MECHANIZATION AND DEATH: MEAT

Centralization and Handicraft

***Paris, the Slaughterhouse of La Villette* (1863–7)**

THE Prefect of the Seine Department, George Eugène Haussmann, so wielded his almost dictatorial powers that in the space of seventeen years he changed the whole aspect of Paris and recast its technical organization from top to bottom. After the steps initiated by Napoléon I, the city had failed to keep pace with the times; Haussmann transformed Paris into a nineteenth-century metropolis.[1] He was the first to perceive the city primarily as a problem in engineering and organization. In keeping with his foresight and his preference for the large scale, he did not hesitate to provide, in his master plan, for a central slaughterhouse demanding an outlay of 23 million francs. And this he accomplished while his downfall was being openly contrived at every step. He began the building in 1863, opening it 1 January 1867, the year of the lavish International Exposition; yet the installation was not complete when the Second Empire collapsed.

The Central Slaughterhouse of La Villette (fig. 107) was erected on the outermost limit of the fortified belt. One side was bordered by manifold railway sidings, another by the harbor-like expanse of the Canal St. Denis, one arm of which flowed through the plant, whose buildings rose on either bank. On the two other sides, the Slaughterhouse was bounded by a broad military road and a lesser thoroughfare.

It was the first central slaughterhouse to cater to a population of millions. Its lairages, as Haussmann pointed out, could accommodate 'the number of beasts needed for Parisian consumption over a period of several days.'[2] In England and in Germany, vested interests stood in the way of any development such as conceived by Haussmann. Nowhere did anything comparable exist at the time. In his *Mémoires*, Haussmann gives his enterprise the prominence it deserves: 'The vast establishment is one of the most considerable works accomplished by my administration, paralleling the great sewer constructions. . . . I should not forget to mention that the millions it cost were in very large measure balanced by the sale . . . of the better situated lots of the old abattoirs that it replaced.'[3]

The 'old abattoirs' to which Haussmann refers in his *Mémoires* were the work of Napoléon I and represented the first endeavor to organize a slaughter-

[1] For the details of this development, cf. Giedion, op.cit. pp.465–501.
[2] George Eugène Haussmann, *Mémoires*, Paris, 1890–93, vol. III, p.561.
[3] Ibid. pp.560 and 561.

house along more hygienic lines. Napoléon's first decree dates from the year 1807, when he ordered the huilding of public slaughterhouses. The fleshers as a hody were pledged to slaughter nowhere else. In this way, five slaughterhouses were erected outside the city walls as they then stood, three to the north and two to the south of the Seine. In 1810 Napoléon issued a second decree, requiring that public slaughterhouses be huilt in every town of France, and — it was specified — outside the city limits.[4] This sanitary reform was to put an end to the murky doings of previous centuries. In the early years, public slaughterhouses spread rapidly through France and Belgium. With ever-fewer exceptions, they remained municipal property. They were regarded not as sources of revenue, hut as centers where the animals could he slaughtered under supervision. This left the position of the small butcher almost unchanged. To tlus day, in Europe, the areas from which the cattle are supplied have remained preponderantly local.

The 'abattoirs' of Napoléon I also gave their name to the American establishments and were still regarded as models of their kind up to shortly hefore the opening of La Villette. A pamphlet of 1866 remarks: 'Although the name of abattoir has heen given to these erections [American slaughterhouses] — taking the Parisian abattoirs as our models — we neither have perfected arrangements for cleanliness nor protection against fire nor conveniences.' We further learn that Napoléon's abattoirs 'are all conducted in the most rigid manner hy a guild or corporate hody of hutchers. . . . The hutchers have all their work done hy regular slaughterers at slight cost.' Moreover, the slaughterers retain 'an additional prerequisite in the hlood, rough offal, etc.' Of these, the hlood is held the most valuable part. It may he noted that hy mid-century the hlood is already heing saved and its value further exploited in industrial estahlishments. 'It is saved separately in stone wells, afterwards subjected to a scientific process, after which it is used for refining sugar and manuring the earth.' [5]

Just as Haussmann had enlarged Napoléon's Rue de Rivoli, so with the slaughterhouse of La Villette he took up a previously initiated development and pursued it further. Haussmann toiled over the slaughterhouse of La Villette with painstaking care, one might almost say with the consciousness of a mission to fulfil, on a scale so generous that the period has nothing to offer in comparison. It hecame *the* abattoir, a prototype for the rest of the century, just as the houlevards and puhlic parks of Haussmann's Paris became models from which every growing metropolis of the Continent took pattern.

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[4] *Handbuch der Architektur*, 4.Teil, 3.Halbband, Darmstadt, 1884, p.182.

[5] Thomas DeVoe, *Abattoirs*, Paper read before the Polytechnic hranch of the American Institute, Albany, 1866, p.19.

The whole installation bcars witness to the care with which the individual animal was treated. The great lairages (*bergeries*), with their lofts under the high roofs and their careful design, niight have stood in a farmyard; each ox had a stall to itself. Dominating tbe long rows of low slaughterhouses and administrative huildings were three gigantic halls of glass and iron, elegant in design. The central hall, with its nine aisles over 800 feet long (286 m.) served as a 'cattle-shelter' (*abri pour bœufs*). Here tbe animals were bought and sold. The two flanking iron constructions were intended for swine, sheep, and calves.

Later critics have dealt severely with Haussmann's central slaughterhouse. Around 1900 he was taxed with having 'hrought no modification to the dispositions adopted in 1810 for the first five abattoirs.' [6] This is perfectly true so far as tlie technical scheme is concerned. But such improvements were nowhere to be found in the Europe of 1860. At that time, even in America, mecbanical aids to slaughtering had not emerged from tbe experimental stage.

