is assured. Visiting members may obtain information in X-ray work. It is especially desired that all those who are using the X-ray in any way, either professionally or experimentally, send their names and addresses to the chairman of the Committee of Arrangements, Dr. S. H. Monell, 45 East Forty-second Street, New York city. The Society is the only one of its kind in America and is for scientific purposes only.