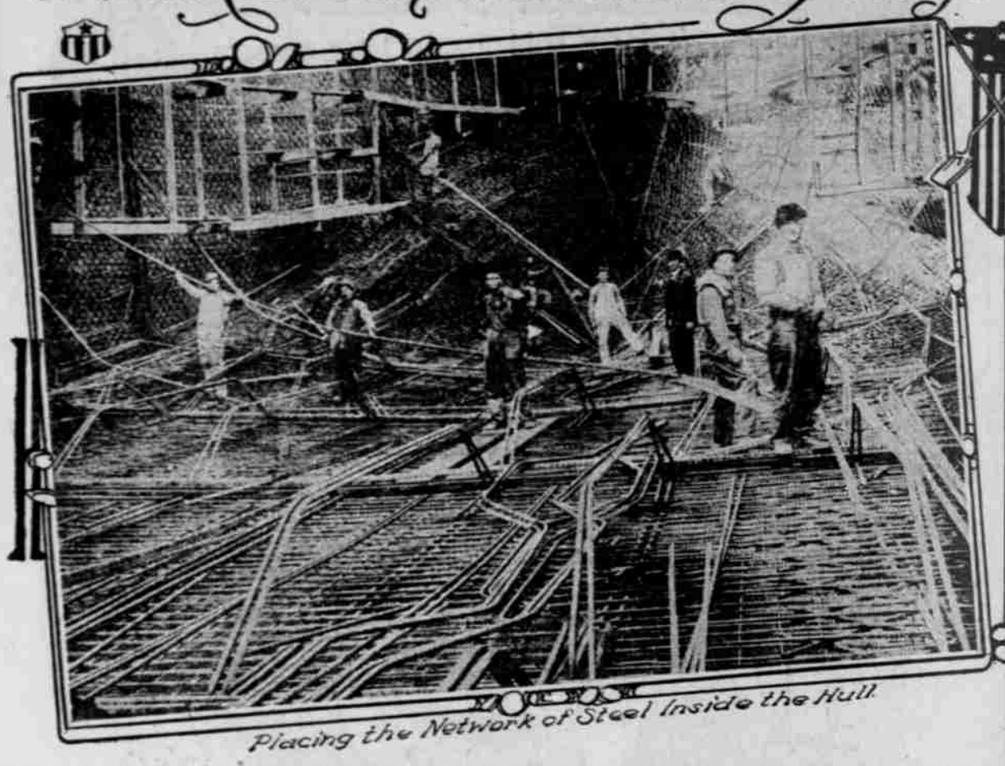
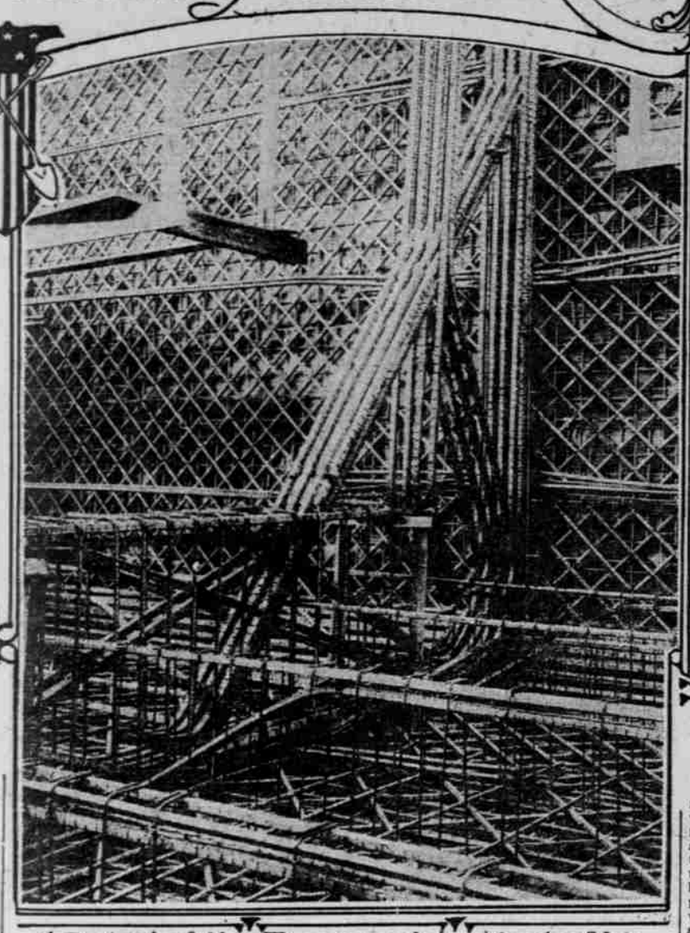
UNCLE SAM'S STONE SHIPS