Certainly this criticism holds good for the methods of operation that prevailed throughout La Villette. A glance into the balls in which the carcasses were quartered attests the calm of the handicraft that no cog-wheel, no conveyor has sbaken; and tlus toward the end of the 'eighties, when in Chicago the assembly line had heen developed.

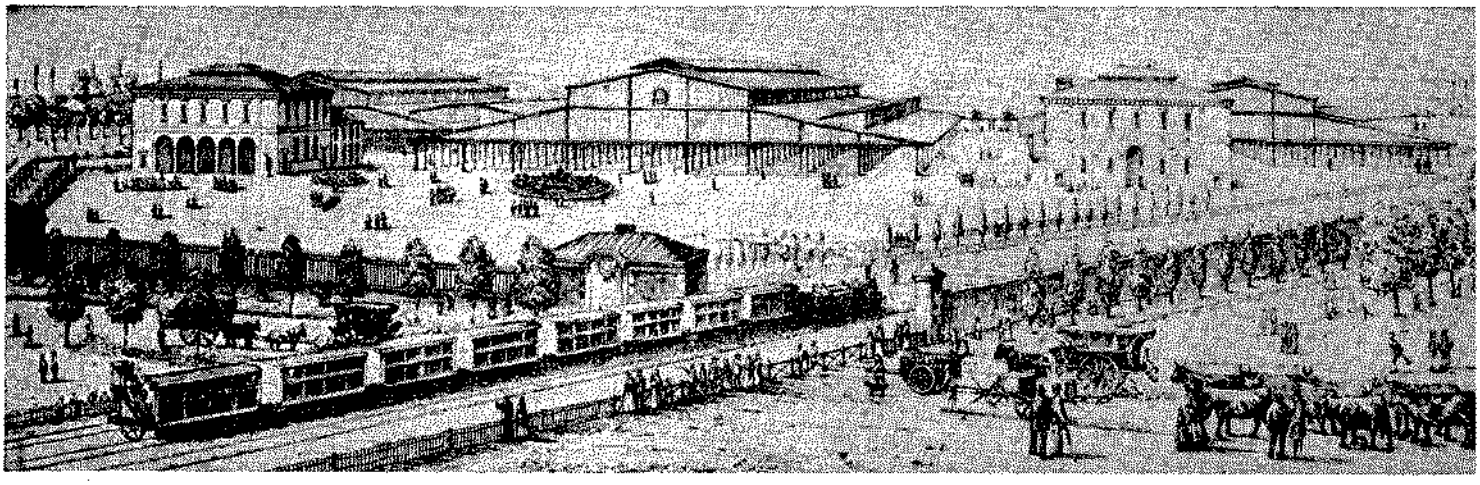
In this curious symbiosis of handicraft witb centralization lies the peculiarity of this establishment as well as of many others in Europe. In La Villette — another point of criticism — each ox had a separate booth in which it was felled. This is a survival of handicraft practices, to which the routine of mass slaughtering is unknown. The long houses in which the cattle were slaughtered consisted of rows of single cabins set side hy side. Long since, technical installations and slaughtering in large halls have superseded them. It may well be that this treatment in separate booths expresses the deeply rooted experience that the heasts can be raised only at the cost of constant care and attention to the individual animal.

The Great Plains beyond the Mississippi, where free tracts of grassland can be dominated from horseback and where the herds grow up almost without care, are implicitly related to the assembly line. In just the same way the peasant farm, where each cow has its name and has to he attended when giving hirth to its calf, is linked to handicraft methods in slaughtering.

***La Villette and Union Stock Yards* (1864)**

Tbis difference between tbe painstakingly raised animal and the herds growing np at minimum effort on the prairie is likewise reflected in the planning of tbe slaugbtering centers.

[6] *L'abattoir moderne*, 2nd ed., Paris, 1916, p.45.



107. Paris, Slaughterhouse of La Villette. 1863–7. *These iron and glass halls, prototype of the abattoir, were built by Haussmann, prefect of Paris under the Second Empire, on a scale unique in Europe. Each ox rested in a stall before its slaughter in a separate booth. Routinized mass slaughter is alien to this calm, handicraft atmosphere. Europe's strongly rooted feeling that each animal needs individual care explains this symbiosis of handicraft and centralization.*

What was going on in America at the time Haussmann built the slaughterhouse of La Villette?

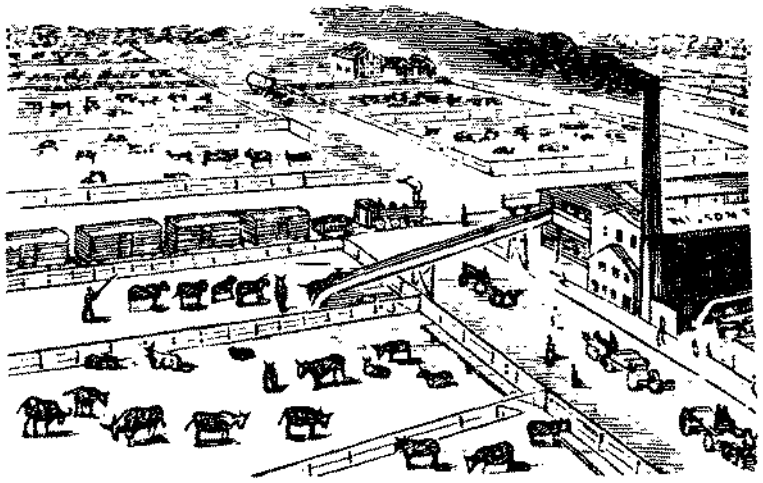
Chicago was engrossed in its first and wildest expansion. It had the same problem to centralize the cattle lairages, to gather them in one place. This led to the founding of the Union Stock Yards, thenceforth the greatest cattle market in the world. Haussmann, having once opened La Villette, did not again set eyes on the plant during his administration. The decision to found the Union Stock Yards was made late in 1864. 'Work was commenced on June I, 1865, and by Christmas of that year the yards were thrown open for business. The yards were laid out as a rectangular figure, with streets and alleys crossing one another at right angles. About 120 acres were covered with pens when the Yards were opened. . . . Every railroad entering Chicago is connected with the Stock Yards.'[7] By 1886, when Andreas wrote his history of Chicago, the railroad trackage surrounding the stock yards had grown to a hundred miles.

