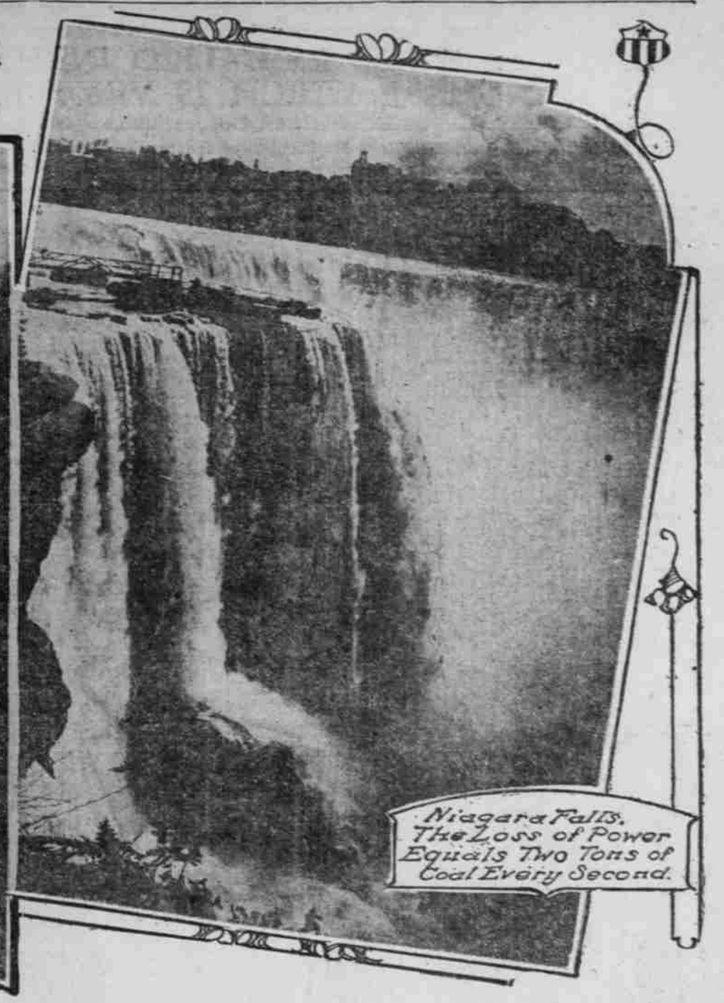
MOBILIZING WATER POWER

How Rivers and Streams Are To Be Harnessed to Uncle Sam's Chariot in Winning the War.

by Frank G. Carpenter.

The Falls of the Iguazu, the Niagara of South America. They Are 58 Ft. Higher Than Niagara

The Water Falls of the Zambesi, the Niagara of Africa. They Are a Mile Wide and 400 Ft. Deep, at High Water Have Five Times the Force of Niagara.



Niagara Falls. The Loss of Power Equals Two Tons of Coal Every Second.

WASHINGTON, D. C., 1918.—The water powers of the United States are to be mobilized as a war asset. They are to be harnessed and used for the saving of coal. They are to be employed to take the nitrogen from the air in order that it may be used for explosives and fertilizers, and also to run the factories which are making the thousand and one things needed in this time of war. This subject is now before Congress, and laws for damming the rivers and leasing the power sites will probably have been enacted by the time this letter is published. The great streams on our public lands are to be thrown open to private capital and an enormous increase of national energy will be the result.

Few people realize how large a place our water powers are likely to have in the life of the nation. They are among the greatest of our undeveloped resources and upon them our position as a world power may depend. According to estimates made by George Otis Smith, director of the Geological Survey, we have, outside Alaska, more than 55,000,000 horsepower easily available, and Uncle Sam's expert hydrographer, M. O. Leighton, has figured that 230,000,000 hydroelectric power could be brought into use. The latter amount is more than five times as much as the available water powers of all Europe, and more than thirty times the possibilities of Germany and Austria-Hungary. According to Dr. Smith, we have more than 8,000,000 hydroelectric horsepower already developed, which is considerably more than nine times the developed horsepower of Germany and Austria-Hungary. Moreover, Canada has enormous water power, and she is our big partner in the use of Niagara Falls and in the force that comes from the dropping of the waters of Lake Superior into Lake Huron through the Sault Ste. Marie canals. She is known to have something like 18,000,000 horsepower which can easily be developed, and she is already producing more hydroelectric energy than our allies in Europe.