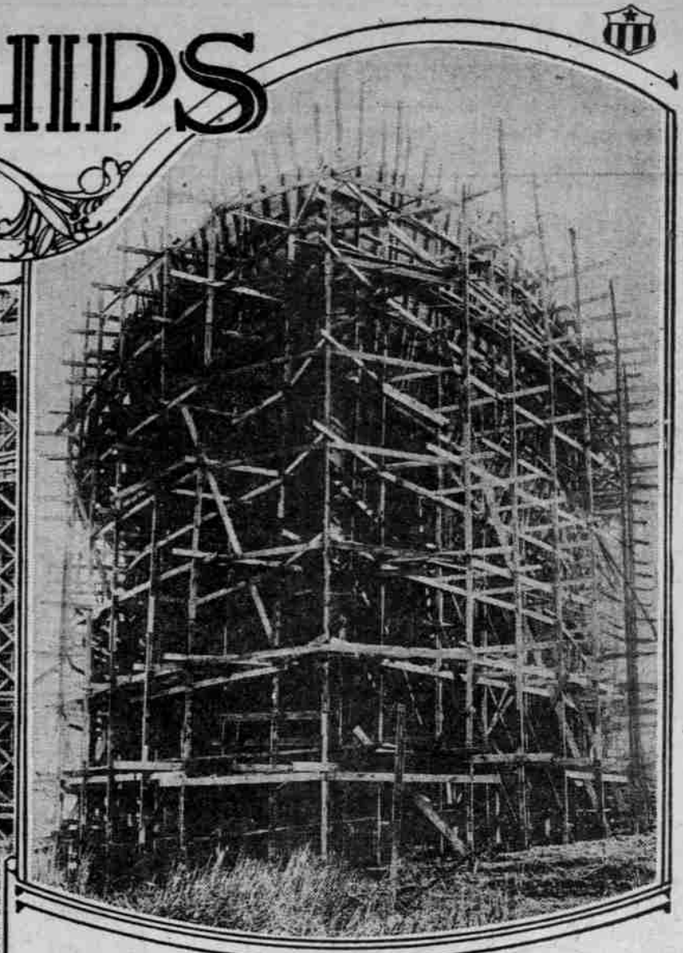
Frank G. Carpenter Writes of Huge Vessels of Concrete.



Placing the Network of Steel Inside the Hull



A Detail of the Framework Inside the Ship



Outside of the Concrete Ship During Construction.

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WASHINGTON, D. C., 1918.—Crossing the oceans in great ships of stone!

Sandbagging the submarine with clubs of reinforced concrete!

Carrying supplies by the thousands of tons to our troops and our allies in vessels made of sand and cement tied together with steel!

This is one of the live experiments that the Emergency Fleet Corporation has now under way. It is an experiment that promises much for its success, for it may create a new fleet that will rank side by side with our vessels of steel and wood in gaining the victory over the Germans. A branch of concrete shipbuilding has just been created under the direction of Mr. Rudolph J. Wig, the scientific expert in concrete of the bureau of standards, and a force of marine draftsmen and of men skilled in the handling and testing of concrete construction is already at work. Tentative contracts have been let for the building of several such ships, subject to full payment on the part of the Government only upon their proving safe and successful for all the purposes for which they are planned. The carrying out of these contracts is now under way, and if they succeed a large shipbuilding programme will be inaugurated in many of the ports along our seacoast.