Here were no iron halls or stalls for the cattle; these animals brought in from the great plains had never known stalls. Summer or winter they could remain in the network of open pens of which the Stock Yards consisted. Thus the yards (fig. 108) formed a collection and market center, from which the cattle were driven directly up an open gangway into the top storey of the packing houses.

Here was no architectonic plan.

Built entirely of wood, and doubtless gradually, no one has ever thought of making a general plan of it. All has been constructed in haste and according to the needs of the

[7] A. T. Andreas, *History of Chicago*, Chicago, 1886, vol. 3, p.334.



108. Chicago Stockyards in the Early 1880's. *Begun in 1865, while La Villette was still under construction, the Union Stockyards correspond to American conditions. The wild herds brought in from the great plains needed no shelter. Summer and winter, they could wait in open pens; from this assembly point they ascended to the top of the packing house by uncovered gangways.*

moment. It is a true labyrinth of sheds and enormous halls that communicate in various ways by passages, staircases, and suspension bridges, over which pass the workmen and over which runs the railway. Without a guide, one could never find his way in these immense structures.[8]

This description is of the time when the processing of livestock had reached a high point, over five million hogs yearly passed through Chicago's Union Stock Yards. The plants had a processing capacity of some 200,000 hogs daily, a figure which La Villette at that time did not equal in a whole year.[9]

The Mechanizing of Meat Production in America

The American meat industry is rooted in the very structure and dimensions of the land. Only these can explain its origin and its character. Long before industrialization gained this domain, its prerequisites were already framed in the configuration of the land.

[8] *Scientific American*, 21 Aug. 1886, p.120.

[9] These figures alone give a distorted picture of the whole. We have therefore brought the yearly turnover of Chicago and of Paris side by side. The Parisian data are drawn from *La Grande Encyclopédie*, Paris, 1884; the Chicagoan from Andreas, op.cit. vol.3, p.335. Comparison of the yearly requirements not only affords insight into food preferences; it also points up the divergent ways of Europe and America. Paris slaughters twice as many sheep and six times as many calves as Chicago. Chicago slaughters pigs to about thirty-three times and cattle to about nine times the Parisian numbers. One firm alone, Swift and Co., in Chicago processes in this year about twice as many cattle as consumed by Paris in the same period (Swift and Co.'s production for 1884–5: 429,483 head). One also notes that America does not subdivide the heading 'Cattle.' In Europe the flesh of the cow is held in low esteem, hence the lower Parisian figure; that of the ox, on the other hand, is highly prized. But in the United States oxen, used as beasts of draught on small farms, are killed in decreasing numbers.

1883	*Cattle*	*Calves*	*Pigs*	*Sheep*
Chicago	Cattle, 1,878,944	30,223	5,640,625	749,917
Paris	Oxen and Bulls, 184,900 Cows, 43,099	189,490	170,465	1,570,904

So long as only Pennsylvania or the New England States were settled, it was possible to preserve the customary European scale: small-farming, self-contained, independent farmsteads. The cities were modest in compass, but lay within easy reach of the cattle-raising districts; numerous villages were scattered through the countryside. Agriculture and stock farming followed the traditions brought over from Europe. But after the war of 1812, as soon as the settlers passed the crest of the Alleghenies and encountered American dimensions, the situation altogether changed. It was easy to raise great herds of swine, sheep, or cattle, but no consumers lived near by. On the spot, the products had no value: The herds had to be driven across wide stretches and over the mountains to the towns in the East, regardless of all hazards and losses.

These extremes of sparsely populated areas far from the consuming centers persisted in America until well into the latter half of the nineteenth century. Such contrast between urban concentration and gigantic undeveloped regions did not exist in Europe. To this day in Europe the meat supply is largely local, while in America producer and consumer live far apart.

Technical conditions have changed in the course of the century. But, around 1820, as soon as slaughtering tended to concentrate in one locality, Cincinnati, which could not itself consume the products hut was forced to export them, the *raison d'être* of the American meat industry became clear. It operates on the assumption that vast areas of the land shall draw their provision of meat from a central place. The meat was either moved on the hoof or shipped, salted in barrels, down the Mississippi. Later on, when Chicago gained ascendancy in the 'sixties, the cattle were loaded into freight cars to be moved East; finally, at the beginning of the 'eighties, the supply system of today was set up, and refrigerator cars distributed the dressed carcasses to the various centers of consumption.

From these heginnings developed the largest industry of the United States, as measured by turnover, 3.3 billion dollars (in 1937), and with a production of some 50 million pounds a day.

The Beginnings of Mechanization: Cincinnati (1830–60)

It is still uncertain how the separate phases slowly emerged to build up a meat industry of continental proportions, the whole form and operation of which make it almost a precision instrument. The drive and inventiveness it represents can he judged by comparison to the same industry in South America. Some insight into the way it evolved is nevertheless possible today.

The industry has its origin in the State of Ohio, center of production during

the early nineteenth century; it centers around the city which European observers up to the 'fifties deemed the westernmost point in which settlement was safe. Cincinnati lies on the Ohio River, the most abundant tributary of the Mississippi, about half way between the industrial city of Pittsburgh and the confluence of the two rivers. The river was to Cincinnati what the railroads later became to Chicago, its life artery; the South was the natural consumer; the export trade passed through New Orleans. Throughout the period of Cincinnati's rise — the peak was reached toward mid-century — there existed no convenient mode of transportation to the consumer-centers in the East.

