

HISTORICAL OVERVIEW OF FRENCH ARTIFICIAL INCUBATION IN THE BACKYARD

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Summary

This article describes, analyzes, summarizes and presents a historical overview of the birth of artificial incubation in the French farmyard which is the basis of poultry farming and has now become a creative industrial jobs. The builders of the first artificial incubators were first used the turkey hen to hatch eggs. These are the beginnings of artificial incubator. But given the poor performance after each brood, the use of turkey hens was abandoned at the expense of a mechanical artificial incubator called water renewal incubator. Its start, its characteristics and its operation have been borrowed from the turkey hen. To avoid repetition of hot water which maintains the room temperature at 40 °, whenever the latter is cooled; manufacturers have invented a new artificial incubator called thermosiphon in which it was equipped with a lamp to directly heat the water in the tank instead of draining it and make a hot water renewal.

Keywords: backyard, artificial incubation, turkey hen, artificial incubator hatching.

Introduction

The backyard has long been the natural and necessary accessory of the farm. Poultry freely walking in the meadow, among the herds. The farmer brought little care for his birds, but certainly not least science. The chicken itself was brewing your eggs in some unknown corner, was driving her chickens everywhere in the green all day. No attention was paid to these birds that were high on day parole or full freedom. In the evening, returning the animals in the barnyard. This way of raising poultry lasted several centuries; not only in France but also in other countries. In France, between the nineteenth and twentieth century, raising backyard birds following the upward march of general progress, no longer resembles what it once was. After rearing in backyards, we have moved to another way of raising poultry; is poultry farming. This form of reasoned breeding, scientific, is related to intensive cultivation and modern industry. Poultry farming has become for the privileged of fortune, a high taste distraction; it has been in the country a real industry, as serious, as lucrative as food, etc. The care knowledge to give to natural incubation was done perpetuated in the countryside, by a continuous tradition, as the seed grain and land management, as all farmers know, without ever having studied in a book.

Increasing civilization, and needs from day to day more, the simple production based on these old ways, has become insufficient and, as it took substitute plow and spade which then had replace the plow by the steam engine, so it was important to find ways to increase the number of animals for a growing population, and each day more demanding in their tastes. We first sought to bring about a greater number of poultry in developing the desire of incubation in chickens, and choosing the most incubators races. It was the first effort in the way of progress; the needs have increased again, nature has been tamed to some birds to force hatching against their will. Turkeys were forced to motherhood in every season. But he had to go even faster, and faster still. The reign of the steam engine had arrived; it has been applied to incubation. It is in the practical science of natural incubation, the inventors of the incubator have drawn their first lessons. These are primitive and fixed data that guided the first attempts to make the first artificial incubators. Several authors have published papers on quality artificial incubation. These numerous writings on the various methods of hatching poultry eggs in incubators are known machines called animal scientific, breeders, hobbyists in poultry, etc. Artificial incubation is to protect eggs of poultry by providing a temperature corresponding to a mother hen would provide by lying on her eggs. Two fundamental questions facing us in relation to the above. How are made the first artificial incubation before production of the first modern incubators? And how functioned artificial incubators available to breeders at that time before the design of modern artificial incubators today?

To address this problem, we used a scientific research methodology approach based primarily on the history of science and technology which fall within the social sciences. This reflection has led us to work on two specific objectives. The first was to make a fundamental retrospective research whose primary mission briefly trace the history of the birth of artificial incubation in the French yard. The second was to make an analysis of both descriptive and explanatory statement after the essential points concerning artificial incubation technology implemented gradually by the first builders of the first artificial incubators who served in the French yard bass. It is therefore a history of research in agro-pastoral sciences derived from the social sciences because it studies not only the relationships between human beings, men and animals in a given good space, but it also puts highlight the geographical space in which coexist both beings. To conduct the research, we relied on various documents still available in certain centers of French appropriate research. The methodology and the various information obtained allowed us to focus our work on the following basis: the beginnings of artificial incubator, the construction of the water renewal incubator, operation and construction of the incubator thermosiphon.