The ships contracted for range in size from 2000 to 7500 tons, and they are to be built after specifications and plans furnished by the United States Government. The companies engaged in such construction are in the three cities of Boston, New York and San Francisco. The contract with each provides that the Government shall pay only one-half the cost of building the vessel if it fails to come up to all the requirements when tested in all sorts of weather and under various other conditions. In short, Uncle Sam pays only one-half the cost of the experment if it should fail to work.

But before I write more of the Government plans let me tell you what has been done and is being done in concrete shipbuilding in other parts of the world. The stone ship is not a novelty. Away back in 1849, 10 years before the world was afflicted with the birth of the Kaiser, a Frenchman named Lambot made a small boat of reinforced concrete, and this was shown six years later at the World Fair in Paris. It was a success on the water, and as late as 1903 was reported to be in first-class condition.

The Dutch began to build barges of reinforced concrete 31 years ago, and there are now barges of 55 tons on the Holland canals. The Italians have been using concrete barges for more than 12 years, and there is one 80 feet long and 24 feet wide which has been employed on the Welland Canal since 1910. It is used for carrying sand and gravel and heavy loads of stone.

We have been using concrete barges on the Panama Canal for eight or nine years, and they have been making great pontoons there for landing stages of the same material. There are several concrete scows on the Chesapeake Bay, and there is a concrete pontoon of 783 tons in the harbor of Sydney, Australia. There are concrete boats on the Manchester ship canal, and a concrete barge was built for use on the Paris ship canal only last year.

Today one of the chief concrete shipbuilding centers is Norway. The Fougner Steel Concrete Shipbuilding Company there is making ships varying in size from 200 tons to 3000 tons, and these are intended to carry coal in the open season. So far one of 600 tons has gone to sea, and it is said to withstand the storms of the ocean. I have before me a catalogue issued by the Fougner Company. In this it offers to deliver seaworthy ships of 200 tons, dead weight, within three or four months, and states that it will have some ships of 3000 and 4000 tons ready for delivery this year. The Germans have also done something in concrete shipbuilding, but no statistics as to their progress are, for obvious reasons, available just now.

Last year concrete ship construction was going on in Denmark, France, England, Norway, Spain, Canada and the United States. Our Consul at Christiania has lately described a plant at Norway, where concrete vessels of 3000 tons displacement are being built, and it is stated that the Swedish Minister of Marine has recently ordered a lighter of 1000 tons of a plant where they are now erecting ways for the building of ships of 4000 tons.

The largest concrete vessel ever planned was launched last month by the San Francisco Shipbuilding Company at a California port. This is a steamer to be used in the trans-Pacific service. It has a displacement of 7300 tons and will carry 5000 tons of deadweight cargo. The ship is 320 feet long, over 45 feet wide and 30 feet deep. When fully loaded it will draw 24 feet of water. The ship is a monolith, or vessel of continuous stone. Her floor is four and one-half inches thick and the walls of the hull are four inches thick, with a great steel shoe down the bow. Imbedded in the concrete is a basketry of steel mesh, consisting of heavy iron bars, which weighs altogether more than 500 tons. The boat will be equipped with triple expansion engines of more than 1700 horsepower, and it will be moved through the water by a screw propeller at 10 or 11 knots per hour. I have photographs of the exterior and interior taken during the construction, which show the enormous size of this huge boat of stone.

