A practical exposition of the Cantelonian system of hatching eggs, and rearing poultry, game, &c.; by hydro-incubation, or top-contract heat / [William James Cantelo].

UNDER THE PATRONAGE

OF

Her Most Gracious Majesty the Queen;

HIS ROYAL HIGHNESS PRINCE ALBERT;

AND

HIS ROYAL HIGHNESS THE DUKE OF CAMBRIDGE.

A

PRACTICAL EXPOSITION

OF THE

CANTELONIAN SYSTEM

OF

Hatching Eggs, and Rearing Poultry, Game, &c.,

BY

HYDRO-INCUBATION,

OR

TOP-CONTACT HEAT.

SECURED BY LETTERS-PATENT FOR THE UNITED KINGDOM, THE COLONIES, AND THE CHANNEL ISLANDS; FRANCE, BELGIUM, HOLLAND, AND THE UNITED STATES OF AMERICA.

THIRD EDITION, Revised and Enlarged.

BY WM. JAS. CANTELO,

INVENTOR AND PATENTEE, 4, LEICESTER SQUARE.

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PREFACE TO THE THIRD EDITION.

Since issuing my first and second editions of this little essay, I have received so many flattering encomiums from persons of education and discernment, on the subject of my invention and of my strictures on many errors and discrepancies heretofore received as truth, that I have been induced to add a few pages of remarks, which I hope may be interesting in an amusing as well as scientific point of view, and I think I may justly claim to have made some few observations never before published.

Since publishing my last edition I have been obliged to adopt a new material for the application of the top-contact heat; having found that neither the much-vaunted vulcanised India-rubber nor Gutta-Percha will bear the continued action of warm water; the India-rubber, after a certain time, giving out a most poisonous and deleterious gas (sulphureted hydrogen), and Gutta-Percha becoming partially dissolved. I have now in use plate-glass as a communicator of heat to the top of the eggs, making use of a tray;

something like a spring sofa to bring the eggs up into equal contact with the glass. This not only realises my expectations, but forms a beautiful sight, as, by raising the cover of the Incubator, the process is seen going on through the glass, as if it were a transparent hen in the act of incubation. The Incubator has thus become doubly interesting; so much so, that I have opened a place of exhibition in Leicester-square, where I hope to receive many thousands of visitors.

As my talent does not lie in book-making, I shall still confine myself to the strict matter connected with my discovery and invention, for the purpose of inducing individuals, or companies, to carry extensively into practice my system of hatching eggs and rearing poultry, as an article of food for the community. My process in no degree alters the nature or character of the fowls: it only facilitates their production, so that the most approved methods, recommended by other authors, for the feeding and management of poultry, need not, by my plan, be superseded. With regard to the commercial, agricultural, and profitable department of the business, I have added, in an appendix, a list of prices, some remarks, and an estimate of the probable profits connected with the business.

Regarding my scientific discovery, I now quote the advertisement which appeared in the *Times* and *Morning Post*, of the 8th January, 1848.

"Model Poultry Farm, Chiswick, Jan. 7th, 1848.

"I hereby give notice to the public, and to the scientific world in particular, that some years ago I discovered the blood-heat of the feathered tribe to be 106 degrees Fahrenheit, instead of 98 degrees, that of the human race, as hitherto asserted and believed, and I challenge the world to produce evidence to the contrary. The design of the Great Creator in such an arrangement, and other particulars connected with the subject, I will endeavour to prove, and also, that top-contact heat, and two temparatures applied, is the only true principle of hatching eggs and rearing poultry.

"Wm. Jas. Cantelo."

In elucidation of the subject, I now quote a letter which I had the honor of reading and presenting to H.R.H. Prince Albert, in Windsor Castle, on the 4th January, 1848, when I had the distinguished honor of exhibiting my invention to the whole of the Royal Family and Court.

