Reducing Our Waste in Eggs*

What the Demonstration Car of the Department of Agriculture is Doing

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A LARGE refrigerator car, painted white, and bearing on its sides the inscription, "U. S. Department of Agriculture, Poultry and Egg Demonstration Car," was backed down a railway siding in a typical Southwestern town and came to a stop about two blocks from the station. There it remained while the heterogeneous mass of freight cars to which it had been attached rumbled slowly away, to disappear in the north. Two men carrying sweaters that seemed strangely out of place with a temperature that particular morning in the neighborhood of 105 degrees in the shade came toward it from the station, unlocked the door, let down a flight of steps and entered. A moment later came the regular throbbing of a gasoline engine, the whir of large fans could be heard, and incandescent bulbs began to flood the interior with light. The men put on their sweaters, for it was suddenly getting cold.

The Department of Agriculture's demonstration car was now ready to begin its daily business of trying to reduce the \$50,000,000 annual waste in eggs. Part of this loss can be debited to needless breakage of eggs in transit from the nest to the retailer. The balance represents the unnecessary adding, spoiling and deterioration of good eggs that comes from bad handling on the farm, on the way from the farm to the town, in the town, in transit from town to city, and in all stages of progress from the carload lot to the breakfast table.

The importance of the loss of eggs which has occurred by the time the product reaches even the country shipping centers can be seen from reports of twenty prominent shippers in a single egg-collecting point. These men reported that one year the percentage of eggs which arrived in a state so bad that they were an absolute loss rose to 8.33 per cent in November, with a mean loss for the year of 4.36 per cent for the 32,730 dozen eggs, or over 1600 cases, which were specially examined. The loss in eggs between the time the hen lays a fresh egg and the time when that egg is traded or sold to the country merchant may be judged, also, from the fact that a special inquiry conducted among country storekeepers in October showed that only 25 per cent of the eggs they secured from the farmers would rank as "firsts," and that 60 per cent were "seconds," due to long holding on the farm; that 5 per cent were cracked, and that 4 per cent were rotten or stuck to the shell.

Reports had reached the Department of Agriculture that the shipments of eggs at this particular time from the Southwest were showing far more than the normal number of "floaters," "blood rings," "white rots" and "black rots," which are terms employed in the egg-handling trade to represent the different stages of descent from a good egg into a very bad egg; and instructions began to go out from Washington: "Send the egg car to central Texas and travel north during May." In response to these orders the car was delivered at this particular station on a hot May morning, and thus was added another fraction to the 7,000 miles the car has traveled during the last two egg-laying seasons on its egg-saving mission in Kansas, Oklahoma, Texas, Arkansas and Missouri, the corn States which produce a vast proportion of the eggs consumed in the great cities of the East.

The demonstration car is fitted up to be an egg packing and chilling establishment on wheels. In one end is an ice bunker holding over three tons of ice, and at the other

end is a good-sized gasoline engine for running the cold-air fans and driving the dynamo which supplies light. By means of false walls running from the ice chamber, the fans are able to drive chilled air to all parts of the car, and thus make possible the proper precooling of eggs for shipment, and the testing, packing and handling of eggs at temperatures which prevent or delay spoiling.

The chilling of eggs is almost the beginning and end of keeping New York and other great cities supplied. Heat is the great enemy, for once a good egg has stood for any time at a temperature of over 68 deg. Fahr. it begins to incubate, if it is a fertile egg, or to spoil, if it is an infertile egg. For this reason the car is equipped to give a practical demonstration of the advantage of keeping eggs cold and chilling them thoroughly before starting them in refrigerator cars on the long haul from the corn belt to the great egg-consuming centers.

In another section of the car are two egg-candling rooms, supplied with electric lights, equipped for candling eggs by being inclosed with dark coverings in which there

Government has printed carefully colored lithographed charts, which show the exact appearance of different grades of eggs before the light. With this chart the egg dealer and even the housewife is enabled to candle eggs with sufficient accuracy.

The absolutely fresh egg held against the light shows a distinctive pinkish glow of goodness. Let that egg, however, remain out in the sun or in the summer heat for a little time, and within a day or two it begins to show "blood," a tiny series of little blood vessels forming around the embryo of the chick; or the heat may cause the yolk to go toward the top and shift easily, which characterizes it as a "light floater." Again, the yolk may mix with the white and make a "white rot," a condition also revealed by the candle. The final stage is the "black rot," where no light at all can be seen through the egg. The egg has now reached the explosive stage, which makes it such a favorite missile of the average boy. There is, however, another type of bad egg which most people would think good for food. The yolk is a firm golden ball and the white a clear liquid. But the white has a greenish color—and the green indicates that the egg is full of bacteria—it is a "green white egg."