It was with the photographs before me that I talked with Mr. Wig, the chief engineer of the concrete shipbuilding branch of the Emergency Fleet Corporation, about the vessels which Uncle Sam will construct. They will be built after much the same methods as those employed in making the California steamer and some of them will be even greater in size. The largest ships will be about 410 feet long, 54 feet beam and 36 feet in depth, and their draft will be 28 feet. These big ships are to be of 7500 tons, and the vessels it is proposed to construct will range from that size down to 3000 tons. The ships will have reciprocating steam engines and each will be moved by means of a shaft and screw propellers. The largest ships will be equipped with steam turbines and the machinery all told will be much the same as that of the fabricated steel vessels or wooden vessels now being constructed.

The walls of the hulls will range in thickness from four to 10 inches. They will be made of concrete and steel, the steel being in the form of bars, from one-half inch to one inch and a half in diameter. The bars are arranged in a network, so that each carries a certain carefully estimated proportion of the load.

In the building of a ship like this nothing is left to guesswork. There has to be just so much concrete, a mixture of gravel, sand and Portland cement, and just so much steel, running here and there through it, held together by the cement, and this steel must be placed in just the right spot, for every bit of it has its own work to do. The whole is carefully planned by the naval architects and designers and everything is done according to the plans and specifications. The first thing that is done is the building of a wooden mold of the exact shape and size of the outside of the vessel. The steel bars are then laid in the exact places set down in the plans. They are placed in a crisscross or basket-shaped network and are tied in place by small pieces of wire, so that each bar stays where it is put.

After the whole network has been accurately fixed an inside wall of boards is built up and the concrete poured in. When it has hardened and the frames taken off it leaves the walls of the hull inside and out as smooth and clean as the walls of your parlor. The inside framework, including the partitions, the girders and beams, are all made of reinforced concrete. The steel rods are put in bent to the shape the framework requires, and a box is made around them, into which the concrete is poured. The cement mortar begins to set almost as soon as it is in place, and within a short time it is as hard as though the whole were of stone. There is no structural steel in the ship. Every bit of the framework is of this concrete, reinforced with steel rods, and this is true of the bulkheads, the decks and the hatches. There are no rivets whatever and the whole ship is for all the world one huge structure of solid stone, with these steel bars running this way and that everywhere through it. As it floats on the ocean it looks just like one of the steel steamers, and it could hardly be distinguished from the smaller greyhounds of the Atlantic.

I asked Mr. Wig as to whether these ships would not be very much heavier than other vessels of the same size now on the ocean. He replied that the weight of a vessel of reinforced concrete will be from 15 to 20 per cent heavier than one of the same tonnage constructed of steel, but that the cost of the concrete ship will be only two-thirds or three-fourths as much as that of the steel ships. It will take as long or longer to build the concrete ships as steel ships, but the plant for erecting more quickly, and it will be much less expensive. A steel shipbuilding plant costs in the neighborhood of $400,000 and upwards, whereas one for concrete ships can be erected for $2000 or less.

"Moreover," continued Mr. Wig, "the materials used in making the concrete fleet are such that shipbuilding plants can be erected almost anywhere along our coast. All that we need is some Portland cement, some steel rods and a gravel bank, or one might use a clay bank and kiln and make terra cotta instead of stone. They are now using crushed terra cotta in the concrete vessels being built in San Francisco. The terra cotta if properly burned becomes as strong as the stone when mixed with cement. It is full of pores and air spaces, and consequently much lighter. It is very important to reduce the weight of the hull as far as possible consistent with the strength of the ship. It is estimated that for every pound per cubic foot that we can cut down the weight of the concrete we can reduce the weight of the ship from 10 to 20 tons, depending upon the size of the vessel. If the weight is reduced 20 pounds per cubic foot, the ship will carry from 200 to 400 tons more of cargo. It is therefore important that the concrete be made as light in weight as is possible."

I here asked as to the amount of steel in the big ships, and was told that each of the larger vessels will have more than 18,000 steel rods of the larger size weighing 750 tons and an equal number or more of steel rods ranging from one-half an inch upward in diameter. Each of these rods is 60 feet long and if all were joined together they would make one great strand of steel so long that it would reach from Boston to New York and thence on to Washington. The larger steel rods are bigger around than a hoe handle.