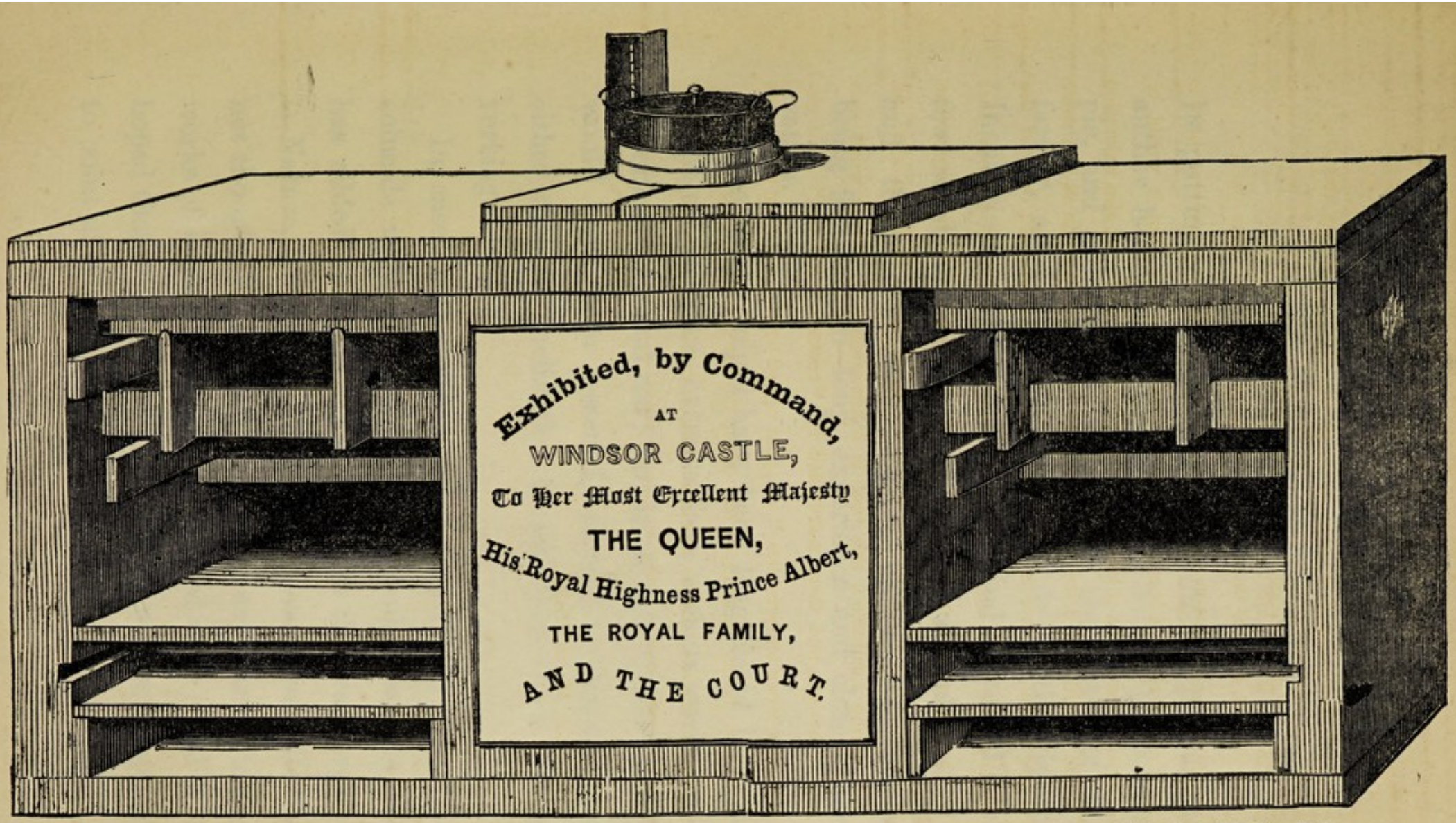
"My Prince,—

"It has been asserted and believed, that the blood heat of the feathered tribe is the same as that of the human race, viz., 98° Fahrenheit, and, therefore, ovens have been used at that degree, which caused the eggs to evaporate over the *whole* surface, thus destroying in almost every instance the principle of vitality. This is a fatal error, as I shall plainly prove. Were this the degree of heat required, the atmosphere alone would in many countries

supersede incubation, and hatch the eggs without the assistance of the parent bird, or "top-contact heat," the natural principle of hatching. This is evident from the fact, that the thermometer occasionally rises in many parts of the world to 98 and even 100 deg., and should the atmosphere continue at this point during eighteen hours, vivification would commence; but it would be arrested if the degree of heat should fall below this point; as, also, animation would infallibly be destroyed, should the atmosphere remain at the same degree of heat, in consequence of the undue evaporation going on over the whole surface of the eggs. My great experience has led me to discover, that the blood-heat of the feathered tribe is 106° Fahrenheit; a higher degree than is ever known in any country to continue long enough to vivify the eggs; and that during incubation, this heat is communicated to a very small surface of the eggs, and there maintained by "contact at the top." This explains the "two temperatures;" viz., that caused by the contact of the breast of the bird during incubation; the other, the surrounding atmosphere, according to climate, seasons, or circumstances, varying from freezing to 100°.

"WM. JAS. CANTELO.

"*London, March*, 1848."



Representation of a Two-tray CANTELONIAN PATENT HYDRO-INCUBATOR, 6 *feet* 4 *inches long*, 2 *feet wide, and* 2 *feet* 8 *inches high.*

AND THE GOOD P
THE ROYAL FAMILY
THE QUEEN
ATLANTIC CYCLE
Manufactured by C

INTRODUCTION.

In putting this little treatise before the public, the author has endeavoured to place facts in plain, simple, and short terms, as well for the benefit of the farmer, as of those who may wish to practise Hydro-Incubation. Every idea will be found expressed in as few words as possible, divested of all technicality; and the reader may rely on all the information being founded on long experience and close observation.

These pages might have been lengthened by philosophical remarks, extracts from various works, and reasonings *pro* and *con;* but in so doing, their utility would have been lessened, since few persons have either time or inclination to sift facts from useless verbiage.

In cases where the author's experience does not coincide with the observations of other writers, he has added remarks, but he trusts to the great arbiter —Nature, for the elucidation of his assertions. He has not thought it necessary to refer in any manner to the works of others, except in a general view; and it is hoped that nothing herein contained will be supposed to point at any in particular.

GENERAL REMARKS AND OBSERVATIONS.

I SHALL commence this subject by asserting as an indisputable fact (how much soever it may be opposed to the generally received opinion), that *no means have heretofore been discovered for Artificial INCUBATION, in the slightest degree resembling the operation of nature.*

Although the Egyptian method of *hatching* has proved the most successful of any hitherto attempted, still it does not owe its continuance to the correctness of its principle, but to isolated facts, some of which are as follows :—

1st. In all hot countries the various kinds of animal food are comparatively scarce: consequently, the breeding of poultry is a matter of paramount importance.

2nd. The fowls lay more eggs, and are less prone to incubate than in our more northern climates.

3rd. The chickens are more easily reared without the maternal assistance, owing to the equable temperature of the climate, and the care that can be afforded them at little cost.*

Thus we see that with only partial success what *can* be effected helps to fill the void, and pays in price what is wanting in quantity.

It is true that artificial *hatching* has been extensively tried, and publicly exhibited ; but the failure of these experiments testifies that the means employed have never been adequate to the end in view. And yet these pretenders have all drawn back from admitting their failure in a process universally supposed to be so simple as only to require an even blood-heat during twenty-one days ; all have attributed their ill success to the want of a regular temperature, or proper degrees at proper times ; *all have overlooked the meaning*

* Moreover, the Government has owned the Mammels and paid a subsidy to the operatives.

of the word "INCUBATE," "*to sit upon*," and the necessity of carrying out in their experiments the principle involved in that expression.

Many have been led to continue their labour for years, from the fact, that, although the principal injury takes place during the first days of the process, its fatal effects only appear towards the time when the chicken should release itself from the shell. Others have sooner abandoned the attempt; but ask them why, and you will be told—other business, the difficulty of procuring eggs, or some excuse equally remote from the real cause, viz., *they did not find it so simple as it appears.*

There have been millions spent in these fruitless attempts, which might have been saved, had Reaumer, and Bonnemain, and others, told the truth instead of pretending to a real success, which these pages will *prove they never had: nay, it would have been better had they even remained silent on the subject*, instead of enticing others, by delusive representations, to fellow blindly in their steps. Many have done so to their ruin; and this was the cause of the loss of several thousand pounds to the inventor of the present process, although eventually leading to the desired end.

The plan, heretofore pursued, has been to place the eggs in a room, or oven, heated to 98° or 100° Fahrenheit. According to the opinions of different advisers, the heat should be regular throughout the time; or raised, or lowered gradually, to or from this point,—all recommend placing water in the ovens, in order that the evaporation may serve in place of the natural moisture of the fowl.

All this looks very natural at first sight, but is easily proved to be fallacious. In the first place, there is little or no variation in the blood-heat of the fowl; it is at all times about 106 degrees, being several degrees higher than the blood-heat of the human race. In the

second place, the fowl throws out very little perspiration or moisture; and if she did, it would neither enter the warm egg, soften the shell, nor prevent the egg from evaporation.* But it is hardly necessary to disprove, piece by piece, all the fallacies which have been put forth on this subject; as a clear exposition of this natural process effects the same objects as a whole.