I. First Fruits of artificial incubator

1.1 From the incubation by turkey hens

In France as in some European countries, women farmers have long sought to replace the natural incubation by hens forced incubating turkey hens. To get to the turkey hatching chickens before nature does it pushes them even before they have spawned many of those who were subjected to this regime for years remained sterile. A simpler way was employed as follows: on the first days of December, we take high turkey hitherto free in the backyard without any prior preparation to the role that we want to fill it. It is placed in a box or in a basket with a lid. Is raised quite considerably a nest of straw to cover that, once closed on his back prevented him from standing. The closure is secured or simply loaded with large stones. Every morning, the turkeys have a freedom of fifteen minutes to eat, then they are reinstated in their narrow prison. After a few days, they start to get used to their new role, and several turkeys, accouters in the same room, each return to their nest without mistake by force of habit. It then puts them on trial some old eggs filled with plaster or rather glass or porcelain eggs; they are slowly paces of incubators and end up deciding for hatching seriously. The lid of the box is removed; they receive twenty eggs and more, according to their size or ability to smolder. All these preparations require eight to fifteen days. Some animals, however, stubbornly refuse to forced maternity. This farming method could not be generalized because it has given amount of poor results.

1.2. Adventures and disadvantages of turkey hens

As alleged, to forced incubation is that they have not been sufficiently selected for the goal where we want get. Turkeys that eventually resolve, can uninterrupted four or five broods a year. Some go up to eight. Each outbreak, a single mother led all the chicks, and the others continue their work machine for hatching. Despite its simplicity, this winter incubation system has many drawbacks and is feared too dissatisfied. The eggs are broken by a heavy and clumsy mother, who often crushes her young during the outbreak; nests are soiled, diseases are present, but no effective cure, incubators are covered with mites that plague their chicks. People involved in this method of hatching put incubating four hundred eggs for a hundred chicks.

It was quite difficult to remove the clear eggs because many turkeys dirty eggs to the point that the mirage was impossible. A dozen turkeys are employed at least for this meager result. These abnormal animal incubators were asking a lot of care and a disgusting task for housewives. They must be up and clean every morning and invest in the diet because they had them bring their lunch nearby so they do not move away long eggs. Despite such care as soon as an outbreak occurs and some incubators die in a few days, it is a real disaster for the poultry and proven.

1.3. Employment turkey than an artificial incubator

To establish an artificial incubator, he must first find the principle in a form that is simple and economical, regular heat. This found to operate the machine and in some being general. Besides his little habits; watch her, in a word, and imitate. Since turkey could be converted into machine and perfectly managed his brood, there was no reason why the machine is transformed into turkey and succeeds well. This said, the instructions for the conduct of an artificial incubator are easy to write in general terms: a thermometer under the wing of a guinea, applied exactly against the skin, reaches 40 centigrade; the beast is lying just above it rises to 39 degrees at the edges of the nest, under the neck and wing tips, it marks only 37 ° or 38 °. However, owing to the movement the beast made its nest, only leaving it or returning it, the eggs are not always in the same place.

The hen takes care of disturbing with its beak. They now occupy the center of the nest, sometimes the periphery and are therefore exposed, during the brood, at a temperature varying between 38 ° and 40 °, sometimes less, but never more. Where precise indication, to an incubator, to achieve 40 ° as the maximum point and not to be feared, even the need to facilitate the lowering to 38 ° and 37 °. When the chicken back to the nest, after eating, the eggs are almost cold. There are regular interruption of caloric influence and the outbreak does not occur within the normal time. This implies the need to interrupt also regularly share the incubator leaving every day to cool the eggs for a period of time corresponding to the one that takes the hen for his meal and for his exercise.

In the wild, the hen lays eggs on the ground, in the open air in almost immediate contact with the humid emanations of the earth terms that it was easy to bring in an incubator; complete, sufficient moisture ventilation. Respect, to make a perfect incubator, to which the basic rules are easily applied to find the simplest way to maintain, at any point, a regular temperature. These are the fundamental rules observed who campaigned for the construction of an artificial incubator to replace any point natural incubator, to give eggs a regular temperature while allowing to keep in regard to ventilation, moisture, alternative heating and cooling in conditions absolutely identical to those that would give them a brooding hen freely.

II. Construction of artificial incubator water renewal

2.1. Description of the incubator

It is a cube-shaped wooden box contain a zinc tank. This double-walled circular tank leaves the center of the box large enough vacuum in which are arranged like eggs in a nest. This empty space is covered by two glass frame through which, with nothing open, we can monitor the eggs and the thermometer, the temperature controller. The heat comes from the hot water contained in the zinc tank surrounded by strongly crushed wood sawdust and is managed by regularly changing a small portion of water morning and evening. Aeration almost enough by the large volume of air contained in the hot chamber is constantly maintained. Eggs is based on a bed of chopped straw, covering the sand is in mobile racks.