"Another advantage to the Government in building concrete ships in this time of great need," continued Mr. Wig, "is that the work can be done by a class of men which is not now employed in war work and by men who cannot be used in the building of ships of wood and steel. One of the chief difficulties in our hurried shipbuilding construction just now is the lack of skilled labor. We cannot find the skilled men, and it takes time to train them into the work. This concrete construction brings in a new class of labor as well as of material, and thereby adds one more factor to our side of the equation in winning the war."

"Have concrete ships any advantage over ships of steel and wood?" I asked.

"They have some advantages and some disadvantages," replied Mr. Wig, "but the chief reason for the concrete ship just now is that we need more vessels to withstand the submarine warfare, and that we must have them at the earliest possible moment."

Throughout our conversation about concrete ships Mr. Wig was very conservative. He evidently believes that the new vessels will do all that is expected of them, but says that the Government expects to test them out thoroughly before entering into any large shipbuilding programme. Many of the problems of the concrete ship are being carefully studied, and experiments are made to remedy the difficulties which arise. A very important matter is the durability of the ship and whether its life may not be lengthened. Mr. Wig thinks it can, and his judgment on such matters is worthy of great consideration. In connection with the bureau of standards here at Washington, he has been engaged for a long time investigating all matters relating to concrete and its durability. It was not long ago that he was sent by the Navy Department to inspect the concrete construction along the Atlantic and Pacific coasts of this country and Canada. He also visited all the ports and examined the concrete harbors of the West Indies Islands.

During this work he found that the concrete was greatly affected by the salt in sea water, a matter which is important in making these ships to sail over the oceans. He found that wherever the concrete came in contact with the salt air it was deteriorating and disintegrating, and that the deterioration was much greater in some places than in others. For instance, he examined a series of concrete platforms erected on concrete piles in the Cape Fear River from Wilmington, N. C., to the sea. The platforms were built by the lighthouse service to hold the beacon lights outlining the channel. At Wilmington, where the water was fresh, it was found that the concrete was almost as good as when it was made, and that the steel used to reinforce it was clean and free from rust. A little further downstream, where the tide came up and the water was brackish, the salt water had eaten into the iron, forming rust, while at the mouth of the river so much rust had been formed upon the iron that it had swelled and caused the stone posts and platforms to crumble to pieces.

From these and other observations Mr. Wig reported that sea water has a bad effect upon concrete. He believes, however, that certain methods of treatment may be used which will prevent the salt water from reaching the iron. This may be done by galvanizing or painting the rods before they are put in. This is being done in the ships now under construction.

It may be possible also to paint the hulls of the ships so that the sea water or moisture cannot go through the concrete. As it is now, when the vessel is completed, it is practically impervious to sea water, because the cement, when it sets, covers the outside with a skin of limestone, which sea water does not penetrate. This protects the hull until it is abraided or broken, at which time the salt moisture comes in.

The problems that enter into the designing and building of a ship of this kind are puzzling. The man who knows nothing of concrete and the action of metal upon it would naturally suppose that if the steel rods in the concrete rusted holes might be created through which the moisture could seep. The fact is, the rods swell with the rust and break the artificial stone in just the same way that the old Egyptians used to break great blocks of granite by drilling holes and driving in wooden pegs, which they then soaked with water. The water caused the wood to swell and this broke the granite. In the same way the particles of rust take more room than the solid rod and break the concrete.

In fact, everything connected with a vessel of this kind is a matter of scientific study and experiment. Its building must be carefully watched, for any flaws that may occur during the construction are hidden in the concrete after the ship has been poured. This is not the case with ships of wood or steel, where the construction can be examined when the ship is completed. For this reason the inspectors and superintendents must be men of more than ordinary ability, and they will probably command as high, if not higher, wages than similar men employed on the steel and wooden fleet. Uncle Sam will have his own inspectors on the job all the time. It will be on the common laborer that the saving will come.