Nature works with consummate skill, and in all her operations is perfect; we, therefore, must not try to improve her ways, but follow implicitly in her steps, in all our attempts to imitate her wonderful workings. She has ordained the germ of the egg (*so long as it is kept in a horizontal position*) to float uppermost within and against the shell, in order that it may meet the genial warmth of the breast of the fowl. We must, therefore, in incubation apply warmth to that part only, and of the degree determined by nature.

A fowl of any kind prefers to incubate upon the ground. Nature having supplied the egg with only a limited quantity of moisture, has thus arranged to prevent evaporation from a large surface, as the egg is only warm at the part in contact with the fowl, until the blood-vessels searching nourishment for the embryo, have surrounded the inner surface of the shell; when the whole egg becomes gradually warm, and eventually of an equal temperature, by means of the circulation of the blood through these vessels.

We must, in a word, apply the same degree of heat as Nature, and in the same manner—"by top-contact,"—and, like her, allow the inferior portion of the egg to remain cool, until warmed by the inward circulation of the blood.

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* I claim to be the first to have observed that a fowl does not sweat, but, like the dog, throws off a quantity of moisture from the mouth; as may easily be noticed (now it is pointed out). The fowl continually shaking the head,—by minute inspection, it will be seen that a small drop of moisture leaves at each movement.

The difference between "top-contact heat," and that received from radiation, as applied to hatching, is this:—by radiation, or oven heat, the eggs will be hours arriving at the desired temperature, not only when first put to hatch, but at any time afterwards, when they may have been allowed to get cool. The egg will, of course, heat alike over its whole surface, and, consequently, evaporate equally from every part. On the contrary, heat applied in "top-contact," penetrates almost instantly, and revivifies the germ; and although a much higher temperature is used in this case, in imitation of Nature—that is, 106, instead of 98 degrees—still, inasmuch as but a small surface is thus heated, the loss of moisture is much less than by a radiating heat.

The fowl leaves her nest every day, in search of food, for twenty or thirty minutes;* this must be imitated also, as the temporary loss of heat has the effect of causing the air at the butt end of the egg to diminish in bulk, and the vacuum is filled by a fresh supply, drawn in for the nourishment of the germ.

The eggs must be moved three times a day—morning, noon, and night—which prevents the adhesion of any part of the fluid to the shell, and also gives the small blood-vessels a better opportunity to spread around the surface of the egg. This is effected by Nature; when the fowl leaves her nest, or returns to it, she naturally disturbs the eggs, and also, from any change she may make in her position while upon her nest; and also, as she pulls the eggs up against her sides with her bill; this has given rise to the supposition that she carefully turns her eggs.

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* From experiments which I have made, I am satisfied that should a hen leave her nest for the space of twelve hours and upwards, the hatch would not be injured. It may appear still more extraordinary, that the vitality of an egg (provided it has not been sat upon) is not liable to be destroyed by exposure to cold (say for one night) however intense, unless the shell be burst.

POPULAR ERRORS.

Perhaps as strange errors have been (through both ignorance and design) circulated on the subject of poultry as on any other that could be named, and I mean to extend this assertion to many writers on the subject.

To begin with the Egyptian process, travellers who pretend, truly or not, to have seen the Egyptian mammels or ovens, and who have described the process, commit a curious blunder which I have not yet seen noticed; thus, they tell you what they pretend, or perhaps guess, to be the process—or what their interpreter guesses it to be—and, after detailing the whole affair, they soberly tell you that the process has been kept secret for ages, in two villages, and passed from father to son, down to the present day.

One tells you the eggs are laid upon bran; another, that they are buried in sand, in imitation of the ostrich,—whereas the eggs of the ostrich are not hatched in this way, but may possibly have sand scratched over them to conceal them during the absence of the old bird—but that they are placed there for the purpose of being hatched by the sun is absurd; we might as well say that the Muscovy or eider duck hatches her's under down, because, during their somewhat long excursions in cold climates, these birds cover their eggs with down from their breasts to keep them warm during their absence from sitting on them.

The only eggs hatched in the sun or sand are those of cold-blooded animals, such as fish, reptiles, crocodiles, turtles, &c.

Another error, promulgated by those who have pretended to hatch artificially, is, that the young chicken produces heat, thus rendering a lower temperature necessary in the machine or parent bird; whereas

the heat of the fowl is identically the same during all stages of incubation. The proof of this is very simple, when you are reminded of the fact that a hen often sits during two or more terms of incubation, hatching perfectly well; and also it often happens that she will hatch eggs of various stages of incubation. I never alter the heat from the beginning to the end; when I have done so, I have found the hatch injured.

The Ecaliobeon pretended an advantage over the natural mother, from the eggs not becoming addled or rotten. I, on the contrary, am *proud to say* that eggs in the incubator will become offensive or addled, if kept in after the germ has from any cause died; thus, even in this instance, perfectly imitating nature.

Will it be believed that a public newspaper, in this enlightened age, would assert that a certain kind of duck lays all her eggs in a nest under water, and goes down to sit upon them? Yet I have the printed article as proof. A moment's consideration would have shown the person who should have reviewed the articles, that a duck, being specifically lighter than water, naturally floats on the surface, and only keeps below by muscular exertion, or swimming downwards, and the moment that she ceases muscular movement, she rises to the surface. This reasoning is entirely independent of any philosophy, and must be clear on a moment's reflection.

Even country people, and farmers' wives, who ought to known better, will place the butt of an egg against the lip to ascertain whether it feels cold or not; they say the egg is stale, if it feels cold; if warm, fresh—whereas exactly the contrary is the case. Let any one try the experiment, and I will stake my reputation on the result. Without experiment it is just as easily disproved; thus:—It must be admitted that a stale egg is more dried away than a fresh one, thus causing a greater

space in the butt, free from the body of the egg. Now take an empty shell of an egg and place it against the lip, and it will almost instantly lose the cold feeling. Why? Because it is empty, and of thin substance, and it becomes immediately warm by contact with the lip; the same effect takes place with the stale egg, it, being hollow at that part, will feel warm, but the full egg—that is, the fresh one—will, of course, require time to become warm, and will consequently produce a cold sensation during a much longer period.