The water powers of the world have not been accurately measured; but we know that the North American continent has several times as much as all Europe, and that the potential energy from harnessing the waters of the United States and Canada will make them the chief industrial centers of the world for all time to come. There are vast water powers in the streams that flow down the east side of the Mexican mountains, and the same is true of some of the countries in Central America.

South America has a few scattering water powers along the west coast. That region for more than 2000 miles is a desert, but the melting snows of the Andes now run the street cars of Peru and there are large electric plants in Chile. The eastern side of the continent is susceptible of enormous hydroelectric development. The falls of the Iguazu, the Niagara of South America, on the eastern borders of Paraguay, have a drop of 58 feet more than Niagara and they pour over the arc of a circle which at high water is about two miles in width. It is estimated that they can easily develop something like 4,000,000 hydroelectric horsepower. There are great waterfalls in Eastern Brazil, which run the streetcars and the electric lights of Sao Paula and Rio de Janeiro; and there are vast water powers along the Madeira and other tributaries of the Amazon.

Africa has some mighty waterfalls. The Niagara of the Zambesi River is a mile wide and 400 feet deep, and it has been estimated that it could produce 35,000,000 horsepower, or six or seven times the amount of Niagara. This may be so at flood times, but it is not so during the greater part of the year. Nevertheless, the power is enormous, and they are now planning to send it from there to the gold fields of Johannesburg. There are water powers on the Kongo enough to run an industrial empire, and where the Nile flows out of Victoria Nyanza are the Ripon Falls, which will some day be making the cotton cloth for the savages of that part of the world.

Asia also has great water powers, but the chief devolpment so far has been in Japan and India, the former country using its waters for its silk mills and factories and to light some of its largest cities. Europe has altogether about 41,000,000 of available horsepower, the chief developments being in the countries at war and in Switzerland and Norway and Sweden. Norway has more than one-sixth of all the water power available in Europe, and more than one-fifth of the horsepower so far developed is to be found in that country.

But let me give you some idea of what power means in the saving of coal. It is estimated that it takes 10 tons of coal to produce enough steam to equal one hydro-electric horsepower running throughout the year. If this is correct, every horsepower going to waste in our flowing waters is equal to the wasting of 10 tons of coal. The total amount lost is so great that it equal several times the amount of coal that we are now using. It is so great that it would light and heat every house in the United States, run all our railroads, move all our factories and leave a vast surplus for the demands of the future. The waste horsepower that is continually dropping over Niagara Falls is estimated to be 6,000,000. It is equal to more than 60,000,000 tons of coal, or to the burning up of almost two tons of coal every second, year in and year out. Take out your watch and look at the second hand as it flies around the dial. Every movement of that hand has a meaning of its own. It means two tons of coal wasted and gone forever. Every ten seconds means enough coal lost to warm the average household throughout the Winter, and every minute is equal to 120 tons of coal lighted at the mine to go up in smoke. That is what we are paying for our honeymoon trips to Niagara.

As it is now, something like 230,000 cubic feet of water drops down over Niagara every second. The amount was 56,000 cubic feet more before Canada and the United States began to harness the falls, and this amount has served to produce more than 500,000 horsepower. The greater part of this goes to Canada. That country has the right to 36,000 cubic feet per second, whereas we have the right to only 20,000 cubic feet. The difference comes from the water we are taking from the Great Lakes through the drainage canal of Chicago, which has to be compensated to Canada, as we are equal partners in these great waterways.