Among the factors to be considered in building the concrete ship is the stress that the hull will have to undergo in riding the waves. The builders must consider the fact that in times of storms the great vessel of stone often rests on two waves with no support in the center, and that this tends to bend up the ends and force down the center. Or the ship may be riding on the crest of a wave with its prow and stern in the air, in which the tendency is to pull down the ends and bend up the center. In short, a continuous motion is going on in the atoms of which the stone construction is made. The men have to know all about this motion; they must understand the elasticity of concrete and how it compares with the steel rods within it. I am told that they have ascertained that the stretch of the concrete is just 10 times as great as that of the steel. In other words, if a certain weight attached to a concrete post suspended in the air will stretch that post, say, ten-one-thousandths of an inch, which is, perhaps, the thickness of a horse hair, the same weight attached to a steel post of the same size would stretch it only about one-thousandth of an inch, equal to the thickness, perhaps, of a silky hair of your baby. At any rate, the stretch of the steel would be only one-tenth that of the concrete. Now, a ship in action has a continuous motion going on in the wear and tear of the particles composing it, and, in a solid mass like that of the concrete ship, the effect of this motion must be understood and accurately provided for. These seem little matters to the amateur, but they are of great importance to the scientific expert and the ship engineer.

The work of investigating the problems of the concrete ship is not confined to Washington. The Emergency Fleet Corporation is seeking information from every part of the country. It is in communication with and has enlisted the assistance of the experts in cement and concrete construction throughout the United States, and all are doing more or less work in studying the problems at hand. The corporation is also in touch with the work that is going on along the same lines in various parts of Europe, and the results of this work are being carefully watched by the whole shipbuilding industry.

Modern Poultry Culture

Half of the yearly egg supply is produced in March, April, May and June. It is the season of over-production, when more eggs are laid than are consumed. Back-yard poultry raisers and others should take advantage of this situation, and store the surplus eggs against the period of under-production. It is just as practicable to preserve eggs as it is to preserve fruits and vegetables, and a whole lot easier. Now is the time to do this, when prices are low.

BY ROBERT ARMSTRONG.
Expert Poultryman and Writer.

A FEW weeks ago the wholesale prices on fresh eggs dropped 22 cents a dozen in one day's trading in some of the large Eastern cities; in six days the prices dropped over 30 cents a dozen. Why? Because it was the opening of the season of over-production. There had been a spell of mild weather, the hens started to lay freely, and supplies came into the wholesale markets in large quantities. Shipments came in faster than they could be absorbed on the basis of Winter prices, bids fell off, and the prices sagged heavily; result, a break in the egg market. According to the reports it was the sharpest break in prices ever recorded for such a brief period.

A similar situation takes place every year. Egg production is not uniform, and it never will be equally distributed. Spring is the natural period for egg production, and for about four months, commencing with the first week in March, half of our yearly supply of eggs is produced. For the balance of the year production is light, and during the Fall and early Winter months it is almost nil. Then it is that the prices on fresh eggs soar. Farmers produce practically no eggs during cold weather; the available supplies are mostly from commercial poultry plants.

So long as eggs are traded in on the basis of the law of supply and demand, prices are going to be low in the Spring. The markets are then glutted with eggs, so to speak, and to find an outlet for them the bulk of the shipments must go into storage.

Backyard poultry raisers and farmers will find it to their advantage to enter this field, if only to meet the demands of the home table. Why sacrifice your eggs at low prices in a glutted market, when you might just as well store them at home, and use this surplus later on? The professional egg dealer finds it profitable to store eggs, why not get in on this game? Very little equipment is required, and the risks are small, providing certain precautions are taken.

It is not necessary to store the eggs all at once; you can put them down a few at a time—every day, as you get them. Preserving eggs is as simple as preserving fruits. And where is there a woman who does not take pride in displaying a storeroom or cupboard filled with rows of jellies, jams and other goodies? She regards preserving as a part of good housekeeping, much the same as cooking and cleaning.