Many persons have positively insisted, and some have gone so far as to say they have seen it, that the parent fowl breaks the egg at the proper time for the chicken to hatch. On the contrary, nature has provided the chicken with an apparatus perfectly adapted to procure its own exit; and if the smallest particle of the shell is broken, even after the chicken has forced open a hole, it will, in most instances, bleed to death, the whole interior surface of the egg being covered with a beautiful tissue of veins and arteries, which have served to convey nourishment to the little animal in an imperfect state. When the chicken has broken through the shell it lays about twelve hours to gain strength from the atmospheric air, and to enable the lungs to become perfect in the functions consequent on breathing; the chicken grows in size and development from inhaling the atmosphere, and swells out from the interior; this forces the remains of the egg into its body by the navel, as also the intestines (which in a chicken are formed outside the body*), and in like manner the blood filling the tissue of veins around the inner surface of the shell, is forced into the system, when the interior surface of the shell becoming thus in a man-

* I have exemplified this fact to several surgeons, to their very great surprise.

ner free, the little animal makes another movement, as the head is bent down under the right wing with the bill on the back and the legs doubled up in front, gives a slight rotatory movement, and turns the body gradually round in the shell. At each movement, the instrument supplied by nature for the purpose,* is forced to make a fresh opening. Thus, by a series of thrusts, the shell is cut about three quarters of the distance around, when the remainder breaks; the end of the shell then opens like the lid of a box, and the chicken finally pushes his way out, when, in a very few hours, he is able to stand or run alone,—the remains of the yolk and white of the egg, not used in his construction within the egg, serving for nourishment to the system until he learns to eat.

It has been asserted, both in France and England, that chickens hatched and reared by artificial means will not lay eggs, or will not sit. I presume this must refer to those few (and still I doubt the fact) which have been hatched by heat applied beneath them, which has doubtless produced an imperfect animal. I have reared several generations, lineally descended from those hatched by my apparatus, and in fact, I can discover no difference whatever in the chickens, from those reared in a barn-yard, except what may arise from a different and more careful mode of rearing or feeding.

THE HYDRO INCUBATOR.

The form or method, considered by the inventor as best calculated for the application of "top-contact heat" to eggs during incubation, is that of a current

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* A small sharp pyramid on the tip of the bill.

of warm water flowing over an impermeable or waterproof cloth, beneath which the eggs are placed.* This is effected, on a large scale, by pumps, and, in a small apparatus, by the law of gravitation causing the particles of warm water to rise, and those that have become partially cooled to fall. A tank of water is kept continually at a temperature of 108 deg.,from the surface of which it will naturally flow over the waterproof cloth, a return-pipe being so placed as to connect the outer end of the cloth with the bottom of the tank. The eggs are placed in drawers having open-work or perforated bottoms, and they are laid on a piece of thin woollen cloth. The drawers are placed beneath the Incubator, and raised so that the eggs come in contact with the waterproof cloth, but so as to allow a space between the sides of the drawers and the incubating cloth. These sides being lower than the top of the eggs, allows the air to circulate around them, as it rises through the bottom, and passes out over the edges of the drawers.

These particulars, not very easily conveyed in a limited description, will be duly appreciated on inspecting an incubator in operation.

PROCESS OF INCUBATION.

The eggs intended for incubation having been inspected, as hereafter described (which can only be dispensed with in case of perfect confidence in the source of supply), are placed under the incubator.

The eggs should be gently moved three times in the twenty-four hours, and once a day they ought to be slightly damped with a soft sponge or brush, on the

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* See preface to third edition.

top only, as they lie in the tray. About mid-day, daily, they must be taken out and allowed to cool for twenty or thirty minutes, thus imitating the action of the hen leaving her nest to feed, and allowing a fresh supply of vital air to pass into the egg as it cools.

After three days of incubation is the surest time for inspection, in order to take out those which have no germ; although it may be done previously; as, after eighteen hours of incubation, you will observe, at the top of the egg, a round spot or shadow, which is the beginning of the germ; but not so certainly as at the expiration of three days. They must be again inspected after the tenth day; this second inspection will prevent those having only an imperfect germ from becoming addled, and injurious to the good eggs. There may still be an occasional bad egg after this time, but it will be easily discovered by practice, from a ringing or hard sound, when moved with the others; while the good eggs sound very dull, as if cracked. A suspected egg should at any time be examined, and withdrawn.

The hatch should begin pecking at the expiration of nineteen days and a half; thus, supposing a number of eggs to be put to incubate on a Thursday at 5 P. M., on the Wednesday morning previous to the expiration of three weeks, I should expect many to have pecked, and some even to begin to come out. Those which have not hatched of their own accord, on the Thursday morning three weeks, may be reckoned (provided the heat has been kept up to the right point) as good for nothing, even if taken out of the shell; that is to say, those which are last are worth least.

ORGANISATION.

The space at the butt of the egg takes a very prominent part in the formation of the young chicken, an office that I believe I was the first to observe; that is, no less than the provisional lungs of the embryo, up to about the time he breaks the shell, when his own have become perfect, and he first breathes the atmospheric air.

The chicken is often heard to cry in the shell; but a portion of air has already entered, although the cracks are yet too small to be distinguished by the eye; but are proved to exist, as the shell has a cracked sound when struck. When the egg is first under incubation the embryo swells and throws out small roots or veins, in the same manner as a plant, in two days or less; these roots, two in number, can only at first be distinguished; these make their way towards the small space at the butt of the egg, coming in contact with the atmospheric air contained therein, through the intervention of a very thin membrane, as in the lungs of any animal; very soon they appear united by approaching each other along this membrane; one now forms a vein, the other an artery—the vein carrying the blood to the factitious lungs, to be purified—the artery conducting it to the central germ, with the nourishment imbibed in the circulation. Other ramifications are gradually formed, until the whole of the interior surface becomes covered with veins and arteries, forming a beautiful web or netting through the whole area of the inner surface of the shell. When this entire tissue is formed, the growth of the embryo is extremely rapid.

In several works that I have seen, a long and detailed account is given of the progress of the embryo-chicken within the shell ; each being, I think, almost

a copy of the other. I beg most clearly to disagree on this part of the subject. The chicken is, in my opinion, an embryo-chicken from the beginning, and not an embryo part of one, as we are led to suppose from the various parts being mentioned as they are pretended to be made and put together, *not as nature does*, but as a man is supposed to make a piece of machinery. Thus they soberly say, first one part and then another ; whereas all goes on in beautiful unison, the chicken being capable of motion at five days of incubation. This, however, does not prevent us from watching the progress made by nature in this beautiful operation of forming life, and various substances and colours. We have horn, feathers, skin, muscle, bone, integuments —a beautifully-organised little animal, almost capable of thought, possessing memory and many wonderful instincts, means of offence and defence, breathing, all the senses, digestive organs, sensations of pleasure and pain—in fact, a perfect animal organisation, produced from an almost transparent and simple substance—the white of an egg or albumen, with a small addition of yolk, atmospheric air, and warmth.