A perfect shell is one of the essentials of a good egg, because any crack or break in it will tend to let in all sorts of bacteria to hasten its putrefaction. The egg, therefore, must be graded not only by the condition of its contents, but by cleanliness and soundness of shell as well. An egg that is so badly cracked that its contents escape is termed a "leaker." A "leaker" not only will not keep itself, but it may soil and injure a large number of eggs packed in the same case with it. They are thrown out, therefore, at every stage of handling, and constitute a total loss. "Checks" are eggs the shells of which are cracked, but the membranes still intact. These, too, are sure to rot quickly. The egg with a dirty shell, no matter how good its contents may be, does not bring a high price on the market. Washing eggs, however, hurts rather than helps them, for the reason that any water put on an egg washes off some of the protective covering which

the hen puts on the shell to make it more resistant to the entry of germs. A washed egg is shiny and smooth looking, and lacks the powdery bloom of a clean, fresh egg that has not been washed.

For the woman of the farm, each good egg in its shell is practically so much cash. In fact, eggs and chickens supply a large proportion of what might be called the ready spending money of the farm woman. The local merchant pays her for her eggs either in money, or else immediately transforms the eggs into calico or shoes or groceries. The country storekeeper similarly regards the eggs as money, and deposits them with the local egg collector and shipper, who honors the poultry check and turns back the cash to the storekeeper. From this point of view the local egg shippers might be regarded as running an egg bank.

The doctrine taught is not especially altruistic, for the local egg man or farmer owes no philanthropic or social duty to a distant consumer. The argument is entirely one of dollars and cents in the pocket of the farmer and his wife, the local egg-commission man, and in the general pocket of the county itself.

"Thirty per cent of your eggs are wasted. You are getting 30 per cent less money for your eggs than you ought to be getting. It isn't a question of tools or money

An egg chart illustrating various defective conditions.

A, A fresh egg, before the candle, and out of the shell. B, Slightly stale egg, showing evidence of incubation. Before the candle, and out of the shell. C, Stale egg, showing a settled, flattened yolk and a thin white. Before the candle, and out of the shell. D, Yolk beginning to adhere to shell. E, This shows a blood ring. F, Cracked egg invaded by mold. The shell shows mold inside. G, White rot or addled egg. H, Egg with green white.

is a single hole the size of a half dollar. In these dark rooms the experts hold the egg before the candling light, and its condition is instantly revealed with almost photographic clearness. The purpose of candling eggs at home, of course, is to decide which of the housewife's dozen is in perfect condition for breakfast or cookery. On the commercial scale, the testing is to determine not merely whether the egg at the moment is good for immediate consumption, but whether, if properly chilled, packed and handled, it will survive a long shaking up on a 1,000-mile railroad trip and remain good in transit, storage and the retail store until it reaches a distant home. For unless an egg starts on its journey in absolutely good condition, no amount of refrigeration or careful handling will restore it to goodness. And the egg that has begun to deteriorate, that shows the first sign of the incubation of its germ, spoils rapidly every hour that it is subjected to ordinary summer temperatures—in fact, every minute that the fresh-laid egg spends in the nest or elsewhere, exposed to more than 68 deg. Fahr. starts it on a downward career. As the temperature mounts, the egg approaches hatching conditions. At 102 deg. Fahr. it might as well be in an incubator or under a hen.

To assist those who are not experienced candlers, the

*Year Book of the U. S. Dept. of Agriculture.

or capital. It is a question of care and intelligence which cost nothing but a little time. Come to the car and learn how to save \$1,000 a week in rotten eggs."

If the egg car, with its doctrine of egg conservation, reached only the collectors, it could save but a fraction of this waste. Eggs do not stay good as long as they are in the country and suddenly become bad when they come to town. An egg is full of original sin from the moment it is laid, and asks only for a little leisure in a warm place to indulge in all its proclivities for wickedness. The morning laying, if left all day in the heat or in a hot hen-house over night, will begin to develop the hatching germ. Good, fresh eggs put in a basket and stored in the hot kitchen for a day or two may reach town in such condition that they must be used at once to be available for food. A basket of perfectly fresh eggs left in the back of the wagon and exposed to the sun during a 10-mile drive to town may reach the country merchant in such shape that not even immediate chilling will make them available for long shipment to the cities. This is the story constantly revealed by the candle on the egg car. It is evident, therefore, that if the egg is to be palatable to the city consumer, care in its handling must begin on the farm.