The products were almost worthless at first, even in Cincinnati. 'I have referred to the remarkable fact,' says Charles Cist,[10] historian of Cincinnati, in 1866, 'that there was a period in the West when corn would not, in some sections, command six cents per bushel, and in others was of so little value as to be substituted for wood as fuel.'

In the effort to absorb an abundant corn crop, Cincinnati resorted to condensing it in the form of whisky or hogs. The broadness of the land made it possible to let the hogs run in the woods to feed on acorns and beech-nuts 'until five or six weeks of killing time, when they are turned into the corn field to fatten.'[11] Production figures soon reached a height that seemed no less extraordinary to European eyes than did the method of raising the animals. 'Some of these farmers drive in one season as high as one thousand head of hog into their fields; from 150 to 300 are the more common numbers, however.'[12]

This led directly to overproduction. The packing industry could not cope with the entire bulk of material produced. Here, very early, appears a symptom that in the course of the century becomes ever more conspicuous in American life: surplus production and its artificial dissipation. While first appearing in the agricultural domain and in relatively sparsely populated districts, it was later imparted to nearly all branches of production by a highly intensified industry.

When the large-scale industrialization of meat production set in, surplus production led Cincinnati to use only the most valuable parts and to throw the remainder into the river:

> Not less extraordinary is the fact, within the knowledge of hundreds now in Cincinnati, that in the early ages of pork packing, say in 1828, there was so little demand for any

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[10] Charles Cist, 'The hog and its products,' *Commissioner of Agriculture Report*, 1866, p.391.

[11] Charles Cist, quoted in C. F. Goss, *Cincinnati, the Queen City*, 1788–1912, Chicago, 1912, 4 vols.; vol. 2, p.334.

[12] Ibid.

portion of the hog, other than hams, shoulders, sides and lard, that the heads, spare-ribs, neck-pieces, hackbones, etc. were regularly thrown into the Ohio River to get rid of them.[13]

At that time, Cincinnati processed about 40,000 hogs a year.[14]

It is a far cry from this phase to the meat industry of today, which attempts to utilize all its by-products, down to the pea-sized pineal gland of the hull, 15,000 of which produce one pound of pineal substance; or the gall-stones, which are shipped to Japan to be carried about by individuals as talismans or charms.

In the early days of Cincinnati, slaughtering was conducted as a process distinct from packing and preserving, and the work was performed in separate places. Such a division still marks the European practice. 'The packing houses were located on the wharves or close by, for water transportation, while the slaughter houses were outside the settled city area. The meat for packing was carried through the city streets from the slaughter houses to the packing houses.' [15]

Altogether different was the method of slaughtering and dressing the beasts. As we have noticed,[16] the traveler, as far back as the 'thirties, was struck by the carefully planned organization of the slaughtering. The work could be carried on only in the cool season, the load of an entire year descended on the slaughterhouses in late autumn. Masses of highly perishable products had to be processed with all possible haste. This led to a minute division of labor, step by step, manipulation by manipulation. In much the same way in England at the same period the ship-biscuit bakery substituted mechanical devices wherever the nature of the material allowed. All other considerations were subordinated to the question: How to secure an uninterrupted production line?

Around 1850, slaughterhouse and packinghouse were already united under one roof. William Chambers [17] of Edinburgh, publisher and editor of the *Encyclopedia*, acquaints us with what was then (1854) the largest establishment in Cincinnati. It was four storeys high; an inclined plane led to the top of the building. Up this path the pigs were driven, and slaughtered on the top storey. Thus, in the middle of the century appears the principle of today's packinghouses: to utilize the animal's own weight to transport it downwards from floor to floor by the force of gravity.

William Chambers adds somewhat sarcastically that in England the sufferer is privileged to convey the news of his death to his neighbors by uttering shrill cries. 'In Cincinnati there is no time for this. Each hog entering the chamber