Truly, how wonderful is Nature!

THE ARTIFICIAL OR HYDRO MOTHER.

This consists of a number of warm pipes about an inch and a quarter in diameter, and about the same distance apart, resting on supports about five inches from the floor. Beneath these pipes is a sliding board, which is always at such a height as to allow the backs of the chickens to touch the pipes, and which is gra-

dually lowered as they increase in size. This board is removed and cleaned every day, or replaced by another, which had served the day before, and had been cleaned and aired during the twenty-four hours preceding. Above the pipes (about an inch) is another board, similar to that below, from which depends a curtain in front of the *mother*. This board serves the double purpose of economising the warmth, and preventing the chickens from dirtying each other, as they are very fond of jumping up on the *mother*, if not prevented.

The pipes above described proceed from the small tank of warm water, the heat being kept at about 109 degrees. The young chickens having been once placed beneath this mother, will only leave it to eat, drink, and exercise, and will return to it of their own accord.

I have had great success in rearing turkeys and guinea fowls by the artificial mother, and will undertake to rear a greater proportion by this means (turkeys especially) than can be done by the parent fowl. This may, at first, appear to be a startling assertion; but let all things be considered before judgment is passed. 1st. The fowl has invariably some vermin, and often a great many lice. These are spread through the brood which she fosters, much to their detriment and discomfort. 2nd. The fowl often tramples on the chickens—this always injures, and sometimes destroys them. 3rd. If the chickens of one brood go near the mother of another brood, they are generally pecked or killed. 4th. If the brood is following the hen, it is often over-fatigued, and fewer come home than she took with her. All these points shew a great advantage in favour of the artificial mother.

FEEDING.

Relative to the feeding of chickens a great mystery is made ; some recommend bread crumbs, others, bread or toast sopped in wine or ale, and a great many other recipes ; but I would inquire whether, if these were necessary, Nature would not supply them? On the other hand, what *does* she supply ? Seeds, grain, grass, and worms;—give these, or cracked grain, grass, and worms, or a little chopped meat, and the chickens will thrive. I greatly recommend Indian meal as a feed for the young, and the whole Indian corn for old fowls, and cracked corn, if procurable, for intermediate.

CHOICE AND CARRIAGE OF EGGS.

The egg, when fresh laid, if inspected against the light, will exhibit (generally at the butt) a small void, about the size of a fourpenny-piece, which increases in size from day to day, by the evaporation of the moisture of the egg ; thus giving the means of judging amongst a number which are the freshest, and consequently best adapted for incubation. It is not meant to be understood that no eggs kept a considerable time will hatch ; but merely that the chance is much against them. I have, however, hatched a portion of some eggs kept in a temperate atmosphere upwards of two months, they having been turned regularly every day. All eggs of irregular form, having two yolks, or any part of the shell very thin or scaly, or with any crack or flaw, should be rejected. Should, however, any valuable or rare egg have a defect in the shell, it may be worth while to gum a piece of paper over the part affected, as it is through the extra-evaporation that it would otherwise fail.

Much has been said relative to the injurious effects of the transport of eggs for incubation, and it has even been asserted that carriage by water is injurious. I do not say that an egg purposely shaken with violence, will produce a chicken. This I have never tried; but I can say that they will hatch very well after an ordinary carriage of thirty or forty miles over country roads, provided they have been well packed. I have hatched many fine chickens from eggs which had travelled by rail one hundred miles, and by carrier sixty, having been bought previously in the market of a country town.*

Eggs are generally packed in straw, bran, or chaff; there is, however, a packing much superior to these, which I have adopted with success, viz., oats. This is, of all others, the most economical packing for eggs; for whilst the packer supplies the other at his own cost, he reaps several advantages from using oats. He charges the current price for his oats; he will have no broken eggs (a great item); the eggs are packed in smaller compass, and unpacked with a better appearance; they require much less time to pack, as the oats are thrown on in alternate layers with the eggs, fill up all interstices, and the two together form almost a solid body.

DEFORMITIES.

Stale eggs often produce ill-formed feet or legs, and the same effect is produced by oven-hatching, and even by the present process occasionally, when the water is kept at much too low a temperature; but, with a

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* However, to insure success I would in all cases advise those working my Incubators to keep their own producers, at the rate of one cock to four hens, and use only their own new-laid eggs.

proper heat and fair eggs, a deformity of the chicken will scarcely ever be found under the Cantelonian System.

In all cases of deformity, it is most economical and humane to destroy the chickens. If a *cross-bill*, it always grows worse, and will finish by not being able to eat at all, and a *stiff-leg* is pulled about, and made miserable by the other chickens; and, inasmuch as a deformed chicken would not have left the nest of the mother, it is not worth while to attempt to do better artificially.*

One thing is to be particularly observed, in opposition to what is often written:—Never attempt to free a chicken from the shell, unless the cause of its detention is very evidently an accidental circumstance, which you may know by its loud cries, sometimes caused by the feathers sticking to the shell; but when a chicken is nearly disengaged, or making very violent efforts, there is no danger in pulling open the shell, though the least abrasure of the veins covering the inside of the shell before the blood is taken up by the chicken is always detrimental, and generally fatal. In case, however, of the chicken pecking towards the small end, instead of the butt (which sometimes happens), as soon as it begins to cut round the shell, a piece may be removed, in order to give a little more room for the exit. As the chickens come out, they are gathered in a warm place over the incubator, called the drying nest, in order, when dry, to be placed under the *mother*.

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* I have hatched a duck with three legs, that is, an imperfect and extraordinary one, proceeding from below the root of the tail. This lived and did well, as it had two good legs to stand upon; but the third one was often pulled at by the others.

PRODUCE.

I will at any time undertake to produce more good chickens from a hundred eggs, than can be shown to be hatched by fowls from another hundred out of the same basket, provided always that the fowls shall have no more than ordinary attention bestowed on them, and provided that this is done by disinterested persons. I shall gain by the accidental circumstances attendant on the incubation of fowls.

General Directions.

CLEANLINESS is of great importance, and in this respect you cannot be too careful, particularly where a great many are to be reared. Their place should be cleaned, and well ventilated, every day. Dirty water is very hurtful to chickens of any age, and will alone be sufficient to breed distemper, and cause them to die without any apparent cause.

At six weeks old, the chickens should be removed from the mother, and placed to roost on small perches, three feet and a half from the ground, in a warm place, and every evening, when they go in, they must be put up to roost, as you have no fowl to entice them; in a few evenings they will go up of their own accord.