The use of these so-called mobile racks turner eggs of this great advantage. As a result of their position, the eggs have no contact with the metal and receive no heat or below or to the side, they are heated by the caloric rays, leaving the circular tank converge the center and give the same heat as the chicken while it is resting on its nest. As a result of the circular shape, the heat is accurate. It is a reversal day and night as a hen does when she gets on her nest after eating. These General Terms and regular ventilation and humidity temperature absolutely replace the hen, and are key elements of success of artificial incubator. The incubator does not need to be placed in a heated room, but it is good to choose preferably a temperature equal to piece that is to say where the ambient temperature is the same everywhere in the room.

2.2. Disposition of the incubator

The incubator is simply placed on two trestles 40 cm high, so that air can circulate freely underneath. The background is filled with a layer of wet sand about 3 cm; river sand, sea or career, pounded will, whatever, all also serve well to maintain moisture and its slow release spray. When filling the water tank for the first time, this is to get as quickly as possible, without trial and error, the point of 40 ° degrees inside. For that, it takes almost a third of cold water against two thirds of boiling water; the first water poured into the tank is cold, to prevent the immediate impression of boiling water on the metal causes dilation whose effect, if it is harmful, would at least need. Two or three hours after the water is poured, the thermometer should mark about its normal level.

In pending this result, the eggs are prepared in mobile racks, washing them previously in warm water in order to rid the shell from dirt or fats that clog in the pores. It wipes the eggs carefully while avoiding too sharp shocks that could break up the germ. Immediately the racks loaded with eggs placed in the incubator, the temperature drops significantly, the latter absorbing a considerable amount of calories before reaching the point of the room temperature. The farmer's wife, at the usual hour changes the average amount of water. Ten liters for an incubator hundred eggs. And the next morning the thermometer still mark the regulatory temperature. Cooling is not dangerous especially at the beginning of the brood. The farmer obeyed the principle that the cooling incubation is not dangerous especially at the beginning of the brood. However, the excess heat is only to be expected.

2.3. Position thermometer in the incubator

The thermometer, which is generally considered a mere accessory of the incubator, is one of the main elements of success. Its accuracy, then its position depends the success of the brood. Accuracy is a big challenge, but we care forcibly obtained comparative trials with audited standards after the most perfect scientific data, and an event that can leave a false indication: testing for several successive broods. Whatever employee incubator system, the mercury ball must always, and without exception, be placed on the same level as eggs, that is to say its basic needs neither rested on the eggs, nor be below. The heat still tending to rise, by the fact that hot air is much lighter than cold air. The temperature is higher in the top of the incubator, under the ice at the bottom, there is therefore already a significant difference between the temperature taken over the egg and the decision below, and for the true measure of the heat to which the eggs are subjected, one takes this heat to medium egg, that is to say the base of the thermoregulatory. The temperature control should be on the same level as eggs, and right in the middle of them. To carry the brood, the temperature should not exceed 40 °, and it oscillates at night and in the morning between 38 and 39 °. This proves that the thermometer will not be exceeded during the noon normal degree.

III. Operating artificial incubator

3.1. Means to adjust the temperature in the incubator

How to adjust the temperature and constantly keep the thermometer at 40 ° which is the recommended temperature? This is the question that had asked all those who tried to practice artificial incubation and in which this seeming difficulty often, after choosing an incubator, at the start, the same embarrassment occurs. How to keep a steady temperature, since there is no lamp or stove to keep water in its degree? This embarrassment stopped himself when the farmer's wife had any knowledge of an incubator, and once it has hatched only a hundred chicks. But what seemed most difficult thing is to vary the thermometer to maintain its fixed point. If there is no stove, the special construction of the incubator beg there. Similar to the Norwegian pot, in which the pot of fire continues to boil several hours after being removed from the fire, the incubator has a policy to maintain the heat during a specified time. The constant point is obtained by the regular interval renewal of a portion of the water contained in the tank. This is the substitution of a part of boiling water to an equal portion of water cooled which keeps the average temperature of the oven which are enclosed eggs. We assume at first that an addition of ten liters of boiling water in a reservoir which contains about sixty liters, must produce a sudden rise in temperature that momentarily exceeds normal. It is not so; this heat generation is offset by the accessory circumstances and its influence is zero.