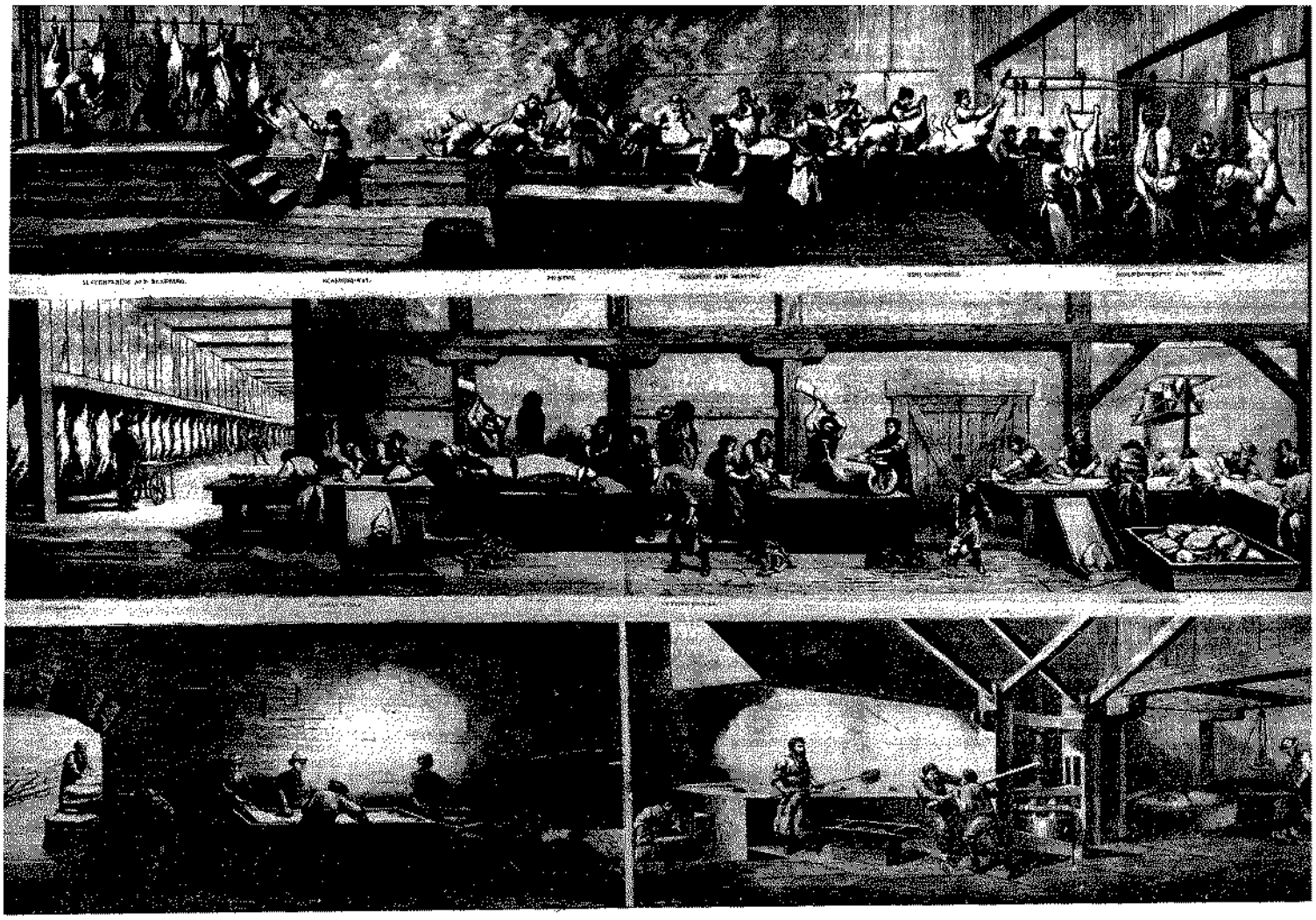
[13] Charles Cist, quoted in C. F. Goss, *Cincinnati, the Queen City*, 1788-1912, Chicago, 1912, 4 vols.; vol. 2, p.391.

[14] Goss, op.cit. vol. 2, p.334.

[15] Malcolm Keir, *Manufacturing*, New York, 1928, p.257.

[16] In the chapter 'The Assembly Line.'

[17] Chambers, *Things as They Are in America*, 1854, p.156.



109. Cincinnati, Hog-Slaughtering and Packing: Panoramic Painting. 1873.
Clutching and slaughtering: '*The ends of the arms of the tong are joined to a chain connected with a pulley resting on an aerial iron rail, suspending the live hog head downwards, and the suspended animals are pushed forward in the presence of the executioner . . .*'
Scalding and scraping: *These are here still performed by hand. The following phase represents the origin of the assembly line:*
Disembowelling: '*The tendons of the hog are slipped over the end of the gambrel placed upon a hook attached to a grooved pulley that runs on a suspended single track railway. One man splits the animal, the next takes out the entrails, the third removes heart, liver etc. and the carcass is washed by the hose-man after which it is rolled along the rail to the drying room.*' (*See Fig.* 49)
Drying room and trimming tables. Curing cellars and lard rendering. (Harper's Weekly, 6 *September* 1873)

of death receives the blow with a mallet on the forehead which deprives him of consciousness and motion. The next instant he is hled to death.'

Frederick L. Olmsted, designer of Central Park in New York and one of the most farseeing landscape architects of his day, visited the packinghouses of Cincinnati around the same time. But he preferred not to witness this part of the procedure. He seems to have seen another plant: 'The vast slaughter yards we took occasion not to visit, satisfied at seeing the river of blood that flowed from them.' [18] The more vividly does he convey his impression of the division of labor, passing over technicalities. He recognizes that here already, even in the absence of cogwheels, men's hands are trained to function like machines.

[18] Olmsted, *A Journey through Texas*, New York, 1857, p.9.

We entered an immense low-ceiled room and followed a vista of dead swine upon their backs, their paws stretching mutely towards heaven. Walking down to the vanishing point we found there a sort of human chopping machine where the hogs were converted into commercial pork. A plank table, two men to lift and turn, two to wield the cleavers, were its component parts. *No iron cog-wheels could work with more regular motion.* Plump falls the hog upon the table, chop, chop; chop, chop; chop, chop, fall the cleavers. All is over. But before you can say so, plump, chop, chop; chop, chop; chop, chop, sound again. There is no pause for admiration. By a skilled sleight-of-hand, hams, shoulders, clear, mess, and prime fly off, each squarely cut to its own place, where attendants, aided by trucks and dumb-waiters, dispatch each to its separate destiny — the ham for Mexico, its loin for Bordeaux. Amazed beyond all expectation at the celerity, we took out our watches and counted thirty-five seconds, from the moment when one hog touched the table until the next occupied its place. The numbers of blows required I regret we did not count.[19]

***Mechanization Extended: Chicago* (1860–85)**

Cincinnati, long after it had been overshadowed by Chicago, remained the place with the widest experience in the packing industry. Here new appliances were tried out and their efficiency put to the test.

Despite the mass of material processed, Cincinnati still relied mainly on local supplies. When the landscape architect Frederick Law Olmsted left Cincinnati for Texas by road, the coach horses were obliged to wade slowly through 'droves of hogs grunting their obstinate way towards Cincinnati and a market. . . . Though the country was well wooded,' he asserts, 'I venture to say we met as many hogs as trees. . . .' [20]

The local provisioning sufficient to Cincinnati's packinghouses contrasts strongly with what occurred later at Chicago. The enormous quantities that this center had to process required a gigantic area of supply. In Chicago we are dealing with dimensions for which there is, even today, no yardstick. A spontaneously growing center of force, it embodies, as few other places do, that brutal and inventive vitality of the nineteenth century. Increasingly it became the most important link between the raisers and the consumers of a vast country.