Too great crowding of the chickens must be avoided at all times, as this of itself will create disease. Should any illness appear, such as sneezing, or watery or sore eyes, those affected must be picked out with the greatest care, and killed. This will root out the evil; whereas, the time spent in curing a chicken does not pay, and suffers the disease to spread, therefore, I say, nip it in the bud.

There has been fully as much nonsense written on the diseases of poultry, as upon artificial *hatching*, but I could never discover the diseases, nor the pretended causes. Disease is, for the most part, engendered by bad feeding, bad water, bad air, or want of cleanliness, and so on; and the only remedy is to root out the cause.

In rearing chickens with the artificial mother, we must not run into any extreme. Inasmuch as the fowl often gives the chickens too much labour in following her, they must also get too little exercise when she is cooped up. With the artificial mother, it is better to entice them gradually to feed at the further end of the enclosure. This will cause them to spread, and take salutary exercise; but when very young, or during bad weather, they must be fed in-doors.

It is good for the chickens to be well fed, but they must not be surfeited; they are naturally very ravenous, and even when full of their ordinary food, will cram themselves to repletion with something more enticing; for which reason I much prefer giving them their mite of meat, or other delicacy, previous to the ordinary meal, or when they are hungry. It is well to let them be hungry once a day.

In speaking of chickens, I wish always to be understood to include turkeys, guinea-chicks, pheasants, partridges, and all young poultry; as they fare very well alike; turkeys are very fond of vegetables of the onion kind, which they eat ravenously, and this food is very good for them.

The different kinds of chickens should be kept separate, or at least separated when a few days old, unless in case of necessity. If turkeys are kept with chickens, it must be with those of a less age, as a turkey chicken is very slow and stupid in comparison.

The ground and situation best adapted for poultry, is a sandy loose earth, not too elevated, but dry and sheltered.

ON THE INSTINCTS OF DOMESTIC POULTRY.

It is a beautiful, amusing, and instructive occupation to watch the instincts implanted by beneficent Nature in animals to which we refuse altogether the power of reason; still, how difficult is it, in some cases, to distinguish between reason and instinct. Thus, the smallest and meanest animals often have memory, and I think memory forms a part of reason rather than of instinct; for my part, I feel forced to the opinion that most animals, although largely endowed with instincts, have some portion of memory and reason, but not of judgment. Memory is certainly a component part of animal organisation, and appears to be entirely independent of instinct. I shall cite some instances, explanatory of my views on this head:—

Young chickens, only hatched a few hours, having always been in the dark, will, on being brought to the light, immediately begin to peck and eat any object in their way. This is most certainly instinct; let them once feed or drink, and they will *remember* where to return for it.

Lay a piece of glass upon the ground, and young chickens will attempt to drink, and young ducks will attempt to dive and wash in it; nor will they desist, even when they find they cannot sink below the surface, but continue in their error—this is, of course, supposing real water out of their reach or knowledge.

If young chickens are being reared without a fowl to direct them, supposing them never to have drank—say at a day old—one accidentally runs into the water-trough; he turns round and begins to drink. The moment he raises his bill in the air to swallow the water, you will see all the others run to him, and begin to do the same. This is instinct, which both directs him to drink and his mates to

know he is drinking. At a few hours old, if, say, twenty chickens are put within, we will suppose, two feet of any warm place—for instance, the artificial Mother—they will separate in every direction ; some, of course, approaching the warmth, although at the distance of two feet they could not have felt it; some having gone in the opposite direction. Those which feel the warmth, make a peculiar, or, I may say, comfortable chirruping, which those at the opposite part of the enclosure understand, when they will approach and get also under the artificial Mother. How beautiful to contemplate, that even a chicken is born to a natural language; the same fact following, no doubt, through all grades of animal life!

Observe the various instincts of poultry in their search for food. Can it be credited that a chicken of two days old (never having had the example set by an older bird) will scratch on the ground like an old fowl, and each time step back and look for something where he has scratched? Thus, a chicken a day old (if only provided with shelter and warmth) is perfectly competent, through instinct and organization, to procure its own living. Instinct is again exemplified in the different choice of food made by different young animals. Young turkeys immediately fly ravenously at anything green, such as cives or nettles, held in the hand; chickens prefer small atoms or grains, such as bread-crumbs, small seed, or groats, always giving preference to the bit, if any, which is in motion at the time. Chickens will eat very quietly together at ordinary food; but if one of them picks up a worm he gives a peculiar cry,—all the others immediately give chase after him, being apparently aware of the nature of his prize, when, eventually, the worm becomes torn to pieces, several getting fragments as the reward of their exertions. Nature seems to have ordained this that they may unite their strength, an

ordinary worm being too large for a small chicken either to swallow or tear to pieces, unassisted.

Having hatched some moor-hens, I was so long in making the discovery of how to feed them, that some starved to death; they would neither eat from the hand, nor peck. It was very difficult to force the smallest morsel down their throats: in fact, I was totally discouraged. I found, however, at last, that it was necessary to hold bits of worm over their heads, when they ate ravenously. I was repaid for my trouble by rearing them. Turkeys will also begin to feed best from the fingers. By knocking on a board, young chickens will immediately run to your hand. I take this to be their supposition that something is being eaten, from their memory of the effect produced by their bills in striking or pecking.

I found, one evening towards dusk, a young chick of about three weeks old, that had been accidentally left out of doors when the others were put in, perhaps an hour or more before; this chicken, or any other, would not on ordinary occasions allow himself to be caught, if he could prevent it; now, however, feeling his forlorn situation, the moment I was in sight he ran up to me as fast as he possibly could, and came to my hand to be taken up: when in the house, among the others, he was just as averse to being re-caught.

Chickens will learn to come to feed at any call you may please to adopt; but there is no doubt that the most natural and pleasing is that which nearest resembles the clucking of the parent fowl.

I will finish these observations by the question:—Is it thought, or instinct, that teaches a drake to be a match for the best cock and to perfectly conquer him? I have seen several fights of this kind, and never once saw the cock come off victorious. It generally happens in this way, the drake being invariably the attacking party:—The poor cock is quietly

strutting about near the drake, not in the least thinking of a fight, when he finds some of the fine feathers under his tail rudely plucked out; he jumps, of course, but immediately turns round to see who is the attacking party; now the drake makes not the least appearance of fight, but keeps quiet, and looks as innocent as he can; the cock not discovering any party hardy enough to show fight, quietly turns round to walk away; he is no sooner turned, than another lot of feathers is plucked from the same tender place; this time he turns round, and strikes his spurs at the drake; but, as he cannot do this without jumping up, the drake lowers his head, and receives no harm from any of the blows; the cock then tramples on him, crows, and would, if allowed, walk quietly off. Not so, however; he has reckoned without his host; for he no sooner steps off the head of the drake, thinking him dead, than his seat of honor receives another pull. This operation is continued and repeated, the cock doing all the hard work and receiving all the punishment; while the drake has only to allow his head to be quietly walked upon, raise it up again, and do more mischief. At last, the cock starts fairly for a run. It is then amusing to see the drake suddenly arouse and show his true colors; he opens his bill as wide as he possibly can, and follows the cock with the apparent intention of swallowing him, until the cock has fairly outrun him, in his fear of this dreadful extremity.