3.2. Replacement of water in the incubator

At the time of morning and evening, a certain amount of cold water and replace it with boiling water is pulled from the incubator, the temperature of the room in which is placed has declined by about two degrees. During the twelve hours before, the reservoir water had decreased to a much greater proportion. At this time we open the incubator to return the eggs and let the fresh air for a few moments: the oven has cooled completely by this cautionary outdoors. The eggs themselves put in their place were almost cold and need a large amount of calories to regain their temperature. It is then that boiling water introduced into the tank. There is obviously a heat release but this excess temperature is immediately absorbed and used to repair the losses recorded. This is not extra heat is a replacement; and when compensation is established, the shot, to use the word which denotes the action of boiling water, is completely annihilated, and the thermometer is found to the point that occupied a few hours earlier.

Sometimes foreign circumstances change come this regular walking: egg sudden frost in the middle of the night, or a sharp rise in external temperature, or even an error in the change of the water. And if the thermometer shows a significant variation, it is extremely embarrassed to bring it to the point. Again, not the least difficulty, just change morning and evening the same amount of water to achieve the same degree. Knowing that the reservoir contains both boiling water and cold water, when the amount of heated water in the morning was eight liters, the farmer derives new evening and replaces them with other nine liters 'boiling water. This liter extra water will bring a sufficient amount of heat to restore the temperature of the day. The difference would it be more sensible, two or three liters of warm water in addition would have changed the level of temperature and the thermometer would have tended to exceed its ordinary degree (40 °). Taking into account the external influences, the environment in which the incubator is located, the degree of oven, and a fixed rule would be impossible to establish. It is a case of tit and appreciation, but so simple that it is enough to have led yourself an incubator for three days for the next set in the most precise manner, and without hesitation. It is this driving simplicity, this ease of monitoring that has contributed so much to the spread of artificial incubators in French backyard. And we made these incubators firm utensil to everyone, can be given to all hands, and that made them indispensable in any home where one occupies a little seriously livestock .

3.3. Distribution of moisture in artificial incubators

In artificial incubation, two things are essential: great regularity and constant temperature distribution and regular moisture. This is the unit bringing together these two conditions that must be considered the most convenient and closest to perfection. We can say that all the moisture distribution methods have been tried: the water containers in the middle of eggs, wet sponges suspended above, wet felts placed below; it was to lay the eggs on a grid covering a water basin of the greatness of the incubator; a little more, they would have been put into water. From all sides there was excess or deficiency, it was mostly great irregularity in the distribution. The solution of the question was found by the use of a layer of wet sand at the bottom of the incubator, and the results are such that it leaves nothing to be desired. Eggs are placed in a mobile rack, the bottom is made of wood, have no contact with the sand, but by the intervals of these traps moisture is released slowly by the action of heat, and saturates regularly and a still moderately any breathable air in the interior of the incubator. It's easy, morning and evening, when eggs are removed from the incubator to cool for a few minutes to realize the touch degree of sand moisture. As soon as one realizes that he begins to dry, pour in some part of the water that divides itself, under the principle of capillarity throughout the surface of the sand and then evaporates also. This system is simple, it can be applied everywhere without care or supervision, and ensures the success of broods.

3.4. Installation and action of artificial incubator for hatching in room

To install the incubator is chosen as a regular room temperature as possible to where it does not make very hot day, under the influence of the sun, and very cool at night. We choose a room that is not too exposed to bright trepidation of the street, or any engine, or the violent sound of a factory or a blacksmith. We set the incubator on two tripods thirty centimeters high around so that air circulates freely above. The temperature ruling in the hot chamber, to be 40 °, it will be necessary that the water contained in the reservoir is at a temperature less than 50 °. A cold water half and half mixture of boiling water give this temperature. There is therefore only introduce successively into the tank through a funnel, a cold water jug and a jug of boiling water until perfect filling. It is important to start with cold water. Boiling water on the not yet heated zinc produce too sudden expansion of the metal and may crack the welds; where leakage and multiple trouble. It would also be easy to fill everything with water at 50 degrees, which has no disadvantage for metal. After two or three hours, the thermometer in the incubator will tell if the temperature is at its point. To realize defending science, without thermometer, if one is to the desired degree, just apply the back of the hand on the inner wall of the tank: if you can leave it there without feeling burning, the water is too hot; if kept there too long, it is too cold. The fair is the point where the hand remains without burning, but where however we feel that he should not be further to not keep it there.