At the beginning of the 'seventies — just before the world crisis of 1873 — an observer [21] speaks of the incalculable potentialities of this city. This readiness for achievement unlimited in scope gave the necessary impulse for large-scale experimentation. As soon as the industry began to process animals by the million, the necessary instruments lay at hand. Mass production of raw material (grain, cattle) parallel with mechanization of processing (machinery,

[19] Olmsted, *A Journey through Texas*, New York, 1857, p.9.

[20] Olmsted, op.cit. p.12.

[21] James Parton, *Triumphs of Enterprise, Ingenuity and Public Spirit*, New York, 1872, ch. II.

assembly line), transportation and storage facilities (railroads, refrigerator cars, and refrigerated storehouses) were developed side by side.

When a modest settlement, Chicago had a local area of supply. In 1839, '3000 head of cattle had been driven in from the neighhouring prairies, barrelled, and exported.' [22] Soon the near-by Midwestern states were included; this area of supply likewise proved inadequate.

The great plains west of the Mississippi, stretching from the Gulf of Mexico almost to the Canadian border, were transformed, in little over a decade, into a gigantic reservoir of cattle. The wave moved from the South upwards. There, the Spanish colonists had already bred their Texas Longhorns. In the brief period from the Civil War to 1876, the herds spread over the plains of twelve states. On the prairie, there were no boundaries, no fences; the range was masterless and free. 'The rapidity of this expansion has perhaps no parallel in all American history.' [23]

The same question that faced Cincinnati about 1830 arises once more in the giant domains of the Cattle Kingdom: What is to be done with the surplus? How are the purchasers to be reached?

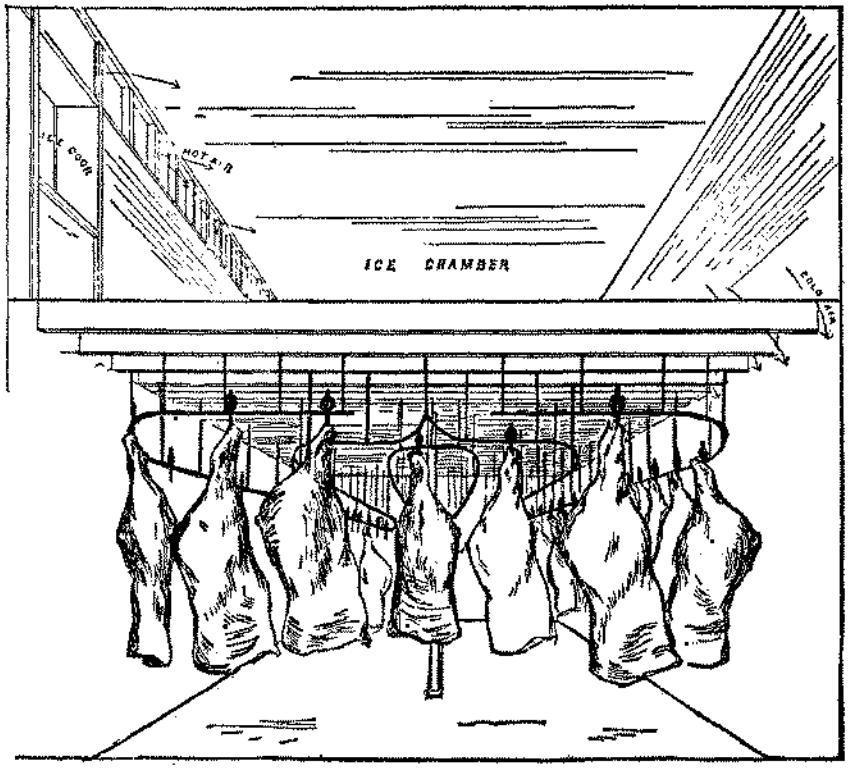
Only bazardous trails were available on which to drive the cattle to the buyers. Faced with these almost insuperable distances, even the cattle dealers became planners and strategists. The most talented of them all, the Chicagoan J. G. McCoy, hending over maps, calculated 'where the cattle trail from Texas would cut the railroads then pushing west.' [24] An ahandoned settlement, Abilene, in Kansas, north of Texas, seemed the most favorable point. It consisted of twelve shacks; prairie dogs were bred there. Within sixty days McCoy had provided accommodation for over 3000 bead of cattle (1867). In autumn of the same year, he shipped 35,000 head. Nearly every train was bound for Chicago. By 1869 the figure had multiplied tenfold, and in 1871, some 700,000 head were consigned to the packingbouses of the Middle West.

THE REFRIGERATOR CAR AND STOREHOUSE

Parallel with the formation of this reservoir of cattle ran many-sided experiments seeking to create the machinery needed for the mass processing of the animals. We shall later examine more closely certain phases of this achievement, for only thus can we gain insigbt into the methods that were tried.

Chicago remained isolated for a comparatively long while. Not until 1856 did it receive its first railway link with the eastern cities. With the mid-century

[22] Parton, op.cit. p.44.
[23] Walter Prescott Webb, *The Great Plains*, Boston, 1936, p.207.
[24] Webb, op.cit. p.219.