I have already written of what Niagara is doing for us in this time of war. She is making nitrates for explosives. She is furnishing the electric heat which produces the grinding materials for our fine machines used to make munitions and liberty motors. She is making aluminum for airplanes, and silicon for dirigible balloons, as well as chemicals for explosives and for hospital supplies. The factories there run night and day, but they are short now of something like 1,000,000 horsepower, and the full force of the falls could be profitably used in factories devoted to the needs of war. So far Congress has not given us the right to use water even to the full amount fixed by the treaties and the factories are held back while the power goes to waste. About three-fourths of all the Niagara power now consumed is used near the falls. A great deal of it goes to Buffalo and some is carried to Lockport, on the Erie Canal.

Next to Niagara, the greatest potential power plant of the United States is that at Muscle Shoals, Alabama. It is there that we are putting up the enormous hydro-electric plants to extract nitrates from the air for the use of munitions. The Government is erecting a dam there which will cost many millions, and the possibilities of the falling water will be upward of a half million horsepower. It is said they are now making nitrogen there by the Haber process, which can be done with low waterpower; but the big dam to be installed will enable them to use also the Cyanamid process, like that of the nitrate plant on the Canadian side of Niagara Falls.

The Cyanamid process is the one chiefly used in Norway, and the one from which much of the nitrates for the German explosives now come. The dam site was given to the United States Government without cost by the Alabama Power Company, which, according to its contract, should be furnishing 35,000 hydro-electric horsepower to the nitrate plant this Summer. One of the dams being erected is to be a mile wide and 105 feet in height, and more than 1,000,000 cubic yards of concrete will be used in its construction.

It is being put up under the supervision of the engineers of the War Department. The original appropriation for these Muscle Shoals projects was $20,000,000, but it is now stated that $150,000,000 may be expended on the plants now proposed. In all four nitrate plants and dams are to be built. Muscle Shoals expects to have a population of 50,000 within the next five years.

It is interesting to know where the great water powers of the United States are. The South has its full share. Something like 1,000,000 horsepower has already been developed, and it is estimated that there is sufficient fall in the rivers and streams yet to be developed to make a total of over 9,000,000 horsepower. As it is now, there are something like 14,000 water powers already in use. There are 1400 in Alabama, more than 1500 in Georgia, 2600 in North Carolina and almost 2000 in Tennessee. There are more than 2000 in Virginia and West Virginia, and South Carolina, Kentucky, Mississippi, Missouri and Maryland have each hundreds of good-sized plants. The Tennessee River alone has an estimated horsepower of from one to two millions, and the Pedee, Santee and Savannah rivers each have hundreds of thousands. South of the Mason and Dixon line there are a number of streams whose names are hardly known in the North which can develop 100,000 horsepower and upward, and the whole of the Southern Appalachian range has a water foundation for large manufacturing industries.

The water powers of New England are not half developed. Some years ago a consulting engineer of the General Electric Company made the statement that more water power goes to waste annually in Massachusetts, alone, than could be developed by the Falls of Niagara, and this is so notwithstanding the census shows that New England ranks very high in its water power development. By the last census there were little more than 31,000 water powers in the United States, and only 600 which had a capacity of 1000 or more. Of these, the six New England states had 5700, and from these was generated almost one-fifth of our total hydroelectric power. At that time New York headed the states in its water power development, due largely to the big plants at Niagara Falls. California came second with a total of almost a half million horsepower flowing over more than 1000 wheels, and Maine was third, with 343,000 horsepower over about 3000 wheels. After Maine came Massachusetts, and then New Hampshire, Connecticut and Vermont.

Today Maine is said to have waterfalls that will yield something like 6,000,000 horsepower, or almost as much as the Falls of Niagara. The amount developed is less than 400,000. Much of this comes from the many high lakes not far from tidewater, the streams from them to the sea having numerous falls. The state has something like 1600 lakes, and these feed the Androscoggin, Kennebec, Penobscot and other rivers which tumble through many falls down to the sea, feeding power plants here and there along their banks.