IV. Thermosiphon incubator and hatch

4.1. Description of the incubator thermosiphon

The thermosiphon is a kind of double-walled metal pan, communicating through two pipes with the water tank to the incubator. The water is in the pot in which is immediately placed the glass of the lamp heats up as if it were on an ordinary stove. The hot water is lighter than cold water instead of herself, as and as it heats, the top of the container and, seeking to always go up, it presents necessarily the only way it is free and follows the course of the extended upper hose into the tank. The empty place she left in the pan by running away, was immediately taken by cold water and therefore heavier, which is access through the lower hose. There is thus established a regular and constant flow, forming a rotational movement as a result of which the entire tank of water just pass over the lamp and heats it. And as the flame lamp always being the same, the water temperature remains constant and regular. The thermosiphon apparatus separate from the incubator, fits thereto by means of coupling. Most connections only consists of a single copper ring with no vice inside; others, in addition to the ring, have a stopcock. The usefulness of this faucet is only secondary and appears only in the case where, for one reason or another we would remove the lamp and driving the incubator with hot water renewal morning and evening. So if there are connections to the stop valves, the first care, after shaking the novice, is to open these valves. Maintaining valves closed, once the light on, it would be liable to lead water to boiling in thermosiphon without that it can escape into the reservoir, and the burst or at less disordering by the vapor pressure.

4.2 Operation of the incubator thermosiphon

The thermosiphon being screwed and the taps are open, filled with water by the right of pipe, the tank of the incubator. Is employed for filling of water at 50 ° or half cold water and half boiling water. This avoids waiting forty-eight hours it would take the little lamp to heat the whole mass of water and we immediately obtain a temperature of 40 ° in the oven. The trickiest part of driving is the way to make the lamp. It is essential that the wick is cut excessively round, and the burner is kept very clean inside and out. To take good round an oil lamp wick, do not cut it with scissors, but only the charred brush part, either with a brush or with a cloth. These cleanliness care being observed, as should the rest do it for any flat lamp, it is important still, every morning, when the lamp is lit, after submitting, keep the wick very low.

Any oil lamp always tends to rise shortly after being lit, especially in a thermosiphon where ambient heat makes oil fifteen or twenty minutes after the lamp was lit everything is sufficiently heated so that the lamp has reached its level normal and that there is more to be feared than she file. The flame being average height lighting, as it is held in an apartment, there is more to look after for twelve hours. The beak of the lamp being proportional to the tank capacity of the incubator, there are never to fear or lack or excess heat, and the temperature of the incubator is also regularly holds with most automatic regulators sensitive and sophisticated. The uninterrupted heating lamp, one is tempted to believe that the temperature must end by the long climb. This obviously would produce if there were regular cause's heat loss, but the opening of the incubator, morning and evening for the care of the eggs, established by compensation. It is certain that the excess heat that could be produced by the constant push of the lamp, only serves to make good the loss made every twelve hours, twice daily ventilation and when the temperature is well regulated from the beginning, we could go to the end of the brood without consulting the thermometer.

However, it is still there in the eggs and if by chance it was found that it tends to fall or to rise, there would only change the lamp flame in reverse or to lower or raise the tray that supports the lamp, so away or closer to the thermosiphon the top of the glass and thus produce more or less heat. We can still, for those who fear not burn a lamp or of their presence, use a lamp of very large caliber that is lighter than two or three hours in the evening and that does exactly the same job that adding water by having the gas or acetylene. A gaslight brought under the thermosiphon, using a rubber hose replacement lamps with advantage and can better either warm quickly with a strong flame, or speak with a nightlight. Finally the new alcohol lamps were performing the same function. Under these conditions, the heating or rather the maintenance of an incubator presents for anyone any trouble.