REMARKS.

The inventor of the process described in the foregoing pages has opened an exhibition at 4 Leicester-square; where may be seen in operation an instance of the wonderful work of reproduction; the means by which one season is made to resemble that of the preceding year; one plant its progenitor, and that animal one of the same species preceding it. It is through reproduction that all the great variety of nature is in some instances originated, and in others perpetuated.

How truly wonderful are the workings of the Supreme, if only read in the most insignificant of his productions! how much more are we forced to marvel, when by dint of immense labour and research we are enabled to form some partial estimate of the beauty and perfection of the means He employs! Judging from the little knowledge we are able to get, what an infinite fund remains still secret!

What more beautiful subject can be found for the cultivation of the rising intellect, than that of the gradual germination, progression, and perfection of an animal? We are prone to admire the rise and growth of a plant, from a seed to a bush, from a bush to a majestic tree,—the bud to the flower, the flower to the fruit. Still, this is but inanimate nature. How much more worthy of contemplation, when all the attributes of organization are coupled with the power of locomotion and thought!

I will finish these paragraphs by the remark, that there is nothing in this exhibition but what may be seen with the utmost propriety by ladies or children. It will always be witnessed with renewed pleasure; and persons would indeed be devoid of understanding or reason, who could see this beautiful process without bending the heart to the Omnipotent.

APPENDIX.

It may be true that poultry has been brought out by artificial means, but the produce has been so inadequate to the expense, that all inventors have abandoned their enterprise, so far as remuneration went. The non-existence, in the United Kingdom, of a system in operation for the purpose of gain, is surely conclusive evidence that all past inventions have been of no practical value. It could not fail to be otherwise, for all sought to maintain one uniform temperature all around the eggs, which more frequently baked the chickens in the shell than hatched them. It would be useless hatching poultry unless they could be well and cheaply brought up as food for the community. The *Cantelonian System* does this; and, by means of it, poultry has been hatched and reared to a great extent.

Allowing a hen two broods, of thirteen eggs each, a year, she will raise only, on the average, eight chickens out of the thirteen. The patent process produces eighteen times a year, on the average seventy-five birds from one hundred eggs, and thousands of them at a hatch, or as many as the incubator may be made to accommodate, and it is capable of being fitted up to produce millions every day.

The plan of production and feeding is so rapid that, at the expiry of ninety-six days, the poultry is fit for market. It is only needful to reserve a few laying stock. Can it fail to be obvious the difference of eighteen broods a year instead of ten—hundreds instead of ten at a hatch—and marketing poultry in

thirteen or fourteen weeks, instead of one, two, or three years, as is the present practice? The principle applies to ducks, turkeys, game, &c., and there is not a nest of pheasant's or partridge's eggs, that might be disturbed by the mowers or other cause, that could not be hatched fully out of the shell, and the birds set upon wing.

Poultry thrives best on variety of food. All animal offal, liquid or solid, may be used to feed the creatures. Graves, and the refuse of the sugar-refiner, brewer, distiller, and baker; overplus fish, and broken meat; the outer leaves of vegetables, even some weeds, with tail corn and damaged grain, Indian corn, rice, and the kernel of the coca-nut: this last will fatten and finish poultry with a most delicious flavour.

By a small reduction of price, surely much more poultry might be sold, were it produced. From 480,000 farms, it is estimated that they do not send to market more than 9 or 10 million head of poultry a year, to supply the whole population of the United Kingdom, shipping and all, which is not one-third of a fowl to each person a year. Were every one to have a fowl as part food, once a month, it would take 326 million more of fowls than are at present produced, which would require 893 Incubators, giving out 1000 fowls a day, or 250,140 trays of 100 eggs each, to supply the deficiency. Many children and poor old people might be kept out of the workhouses, and engaged in this business. So cleanly and free from smell are the Incubators, that they may be put in a parlor, are best accommodated in the basement floor of a house, or may be most efficiently set up in a conservatory.

The business is so simple that any one of ordinary capacity may manage it, by following the printed rules sent out with the Incubators; and many whose health is suffering by confined occupations in towns, might safely resort to a cottage and a garden in the country, to rear poultry to support their families, and to produce wholesome and delicious food for the community.

The profits of the business are large, and embarking in it can hardly be considered as a speculation; for there will ever be a demand for food, and even vegetables cannot be produced with greater rapidity than poultry by the *Cantelonian System of Hydro-Incubation.*

Land of the poorest description, and otherwise almost valueless, is suitable for the purpose of a poultry farm, provided it has a dry bottom or is well drained; and the deposit of the fowls would enrich it, to produce good crops of corn, were their walk occasionally changed. The guano left in the roosting houses would go a great way to pay expenses, and even feathers come to something.

Much misconception on the feeding of poultry prevails. It is said to be more costly than feeding beasts; on the contrary, to feed up an ox to 1,200 pounds weight, usually takes five years—to produce the same weight of poultry can be accomplished in three months, at less than half the cost. Thus the return would be quicker; and capital employed in the Cantelonian poultry business may be made to do wonders.

To ascertain the cost of a fowl, I have made many experiments and trials; and, without the run of a farm-yard, I reckon 8d. will amply pay for the food of a fowl up to three months old. One day, namely on

the 7th Oct., 1847, when I had on hand 1270 chickens, of all ages, from a day to ninety-six days old, which were hatched out from a 4-tray incubator which I had in operation, I gave them:—

	s.	d.		s.	d.	
4 quarts of barley	0	8	or	41	8	a qr.
2 „ wheat	0	6	or	66	8	„
1½ pint of grits	0	4				
Two-thirds of a bushel of potatoes .	0	8	small sorts			
20 lb. Indian corn meal . . .	2	1	or 20s. a barrel			
30 lb. barley meal	3	0	or 19s. a bag.			
12 lb. graves	3	0	or 3d a lb.			
Cabbage	0	6				
Suet for those in coops . . .	0	4				
	11	1				

Multiply 11s. 1d. by 96 days, and divide by 1270, and the cost of a fowl, 96 days old, will be found 10d. But as the above were famine and retail prices, it is not too much to state 8d. as the cost of feed of a fowl at that age, and they might be produced for even less.