As to the other New England states, the Merrimac and Connecticut Rivers are perhaps the most important. The Merrimac is said to turn more spindles than any other river on the face of the globe. It drains a total area of a little less than 5000 square miles, and its average fall is less than two and one-half feet to the mile, but the greater part of the drop occurs at short distances apart, and at these places are some of the biggest factories and mills of the country, lying chiefly in the short distance between Manchester, New Hampshire and Lowell and Lawrence, Mass.

There is a great deal of undeveloped horsepower along the Mississippi River and its tributaries. According to Professor Leighton, the minimum available from these sources is more than 6,500,000 horse power, while the maximum is almost double that amount. The minimum is just about equal to the power lost at Niagara.

The great developed water power of the Mississippi River is that of the big dam at Keokuk, Iowa. The electric plant there has cost something like $25,000,000, and it has a potentiality of 310,000 horsepower. It is now delivering upward of 60,000 horsepower to St. Louis, so that the streetcars of that city are run by the falling waters of the Mississippi, 100 miles away. Moreover, the machinery is so delicately managed, the flowing water being automatically admitted only as is needed, that it is said when the streetcars stop in St. Louis the change in the power used can be felt at Keokuk.

I have been in the penstocks of the great turbine plants at Niagara; and I have seen also the vast turbine room of this plant at Keokuk. The sights are among the wonders of the world. The turbines have the most delicate machinery, which work with the accuracy of a Swiss watch. At Keokuk I saw machines weighing more than 500,000 pounds resting on a single bearing, and above them were generators, each of which creates enough electricity to light an automobile road around the world. Altogether they could illuminate a milky way from the earth to the moon.

In Minnesota reservoirs have been constructed by the Government with reference to the navigation of the Mississippi. These reservoirs have a capacity of almost one hundred billion feet. They have increased the power of the flour mills at the falls of St. Anthony, and have improved the power plants along the Mississippi to the amount of many hundreds of thousands of dollars per annum. Reservoirs have been built for the same purpose at the headwaters of the Wisconsin River; and an enormous increase of water power could be made by carrying out the reservoir plans advocated by the late Senator Newlands.

The greatest water powers of the United States are those of our Western highlands and of the Pacific Coast States. They are several times as great in their aggregate available horsepower as those of all the rest of the country. According to J. N. Teal, chairman of the Oregon conservation committee, the Deschutes River is capable of developing a million horsepower, or about twice as much as Canada and the United States are now getting from Niagara. The chief water power sites of this stream are within 100 miles of Portland, and power could be taken there as easily as it is from Keokuk to St. Louis. The Deschutes has a drainage area about as large as the states of Massachusetts and Rhode Island combined.

Washington has a number of great water powers, including those which supply Seattle. The power of Seattle comes from hydro-electric plants in the Cascade Mountains, and that of Spokane comes from the River Spokane. Spokane Falls are right in the city and the power goes by short transmission lines to the cars and electric light plants. The Spokane River, in addition to the 30,000 horsepower which it can generate in the heart of the city, has several million available horsepower above and below Spokane. It flows for a distance of 90 miles through a gorge, where it has a fall of 1200 feet, or more than twice the height of the Washington Monument. The volume of the fall is such the potential power is said to equal that of Niagara, and the gorge is of such nature that turbines could be put in at short intervals along the whole 90 miles of its course, and each set of turbines would have a fall of about 40 feet.

On four rivers in Northern California there is available 800,000 horsepower, and San Francisco gets power from electric plants in the Sierra Nevada Mountains. Los Angeles has great power plants worked by water which is brought from high up in the mountains through steel and concrete pipes and conduits a distance of 250 miles, and the fall is such that the most of it occurs within 50 miles of the city. It has potentially 120,000 horsepower of electric energy.

There are enormous water power possibilities in Alaska. For 1000 miles north of Seattle the Coast is lined with steep mountains which have a heavy rainfall and many of the islands have high waterfalls.