4.3. Hatching

4.3.1. Release chicks

In the twenty-one day eggs hatch, the index enough to be heard with more confidence as the result desired. Some women farmers attest that still contained chicks in eggs shout; we hear them before you see them. Should at that time to help nature? The hen said, pierces the shell of his nose and helps the chick and helps to get rid of his jacket. It is exclusively admitted that if the hen cannot break itself the shell, the chick pierces with his beak when he arrived at full development. Some women even campaign say she heard the shots that give the chick with its beak to break his prison. These two beliefs are equally false and could not find credit by their likelihood and the kind of mystery, which, naturally, surrounded the birth of all birds. The chick does not strike with its beak. To kick, you need a boost if it is low, but proportionate to the necessary shock and resistance of the object to break.

However, the shell of the egg is much harder than the beak of the chick before it is breathed the air; then, in the interior of the egg, the chicken has suddenly bent and head stuck along the chest, so that the smallest movement it is absolutely impossible. It can therefore neither hit, much less break the barrier that encloses all sides. The first burst of shell, dug point following the accepted term, however, is always in front of the beak, the fact is incontestable and fully consistent with the general law of formation of living beings, the first requirement, the first act of existence is to absorb the outside air. When the chick is enough to support the contact of the air, some naturalists believe it escapes from its beak a remote acid liquid the pores of the shell and popped this place. What is the nature of the liquid, how he operates exactly? These are the questions that must find the answers.

4.3.2. Confusion to reality

Regarding the eggs hatch, it is important to establish is that the shell, to take the form which expresses the fact most simply, breaks of itself. This being admitted, it must be careful to help the chick hatch in his work. But for this work is done freely, without fatigue, a regular 40 ° is more necessary than ever. Above that point, the membrane that surrounds the chick dries, shrivels, instead of expand and break the shell. Below 38 °, the chick appears to lack the vigor to try these latter efforts, the outbreak languishes, and if the situation continues for several hours, the brood can be severely compromised. It has often recommended to moisten the eggs with a few drops of warm water to facilitate the transaction. But water applied under these conditions produced the opposite of the intended effect. We certainly need a lot of moisture at the time of the outbreak, but the drop of water thrown on the shell tends to evaporate under the influence of heat. Thereby passing the gaseous state, it causes any moisture that could simultaneously be released through the pores of the egg, and after a few hours the shell and moist is drier than it was before.

It's a humid atmosphere to be introduced in the incubator, and the best way to get it is widely extended wet sand under the eggs, emptying two different places or three glasses of warm water, or suspending under the chassis a large sponge moistened strongly. Once the first egg appears dug, daily cooling is unnecessary and should not be left open incubator that is strictly necessary to return the eggs by hand, taking care to examine them all carefully to place himself above point dug. The work of the outbreak is quick. In the middle of the egg, the swollen shell rises and form small splinters; gradually open the aperture, and the beak of the chick appears; under his repeated shaking, shell relented and crack all around; neck, leg emerge; yet one last effort, and the chick is delivered from his jacket, he is free.

Conclusion

The main objective of the research on artificial incubation in the French backyard brought in all the answers to our questions. We wanted to know and understand the source of artificial incubation, how has it been organized and conducted during the last centuries by farmers of that time in the backyard before reaching the hatching technique that is a key driver of poultry farming. The latter is known as a food industry that pours on the market for hundreds of millions of chicks from hatcheries. Indeed, the techniques of the known artificial incubation in the 21st century emanate indeed initiated an experiment manifested, and borrowed from the backyard. Technical equipment animalized occurred to perform the same operations as the bird incubator; turkey which the services have not been satisfactory. Its use has therefore not been popularized. It is the first artificial devices that have been perfected over centuries to give birth to large incubators that are used in poultry and industries that produce large-scale chicks either for consumption or for breeding.

After this research done exclusively on the farmyard where we studied the interrelationship between man and animal, it can be assumed that the farmer's wife has played a fairly important role in driving this heavy animal; hen turkey, forcing her to play the outstanding role of the ordinary owner hen eggs. This activity consisted in forced brood is healthy and has earned its place in the annals of the history of science and technology and agro French. Despite significant efforts which comes from the harmonious development of technical hatching, the history of construction techniques livestock equipment as a whole is not included in the educational programs; whether in large livestock poultry schools or vocational training centers. It would be desirable that the responsible organs of livestock teaching programs now think to include in their program a historical study of the entire farming equipment used in livestock buildings. As much every human being has a history, as each object has one. This is why the knowledge of the history of technology objects should occupy a place at the heart of social and technical sciences.

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