The effort is principally to get the farmers themselves to candle and grade their eggs before they start for town, and then to offer the buyers their eggs on a quality basis. This means that the farmer offers so many dozen of fancy eggs at a certain price per dozen, and so many other eggs of different grades at smaller prices. Under this plan the farmer quickly finds that he makes more money by selling his eggs according to quality than when he simply sells them at an average price per dozen, which the buyer has to make low, in order to cover himself against off-size, off-color, dirty, cracked, checked or deteriorating eggs. If the farmer has one dozen of 17-cent eggs and another dozen of 13-cent eggs, he gets 30 cents for his two dozen, whereas under the other basis he probably would get only 13 cents a dozen or 26 cents for his basket. In the absence of a quality basis of buying, the buyer either simply pays a lump sum, gambling on the quality of the eggs, and naturally fixing a very low price, or buys on a "loss off" basis, which means that he deducts from the farmer's returns all the bad, leaking or unmarketable eggs found in his offering. In either event the farmer has had the trouble of bringing worthless eggs to town, and does not get the benefit of the high price that would be paid for the percentage of strictly good eggs in his basket.

Quality buying is equally important to the local storekeeper and small-town egg collector. This was illustrated one day at the car. A dealer who bought on the case-count plan—that is, paid a flat price per dozen for the eggs, whatever their condition—brought a lot of 10 dozen eggs and asked that their quality be determined by candling. He had paid 13 cents a dozen for the eggs, and the candle showed that only eight dozen could be rated either "firsts" or "seconds." The remaining two dozen were so bad as not to be marketable under any grade. The buyer figured gloomily that he had paid about 16 cents a dozen for a mixture of "firsts" and "seconds," or 1 cent above the market price for "firsts."

In connection with the candling demonstration, the demonstrators of the car take particular pains to show each visitor, by means of photographs and actual eggs, the difference in the keeping quality between a fertile egg and an infertile egg, or one that is laid by a hen in a roosterless flock. The fertile egg, because of the chick germ in it, deteriorates very rapidly as soon as it is allowed to get warm. This deterioration appears as blood on the yolk, which is the first very noticeable evidence of the incubation of the chick. The next stage is the formation of the blood ring—a circle on the yolk—which appears when the embryo dies. The infertile egg, which contains no chick germ, will, of course, deteriorate if allowed to get warm, but as there is no germ to hatch, no "blood ring" develops and the physical changes in the contents are very much less marked, and the chemical changes which would make it inedible go on much more slowly. The infertile egg, therefore, will keep very much better and is a better product to put in cold storage for winter consumption. State poultry officials and the dealers in many cities encourage the farmers to remove roosters from their flocks after the season in which eggs for hatching are laid. This movement is aided by the fact that after the hatching season the dressed poultry and egg dealers frequently offer the farmer an attractive price for the roosters, which are then dressed and sent to market. The farmer gains from not having to feed the rooster, the absence of which makes absolutely no difference in the laying of the hens. The infertile egg, moreover, is just as nutritious and desirable for food as the other.

The cold-storage plant in the car is designed for proving to the egg receivers of the towns the importance of chilling eggs to a temperature below 50 deg. Fahr., before they are shipped in refrigerator cars to the large cities. While this process would be of advantage if begun on the farm, it is realized that few poultry raisers can afford ice enough or the cost of even a small refrigerating machine for thoroughly chilling eggs. Instruction to the farmers

in keeping eggs cool, therefore, is largely limited to such practical methods as storing in refrigerators or in the cooler places on the farm, such as the spring house, cold cellar, or ice house. Where none of these methods are available, the farmer is urged to gather his eggs quickly after they are laid, and keep them ever after out of the direct heat of the sun. Figures show how ordinary eggs, by means of a local refrigerating plant, can be brought down in 24 hours to the temperature at which they can safely be shipped. Eggs prechilled to this temperature remain at the safety point in the refrigerator car, instead of having to travel for two or three days at dangerous temperatures until the ice in the refrigerator car can chill them.

Another portion of the car, which is kept cool by the air blown from the ice bunkers, has been made into a small packing room, where cases can be filled and properly nailed for shipment, to show the egg shippers the safest way of preparing their product for the jolting it must receive in freight cars. The importance of this work is indicated by a recent study of the breakage of eggs in transit. According to this investigation, on an average of 24 eggs out of every 30 dozen packed in a case arrived at market either cracked, dented, leaky or mashed. These figures represent the detailed examination of 6,000 dozen eggs before and after shipment, and the results of a general study of the condition of 71 carloads of over 500,000 dozen eggs shipped in car lots from 36 packing houses in the corn belt to 10 different markets on the Atlantic coast. They mean that New York city alone has a breakage of 116,000,000 eggs annually.

The number of eggs broken in transit, it is believed, could be greatly reduced if only sound, new cases were used, proper packing employed, a proper system of nailing on the covers followed, and an efficient method of stowing and bracing the cases in the car practised. A study of egg cases has established exact facts as to thickness of the wood, and has shown that there is a right and a wrong way to drive every nail employed in putting the case together. The specialists have determined that a cement-coated nail will hold better in an egg case than a smooth nail; that the use of less than six nails in closing the case greatly increases its chance of straining, and that nails driven in straight make the box much more rigid than nails carelessly driven at an angle.