110. Swift's First Successful Storage Refrigerator. New York, 1882. *After twenty years of failure, Gustavus Swift succeeded by careful planning in bringing chilled meat to the markets of a distant metropolis. 'The new departure depressed the market by three to four dollars the hundredweight.'* (Harper's Weekly, 21 *October* 1882)

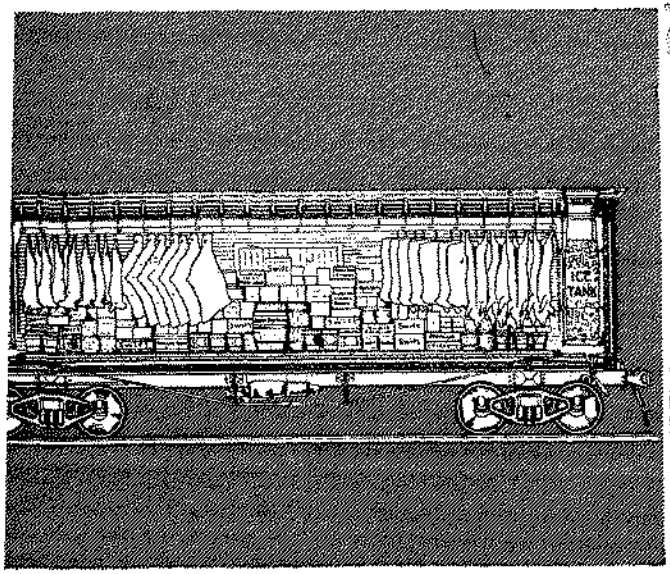
a more intensive widening of the railroad network began. 'It was in 1849 that the whistle of the locomotive was first heard on the prairies west of Chicago,' if only over a ten-mile stretch.[25] In 1850 a portion of the northwestern prairie in the State of Illinois as far as Galena was also brought in. In the 'sixties repeated spanning of the entire continent was successful. At the beginning of the 'seventies, the Chicagoans hoasted of a train leaving every fifteen minutes.[26] In the same decade, the competing lines grew so powerful that a debacle ensued, with open warfare against the railroad companies.

During the 'fifties, to escape the drawhacks of seasonal operation, summer slaughtering was introduced so far as was then possihle in Chicago. This called for capacious, cool storehouses stocked with natural ice. Soon these wooden constructions appeared in every town where packing was carried on. In the early 'seventies, gradually began the introduction of refrigeration by artificial means.

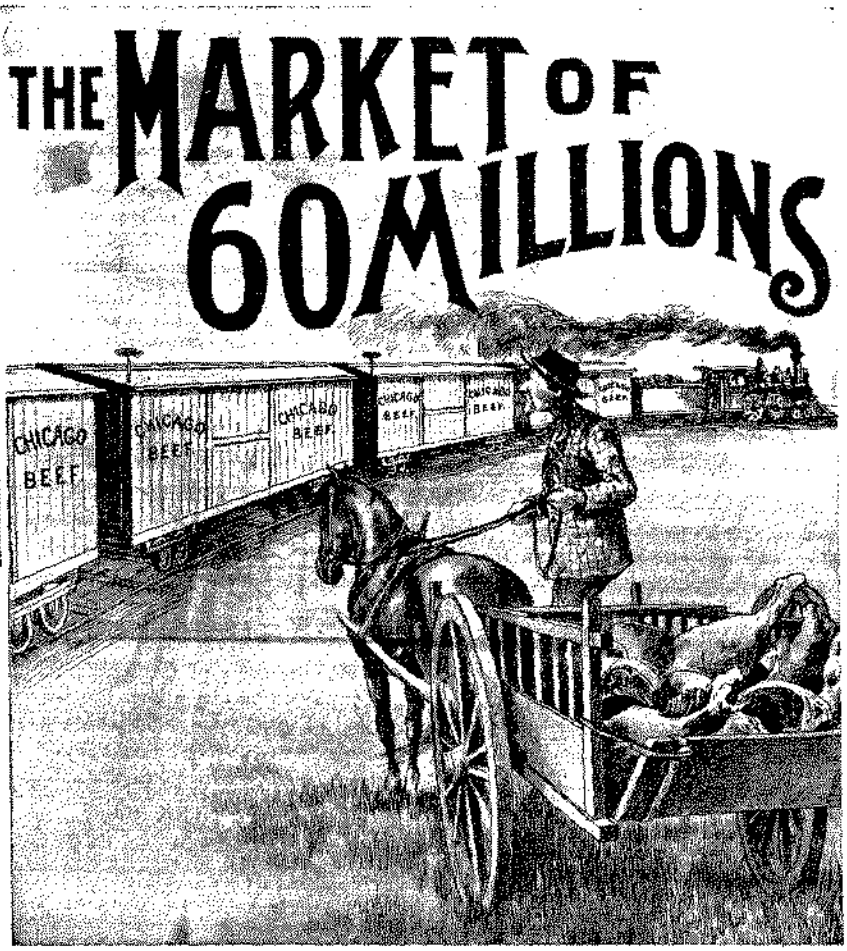
The final overthrow of the local supply system came about only with the introduction of the refrigerator car.[27] The experimental period extended over fifteen years, 1867–82: from the first granting of an American patent in 1867, and from the moving of the first shipments between Chicago and Boston, to the decisive success of the marketing of slaughtered carcasses in New York.

[25] Webb, op.cit. p.222–23. [26] Parton, op.cit. p.46.

[27] For further details see Harper Leech and John Charles Carroll, *Armour and His Times*, New York–London, 1938, pp.125–7.



111. American Refrigerator Car.



112. The Farmer and the Packer. (*Courtesy J. Ryerson Collection, Chicago*)

The problem was handled from the first patent[28] by a regulated air-circulation and by evacuating the warm air. Five years later, 1872,[29] the ice was moved from overhead into V-shaped containers at the end of the car. There were also attempts to effect self-cooling through the evaporation of water.