The Alaska Gastineau Gold Mining Company, which has some of the largest quartz crushing mills of the world, has established a power plant at Salmon Creek, about eight miles away. The plant can develop 12,000 horsepower, and it is run so cheaply that the cost of mining and milling the ore as far as the machinery is concerned is less than 5 cents a ton. The port of Ketchikan, the first one at which the Seattle steamers call in Alaska, is lighted by falls just back of the city, and there is enough power undeveloped in Southeastern Alaska to grind its forests of pulpwood into material for print paper. There are many good water-power sites upon Prince William Sound, and the same is true of the Kenai Peninsula and of other parts of the territory.

Indeed, we have all over our country an enormous amount of white coal, as hydro-electric water-power is sometimes called, and if it could be used it would save hundreds of millions of dollars and the labor of hundreds of thousands of men now employed in the coal mines of the country. According to Hugh Cooper, the engineer who built the Keokuk dam, the loss is enormous. Estimating it at 40,000,000 horsepower, it represents a loss of about 300,000,000 tons of coal per annum. This at $2 per ton, the lowest Government price, equals $600,000,000, or $50,000,000 a month, year in and year out.

Moreover, Mr. Cooper estimates that it takes 600,000 more men to convert that coal into energy than would be necessary for the production of the same amount of energy by waterpower. That means that if we were using our waste water, instead of our coal, you would have not noly $600,000,000 more in money to spend for Liberty bonds, but we could release 600,000 miners and put that many more men in the trenches. The loss of $600,000,000 is equal to the loss of 6,000,000 one hundred-acre farms, an amount which Ventura is far more than the land that has been destroyed in Belgium and North France during this great war with the Germans.

Modern Poultry Culture

The poultry industry has had an uphill struggle over a devious, stony road this past year, and many engaged in the business fell by the wayside. Building materials and supplies advanced in price, labor charges increased fifty per cent or more, and feed sky-rocketed among the clouds; it doubled and in some instances trebled former prices. Corn, which the farmers once burned as fuel, sold around three dollars a bushel. On top of this came transportation difficulties; then Rule 14, prohibiting the sale of hens and pullets. A few weeks ago it looked as though another rule would go through, prohibiting the interstate shipment of ice-packed poultry; fortunately, this was nipped in the bud. And now poultrymen ask: What next?

By ROBERT ARMSTRING,
Expert Poultryman and Writer.

WE hope, and have every reason to believe, that the coming year will bring relief to the poultry keepers. Some of the obstacles already have been removed, while others promise to receive the attention of agricultural leaders, who heretofore have stressed production in other lines, notably the cereal crops.

There is much ado concerning the wheat crop and other grains; we are constantly reminded of their importance in winning the war. And when we consider that about seventy-five per cent of the Nation's farming is done along this line, for the support of farm animals, it is natural that the cereals should receive particular attention, at least for the moment. In our enthusiasm for increased grain production, however, we must not lose sight of the importance of increasing our livestock in like proportion, because if we do, our grain will have been grown in vain.

Animals Are Concentrators.

Without farm animals—cows, pigs, sheep and poultry—the greater part of the six billion bushels of cereals raised last year would have been as worthless to us as a bar of gold to a drowning man. The farmers harvested at the rate of sixty bushels, or one and one-half tons of grain for every man, woman and child in the country.

You will doubt this, perhaps, because you have no knowledge of eating anything like such a vast amount of grain. In effect, however, that is precisely what happened. The grain was condensed, refined and processed into butter, milk, cheese, beef, mutton, pork, fats, eggs, poultry, wool and so on. It was converted, concentrated into these finished products through the agency of livestock. Otherwise the bulk of it would have been practically worthless so far as human consumption is concerned. Livestock and grain crops must go hand in hand; we can not have one without the other. The country has awakened to this reality, and in consequence the livestock growers are now receiving special consideration.

Prominent men interested in all phases of the poultry industry met in Chicago a few weeks ago, in response to a call for a war-emergency-get together, at which conference the War Emergency Federation Poultry Industry was organized, to have headquarters at Washington during the period of the war, to harmonize and co-operate with the National and state governments in securing the means for an adequate supply of poultry products.