ESTIMATE *of the Cost of Working, and anticipated Profits of a One-Tray Patent Hydro-Incubator, for* 1 *Year.*

	£	s.	d.
2,000 Eggs, at 1d. each	8	6	8
1,350 Chickens in the Year, at a cost for Food of 8d. each	45	0	0
Charcoal for One Year	4	10	0
	£57	16	8
Chickens are seldom less than 5s. a couple in London, say 1,350 at 2s. each . . .	135	0	0
Deduct Expenses of Hatching and Rearing .	57	16	8
	£77	3	4

This is independent of the cost of the Incubator and fitting-up, say £50; but of course this capital remains on hand, £77 3s. 4d. left to pay Rent of Cottage and Gardens, Management, &c.; but it must be observed that returns begin to come in at the end of four months.

ESTIMATE *of the probable Cost, Expenses of Working, and Profits of a Six-Tray Incubator, for one Year, to produce Twenty-five Chickens per Day for market.*

Cost of 10,800 Eggs, at 1d. each	45	0	0
Feed of 8,100 Chickens, at 8d. each	270	0	0
Charcoal for the Year	15	0	0
Attendance	50	0	0
Rent	30	0	0
Current Expenses for the year	410	0	0
Sale of 8,100 Chickens, at 2s.	810	0	0
Left to pay Interest of the Capital employed	£400	0	0
Which would be—			
Incubator	127	0	0
Buildings, &c., say	100	0	0
Three Months' Expenses before Returns come in	100	0	0
Necessary Capital	£327	0	0

Estimate for a 60-Tray Incubator to produce 200 Chickens per Day, and 16 Artificial Mothers for rearing them, including the Price at the Manufactory

	£1,600	0	0
Necessary Buildings, such as House for Incubator, Rearing Sheds, Roosting Houses, Basking Sheds, Workshop, Fencing, Divisions, Fittings-up, &c., &c.	3,400	0	0
Furniture of Offices, 2 Horses, 2 Carts, Harness, Tools, Troughs, &c.	300	0	0
Cost of Feed for 24,333 Fowls (this being the number on hand before returns begin), at 8d. each	812	0	0
Labour, Four Months' Market Expenses, Superintendence, Clerk, &c.	500	0	0
	£6,612	0	0

Supposing a net profit of only 6d. each, we have a return interest or profit of £2,434 per annum on a capital of £6,612.

LIST OF PRICES

Of the CANTELONIAN PATENT HYDRO-INCUBATORS and Chicken Mothers, for Hatching Eggs and Rearing Poultry.

Orders for the Incubators, from 20 guineas each, upwards, are solicited by Mr. CANTELO, at his Rooms, 4, Leicester-square.

Agents throughout the Country are wanted.

EVERY one, who has room for it, ought to have a CANTELONIAN INCUBATOR, to rear poultry. Noblemen and sportsmen are solicited to adopt these machines, to rear their game and fancy birds; and tradesmen, and public companies, to make profit. A Poultry yard attached to a Union Workhouse, would prove a great saving and advantage to feed the poor.

The smallest size Cantelonian Patent Hydro Incubator is 4 feet long, 2 feet wide, and 2 feet 8 inches high; and is made to hold 100 eggs. The price, cash, is 20 guineas.

The second size is for 200 eggs; 6 ft. long, and the same height and width as the other. The price is 40 guineas, and so on to any extent that may be desired; 20 guineas being the price for every tray of 100 eggs—so that an Incubator made to hatch 1,000 chickens, would be 200 guineas, and so on in proportion. The improved thermometer is 18s. extra; one answers for any size machine.

The Portable Incubators are made for 100, 200, 400, and 600, but not larger. When premises are determined on, for a greater scale, it is better to fix the apparatus. Printed instructions for the management will accompany machines.

The usual size of a Chicken Mother is 44 feet long, and the price 15 guineas cash, and so on, 15 guineas for every 44 feet long. These must always be fixed, and may be used to advantage, independent of the Incubators, to assist in rearing poultry by the ordinary slow method, and as a preventative against gapes, and other diseases, arising from cold and damp premises.*

It is not pretended that the patent incubator will hatch and bring up every egg to a fowl. From 12 to 30 per cent., after great experience, has been found to be the discount. A one-tray machine will enable the party who properly attends to it, to produce on the average 75 birds a hatch, and 18 of these in the year, being 1,350 fowls. A very different result indeed, from the hen, which sits but once or twice in the twelve months, and does not rear up above 8 chickens at a hatch. A two-tray incubator and one mother may produce 2,700 a year, and so on in proportion—a thousand-egg machine being capable of producing 13,500 full-grown fowls per annum. There is nothing in the principle to prevent millions of eggs being hatched 18 times in a year, by one machine.

Any person can, of course, calculate the sum they would amount to, according to the price at which he felt willing, or able, to sell his poultry.

Hens generally lay eggs after being six months old; but the Cantelonian system does not anticipate keeping a tenth of the poultry for laying stock, so that the quantity and profits arising from eggs is not here taken into account.

Any cottager, or tradesman, who has a small garden, might attend to a one or two-tray incubator in after-hours, and he

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* I also make portable Mothers, for moving about the lawn, for changing the ground in rearing game.

may easily calculate what could be gained by a few thousand chickens.

To accommodate a six tray-incubator with two mothers, there ought to be a house or shed, 140 feet long by 12 feet wide, and 8 feet high,—or say 70 feet long by 24 feet wide, and an acre of ground for the poultry to exercise in, in the open air. The poorest land possible will do, provided it has a dry bottom.

It is only needful to multiply the above statements by any proportions desired to give a fair result.

To estimate the value of the land and premises, to hatch chickens and rear poultry, is beyond the power of the Inventor of Practical Incubation by "Top-contact Heat." An acre of land may be had for £10 or 10s. a year. Sheds or poultry-houses may be erected to cost £10 or £100. The principle is all that can be advanced regarding these matters, and he hopes the details have been clearly expressed, that the Cantelonian Patent Hydro Incubators will yield 18 hatches a year, and that the price is 20 guineas for every tray to hold 100 eggs.—Game, Turkeys, Geese, Peacocks, Guinea Fowl, &c., can be produced on the same principle.

The price got for the birds, and the expense of management, must all depend on local circumstances.

Patents are secured for the United Kingdom and the Colonies, France, Belgium, Holland, and America; and the public must speedily be interested in the invention, as a new system of producing food. No party need spend his time or money experimenting on the business. It is after enormous labour and cost brought to complete practical perfection, and now only requires to be prosecuted to gain wealth.

A. MUNRO, Printer, Great Queen-street, Lincoln's-Inn Fields.