The home preservation of eggs is by no means a new practice; it has been observed for years. Unfortunately, only a few housewives have taken advantage of this opportunity to make a worth-while saving. The chief reason for this oversight is that the average housewife does not know about it; or if she has heard of it, she regards it with skepticism, or as being difficult to carry out. These fears are groundless, as we shall see.

Principles of Preservation.

To fully understand the keeping qualities of eggs, one should have some knowledge of their structure. When an egg is laid it is practically free from the bacteria which cause decomposition, but it is very susceptible to these micro-organisms, which gain their entrance through the pores in the shell. The chief source of infection is dirty or damp nests.

Eggs resemble milk, in that they offer an excellent breeding place for bacterial development; they spoil readily when exposed to insanitary conditions. The shell of the egg is porus to admit the passage of air when the egg is hatched, so that the embryo may breathe; but this shell is coated with a mucilaginous substance, sometimes spoken of as the "bloom" of an egg, which prevents the entrance of bacteria unless the coating is very old, wet, softened by moisture, or rubbed off by careless handling.

Obviously, it is a poor practice to wash eggs, or to hold them in damp places; and it is equally bad to expose them to heat, or to handle them more than necessary. Most of us appreciate the fact that eggs are highly perishable; yet the majority regard this perishability as having to do with the fragile nature of the shell, whereas, moisture is one of the greatest foes, quite as destructive as heat.

There are several ways of preventing bacterial development: One is by shutting out the micro-organisms, another is by cutting off the supply of oxygen, and a third method consists of lowering the temperature below the point where this growth will develop, which is commonly called cold storage.

The housewife cannot hope to conduct an individual cold storage plant, but she can operate a system of excluding the causes of deterioration, by immersing the eggs in a liquid preservative, such as lime water or water glass, which is another name for sodium silicate or potassium silicate.

Water Glass Treatment.

Some 20 or more methods have been tried out in the preservation of eggs, embracing every conceivable treatment, from standing the eggs in brine to coating them with shellac. Only three methods gave perfect results, and these were: First, eggs coated with vaseline; second, eggs packed in a solution of lime water, and third, eggs stored in a solution of water glass.

It was found, however, that the lime treatment sometimes communicated a distinct ordor and flavor to the eggs. The vaseline method was too troublesome. Because of these facts, the water glass treatment is to be recommended; it has given satisfactory results under various circumstances for a number of years.

Water glass, or soluble glass, is commonly sold in two forms; a thick, syrup-like liquid of about the consistency of molasses, and in the form of a powder. Both forms are sold by leading druggists, though the liquid glass is probably the most popular. Usually a considerable saving can be made by ordering the material direct from the manufacturers at wholesale prices.

According to the test conducted by the leading agricultural stations, a solution of the desired strength may be made by dissolving one part liquid water glass in ten parts water. If the powdered glass is used, a slightly smaller quantity of the silicate may be employed.

Only pure water should be used in making the solution, and to be sure of the purity, the best plan is to boil the water for about 20 minutes, then allow it to cool before adding the silicate. In the case of powdered glass, stir the liquid vigorously to prevent the formation of lumps. The water glass is heavier than water, and will go to the bottom unless thoroughly mixed.

Stone Crocks Are Best.

Almost any sort of a container will do for packing the eggs, but it is best to use one of wood, glass or crockery than one of metal. Large earthenware crocks which have a glazed or vitrified surface are preferable. They are easier to clean and will not absorb the solution. Five-gallon crocks fitted with covers are most desirable.

Thoroughly scrub and scald the container before it is used, and then store the filled receptacle in a clean, cool place, such as a cellar. If kept too warm, excessive evaporation is likely to happen, in which event the silicate is apt to leave a slight deposit on the shells of the eggs. All eggs must be completely covered by the solution as long as they are in storage. If some of the liquid evaporates, add to it from time to time.