Purpose of Conference.

No gathering in years has been so representative of the poultry industry as a whole, as this conference. It met to safeguard the poultry interests of the Nation, and it talked straight from the shoulder. Producers, instructors, investigators, distributors, manufacturers of poultry equipment and of poultry feeds, the United States Food Administration, the United States Department of Agriculture, editors and publishers attended the sessions, and what they had to say about the poultry industry left no doubt in anyone's mind but that strong measures were necessary to save the industry from sinking out of sight.

Some of the topics under discussion were as follows: The poultry situation as shown by recent surveys of different states; the education of the public as to the food value of poultry and eggs; National standardization of poultry and egg grades; proper distribution of reports on market quotations and conditions; Government regulation of factors affecting the costs and profits of poultry products; Food Administration Rule 14, prohibiting the sale of hens and pullets; Food Administration rule affecting such trade customs as loaning money with warehouse receipts as collateral, trading between dealers of the same class, and fixing dates for the removal of dressed poultry or eggs from warehouses; closer relationship between poultry producers and various divisions of the Federal Government; better understanding between the producers, distributors and consumers; sound conclusions regarding the actual costs of producing poultry products.

Effect of Rule 14.

The effect of Rule 14 was the center of a stormy discussion; the consensus of opinion was that the ruling had been more harmful than beneficial, especially in its moral effect upon the producers, coming at a time when they were laying plans for their season's work. Mr. Priebe, speaking for the Food Administration, explained that the ruling was adopted at the suggestion of the Bureau of Chemistry of the United States Department of Agriculture, to save the country's supply of eggs and poultry meat, because the hens were being slaughtered at an appalling rate. He said Mr. Hoover's policy was—we must think in food values and not in dollars and cents; that war times cannot be compared to peace times, hence the Nation must show a willingness to sacrifice.

It was urged that producers do not rush their hens to market as soon as the rule was suspended, which became noneffective shortly after the Chicago conference, so that the market would not be demoralized and prices drop away down.

Representation at Washington.

The subject which aroused the most intense interest was the closer relationship between the producers and Goernment agencies relating to production, distribution, consumption and conservation of food. It brought forth the most tangible result of the whole conference, which was the inauguration of a movement to be called the War Emergency Federated Poultry Industry, with an advisory board to look after the interests of the producer and to co-operate with the Government in all activities wherein the producer is involved. A resolution was passed, requesting the Secretary of Agriculture and the Food Administrator that they add a representative of the poultry industry to serve on the Farmers' Committee of Twenty-four, which committee is called by the Government to aid and advise in various agricultural problems, and on which no poultryman has been included.

With this representation it is felt that adverse rulings, such as Rule 14, would not be instituted, and that proposals such as the prohibition of ice-packed poultry would be condemned forthwith. This proposal, by the way, was another recommendation of the Bureau of Chemistry. It was intended to stop the interstate shipment of dressed poultry, unless it was precooled by mechanical refrigeration and shipped in refrigerator cars. And since none but the packing interests had these facilities, the effect would have been to throw the entire industry into the hands of this class. A hearing was held in April, at which there was such a storm of protest that the ruling was dropped.

Man on the Job.