The way in which the eggs are packed inside the crate is also very important. Many experiments have shown that the fillers, or little cardboard cells in which the eggs are put, must be new and strong, and that the flats, or cardboard sheets placed at the bottom and top of each case and in between the layers of eggs, must be springy and unbroken. Much of the breakage in transit is due, not to unusually rough handling by the railroads, but to neglect of these simple facts.

Aeroplane Struts

THE shape of the various struts of an aeroplane are determined principally by aerodynamic considerations. As a good streamline section may be weaker laterally for a given weight than an inferior streamline form, the

How streamline struts are built up.

great effort is to shape and combine suitable materials so that a strut may be fashioned which shall have sufficient strength without adding to weight. In other words, the trend of mechanical ingenuity in this direction, as indeed in all pertaining to the aeroplane, is to perfect combinations which shall increase the strength while decreasing the weight.

Sketch No. 1 shows the simplest form of construction, where the strut is machined from a solid piece of wood, the kind selected being determined by the purpose to which the strut is to be put.

No. 2 sketch shows a strut that is formed from two pieces of wood glued together. The method generally employed is to saw the piece from which the strut is made lengthwise and then to turn one of the pieces around end to end. The effect produced is obvious, the reversing of the grain giving an added degree of strength.

The next step in the evolution of the strut is shown in sketch No. 3 where the nose and the tail are made of ash and the center piece of spruce. In this there are three pieces in the strut, instead of two as in the preceding illustration.

But in No. 4 the number of pieces is increased to five, though there is no radical departure from the manner of assembling them. The nose piece, the center piece, and the tail are of ash, while the remainder of the strut is made of spruce.

In the foregoing class the struts are necessarily heavy and, in consequence, they are employed principally where the member is subjected to a heavy load or a severe shock. Such struts are used in the undercarriage for inter-plane struts joined to the lower wing at the point where the chassis members are attached, or in machines where the undercarriage is secured to the lower wing instead of the body.

In designing the lighter form of struts there are three courses—reduce the depth and thickness of the types just discussed, and of course the limit is soon reached in that direction, or to use larger sections and hollow them out, as Nature does in a reed, or to employ metal in combination.

It will be seen that in the strut shown in No. 5 the formation is in two pieces. Two grooves are made in each portion of the strut, leaving the center untouched, and they are then joined together. The transverse web thus formed very materially strengthens the strut against lateral buckling.

In No. 6 the two halves are joined together by means of a fillet of hard wood.

No. 7 is a longitudinal web of ash to which is joined two pieces of spruce.

The distinguishing feature of No. 8 is the transverse web formed by a strip of three-ply wood set into recesses in the sides of the strut. In this strut, as in the other combination forms referred to, the pieces are glued together.

The final four illustrations are combinations of wood and metal. No. 9 is a steel tube to which is attached at intervals by means of bindings a fairing of wood. In the No. 10 illustration the steel tube is inclosed wholly within a strut of spruce roughly conforming to the simple form shown in the No. 1, while in No. 11 the nose and tail of the strut are formed by steel tubes, not quite closed on one side, and which are pushed into grooves in the wood.

When all-steel construction is used it generally takes the form of a cold drawn steel tube that may be either elliptical or in the form herewith shown in the final illustration.—*Flight*.

Extinction of Species

MANY suggestions have been made in regard to the causes which bring about the extinction of species. In some cases perhaps the times change, and highly specialized creatures are not plastic enough to change with them. Sometimes the invasion of a territory by some new enemy involves the doom of old-established tenants. According to some authorities, species grow old as individuals do. Sometimes the answer is simple enough, for man's ruthlessness is to blame. The subject has been recently discussed by Prof. V. Hensen, who holds that the death-blow may be often due to inbreeding and the associated accumulation of harmful by-products. In this connection he refers to the case of the rainbow trout (*Trutta irideca*), which was brought to Europe from California about 1880. For a while it flourished well, and seemed very resistant. Gradually, however, it lost its grip. The germ-cells of both sexes degenerated before complete maturity, and diseased conditions became common. The liver cells, for instance, became encumbered with fat, and the secretion of bile was interfered with.—*Knowledge*.

Gas-filled Tungsten Glow Lamps

INSTEAD of a vacuum, the space surrounding the filament of tungsten in these lamps is filled with gas. Nitrogen is used in the larger sizes, and argon in the smaller. For small lamps the gas has to have a low thermal conductivity. Therefore argon was used in preference to nitrogen. But it was found to be desirable to add a small admixture of nitrogen, since argon had no great power of resisting electrical discharge, and lamps filled with pure argon were liable to short-circuits.