If the eggs are carefully packed in the vessel, on end and close together, a gallon of water glass diluted in the proportion of one to ten, will cover about 60 dozen eggs. Endeavor to keep two inches of the solution over the top layer of eggs at all times.

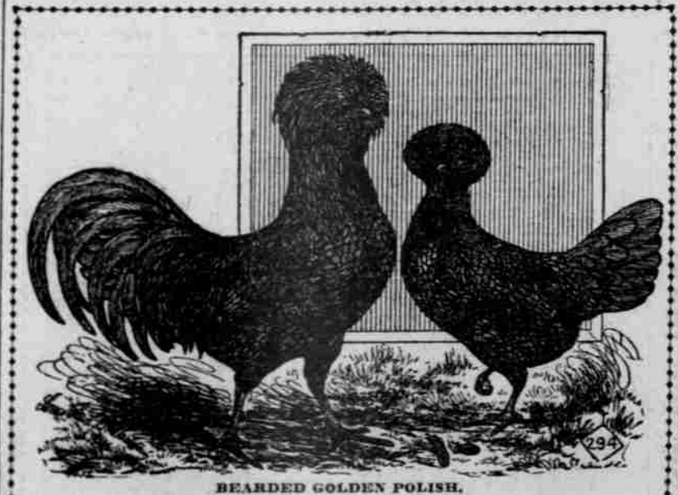
It is not necessary to pack the eggs all at once. In the case of small flocks, this would mean holding the eggs too long. The eggs should be placed in the preservative the same day they are laid. The quicker they are safeguarded against contamination the better. As the eggs are gathered from the nests place them in the solution.

It is essential, of course, that the eggs be strictly fresh, and it has been found that sterile eggs keep better than fertile ones. Never use cracked eggs; they are sure to spoil.

Since high-grade eggs are vital to the success of the work, it is best to be on the safe side and test them before they are placed in the solution. This is easily done by holding them before a candle, to determine their freshness, and to detect the presence of blood clots.

When we consider that one or two spoiled eggs may break and render the entire container unfit for food, it becomes apparent that care at the beginning is paramount.

The method as outlined is not intended to keep eggs indefinitely, but for a period of six to ten months, which is sufficient to carry the operation over to the following season of heavy production.



BEARDED GOLDEN POLISH.

THESE races of Polish fowls were first known as the Crested Dutch. It is probable that they came from Italy to the Netherlands, thence to Western Europe, and later to America.

The first of these varieties was the White Crested Black; and from these the Dutch breeders obtained the silver and golden Polish, some with crests only, and others with both crests and beards. The Golden Polish, as shown above, are of the latter variety, and they have immense crests and beards which almost hide their eyes. Their plumage is generally golden tan in color, each feather laced or edged with brilliant black.

The hens are excellent layers of large white-shelled eggs, so that for a home flock that will be a delight to the eye, as well as a producer for the table, the Golden Polish will be found both pleasurable and profitable. The hens are nonsetters, hence their eggs must be hatched by other hens or by artificial means. The chicks are rather delicate unless kept dry. Damp ground or damp coops are fatal to young Polish.

In size these fowls compare with the Leghorn and weigh about the same. They are very fine-boned and carry a larger proportion of desirable meat. The legs are blue, or, in old specimens, white; the skin is white, and each fowl has a round protuberance on its skull, from which the feathers of the crest grow.

GERMAN NAMES UNDER BAN

Australia Indicates Dislike for Kaiser in Recent Ruling.

MELBOURNE, Australia, March 20.—It has been decided by the Parliament of South Australia that all towns in the state bearing names of German origin are to be renamed. Among the names are Verdun, Mount Kitchener, Beatty, The Somme, The Marne, Cambrai, Jellicoe, Jutland, Sturdee and Allenby.

The government announces that the new names are selected with a view to impressing on the minds of children and others a knowledge of events connected wtih the war, particularly events in which Australia played a large part.