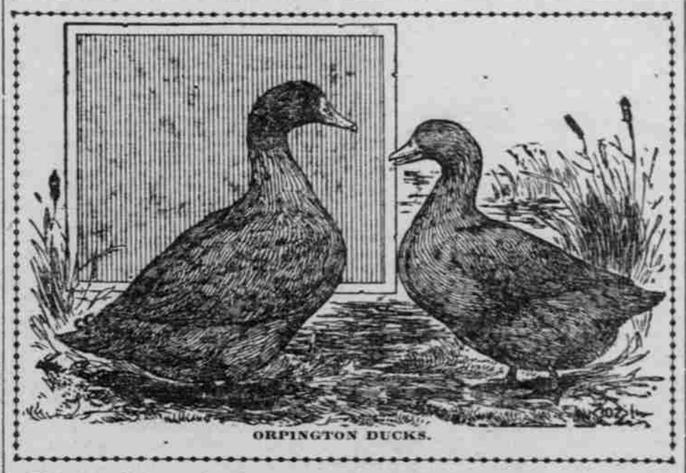
Almost every line of industry has a man on the ground at Washington, whose business is to look after the interests of that particular industry. He should be a broad-gauged man, one who understands the industry from every standpoint, one who has the confidence of all concerned, one who can confer with the heads of various departments and see to it that no regulations are made which are detrimental to the safety of the grower or producer. By safety is meant the ability to produce; because no industry can operate at a loss for any considerable time, no matter how patriotic it may be. It is no longer a question of patriotism with the poultrymen; it is a case of keeping their heads above water, since prices on eggs and poultry have not kept abreast of the costs of production.

The aim of the War Emergency Federated Poultry Industry is to maintain a representative at Washington, a man who will be entirely unencumbered by any official connections, and who can devote his entire time and energy to the interests of the poultry growers. At the time of writing this article the choice of the man has not been made.

The postal regulation, made effective in the middle of March, whereby day-old chicks can be sent through the mails, has helped to overcome the losses resulting from express transportation congestion. Many shippers report that these parcel post shipments are now going through without complaints, and that they are not likely to return to the express service, even though it returns to a normal basis, which always left a great deal to be desired.

At the rate shipments of chicks perished last season, occasioned by long delays and exposure, poultrymen were in despair. Their losses were terrific, and could not have continued another year without driving most of the hatcheries out of business.

Thus we see how Uncle Sam stepped into the breech in this instance. And he will enter the ring in other troubles, too, providing we give him time enough to evolve a course of action. He is back of the poultrymen, of this there can be no doubt. Therefore, we poultrymen must get in back of him for all we are worth, for the biggest crop of poultry in 1918 that has ever been raised.



ORPINGTON DUCKS.

IT is rare that any fancier seeks to originate a new variety of ducks. Breeders are generally satisfied to continue with one of the old-fashioned varieties that have been selected to meet the requirements of their particular market.

A decade ago the late William Cook, famed as the originator of all the Orpington fowls, spent much time in perfecting a new utility duck, one that would compare favorably with the Pekin as a layer, and with the Aylesbury for weight. In the course of his work he not only produced Buff ducks, but a Blue variety, and both are now largely bred. Mr. Cook attached the name "Orpington" to these ducks, after the name of his country place in England.

Breeders are very enthusiastic over their heavy-laying qualities and their early maturity. One record from California shows that a flock commenced to lay at the age of 16 weeks. Another record shows that two ducks layed 258 eggs in six months, which is greatly in excess of the average duck's production.

The plumage of this variety is a soft buff over all, with the exception of the male, that has a seal brown head, several shades darker than the body color. The bills on both sexes are greenish yellow.

The aim has been to breed only those laying white eggs, and to this end careful breeders are hatching only the whitest eggs. A few years of this selection will produce the desired result. The weights required of these ducks are six to seven pounds for males, and five to six pounds for females.

CAMP GAINS INSTRUCTOR

Explosion Delays Departure of Piorda at Cantonment.

CAMP LEWIS, Tacoma, Wash., May 27.—An explosion while conducting experimentsc to help in the war work gave to Camp Lewis a new French instructor. He is Charles E. Picorda, of Seattle.

Piorda was expecting a call to go to Washington for assignment on one of the war boards and at the same time was experimenting on a plan to can milk without condensing it. Then came the explosion and both he and his son were injured. The son has not yet recovered. While the son is convalescing Piorda is teaching French to the soldiers here who are expecting to go over soon.

Piorda's father was vice-president of Switzerland and Ambassador to Rome for years, and the son remained at Rome with his father up to his death. Since then he has been a traveler, working in various capacities in Egypt, Spain and all the South American countries.