Meanwhile the Frenchman Charles Tellier[30] had succeeded in bringing fresh meat across the ocean on the ship *Frigorifique* (1876). In the ports, and even in Paris, American mutton could be obtained. The South Americans claim primacy in this invention for their countryman, Francesco Lecoq of Montevideo, who was closely associated with Tellier in Paris. Lecoq's refrigerating process was based on the evaporation of ether.[31]

George Henry Hammond was the first packer to recognize the potentialities latent in the refrigerator car. Precisely when he sent his first carload from Chicago to Boston is not certain, but it was either in 1867 or 1868. Because

[28] U.S. Patent 71,423, 1867, J. B. Sutherland.

[29] U.S. Patent 131,722, 24 Sept. 1872, J. Tunstel.

[30] Charles Tellier, *L'Histoire d'une invention moderne, le frigorifique*, Paris, 1910.

[31] Ramon J. Carcano, *Francesco Lecoq. Su teoria y su obra* 1865–1868, Buenos Aires, 1919. The French patent was granted to Lecoq 20 January 1866.

the meat was stored on ice, it discolored slightly, and therefore met with some unpopularity.

Complete success was achieved by Gustavus Swift when he conquered the New York market in 1882. He had made thoroughgoing preparations. The refrigerator car he had constructed with the assistance of a Boston engineer (1879)[32] stored its ice in the ceiling, so that the cold air sank slowly past the hanging meat down to the floor. In similar fashion he equipped the New York storehouse: 300 tons of ice were laid in above its strongly insulated walls (fig. 110).

Such was the success of his first shipment that *Harper's Weekly* printed an abundantly illustrated article, 'Cheaper Beef,' in which the reason for its immediate commercial triumph was brought out: 'The new departure has already depressed the market by three to four Dollars per hundredweight. . . . The present agitation of the beef market which must result in a decided and permanent lowering of the beef prices cannot fail to awake the deepest interest . . . at least this era of cheep beef has begun for New York.'[33]

Statistics show how wholesale transportation of chilled meat took effect. Within one year, the number of live cattle shipped from Chicago suddenly decreased by 170,000.[34] This was in 1884, in a period in which production was almost hectically rising in every sphere, just before the great boom of 1885, of which the first skyscrapers remain the most lasting monument.

The Mechanization of Death

The phenomenon of mechanized death will be regarded here neither from the sentimentalist's point of view nor from that of the food manufacturer. Wbat interests us is solely the relation between mechanization and death; such is our present concern. Both are involved in the mass production of meat.

The development of this murder machinery can best be surveyed in the files of the Patent Office at Washington. There one can follow the manner in which bogs are slowly caught by their bind leg with tbe help of cunning devices; fed into the machinery, and, suspended in line, moved into the most favorable position for killing; the manner in whicb cattle are skinned by means of pulleys, ropes, and levers (fig. 122), and hogs scraped by revolving cutters and grippers.

Tbe sole purpose of the drawings in the Patent Office is to illustrate the patent claim as clearly as possible. Yet freely viewed in their continuity, without regard to their technical interpretation and significance, they strike us as a *danse macabre* of our time. Their hare purposiveness is more direct, hence more impressive than the nineteenth-century portrayals of the relation of life to death. This schism is quite apparent in the famous woodcut series of the post-romantic

[70] When line production was applied to the processing of poultry in the 'thirties, similar methods were used: overhead conveyors, plucking machines — consisting of a drum strewn with elastic rubber fingers. We have seen this apparatus even in the smallest killing houses. Poultry packers also adopted the moulten-wax method for complete cleaning.

historical painter, Alfred Rethel (1816–59), about the mid-nineteenth century (fig. 126). He calls the series 'Another Danse Macabre' (1849). With sinister skill and in the noble woodcut tradition of Albrecht Dürer, death is abused for purposes of political propaganda. These woodcuts do not deal with the phenomenon of death. They represent a political satire against the revolution of 1848: Death masquerades as a demagogue. Moralizing stanzas warn against the slogans of republic, of liberty and fraternity.

> He lifts his coat, and as they look,
> Their hearts are terror-stricken.

Death has been degraded into a mere costume. An earlier cut, 'Death as a Strangler' (1847), pictures Death as fiddling on bones. The choice of the scene is significant. It uses Heinrich Heine's description of the outbreak of the cholera epidemic in 1831 at a Paris masquerade.

In the fifteenth century, the Last Judgment, inseparable from death, was a reality as threatening and perhaps more dreaded than death itself. In the nineteenth, only death in its biological nakedness remains, and even this is kept closeted. Hence all images of that time dealing with our relation to death,

124. Advertisement for a Chicago Packing House, 1890's. (*Courtesy J. Ryerson Collection, Chicago*)

Rethel's compositions among them, have become untrue. They use devaluated symbols unsupported by the living reality of belief.

The greater the degree of mechanization, the further does contact with death become banished from life. Death is merely viewed as an unavoidable accident at the end, as we shall point out in discussing why the medieval conception of comfort so differed from that of later periods. It is more honest to picture death in its crassness as the Spaniard, Louis Bunuel, in his motion picture *Le Chien Andalou* (1929), did symbolically (figs. 128, 129). There the symbolization of death is found in the play of irrational associations. Trivial everyday happenings and phantastic occurrences are interwoven into an artistic reality: A razor becomes a long-stretched cloud cutting through the full moon in the night sky, and turns into a murderer's knife slicing through a young woman's eye. The scenario runs:

A balcony in the night.

Near the balcony a man is sharpening his razor. The man looks at the sky through the window panes and sees . . .

A slight cloud moving towards the moon, which is full.

Then the head of a young woman open-eyed.

The slight cloud now passes before the moon.

The blade of the razor is drawn through the eye of the young woman, slashing it.[71]

[71] *La Révolution surréaliste*, Paris, 1930.

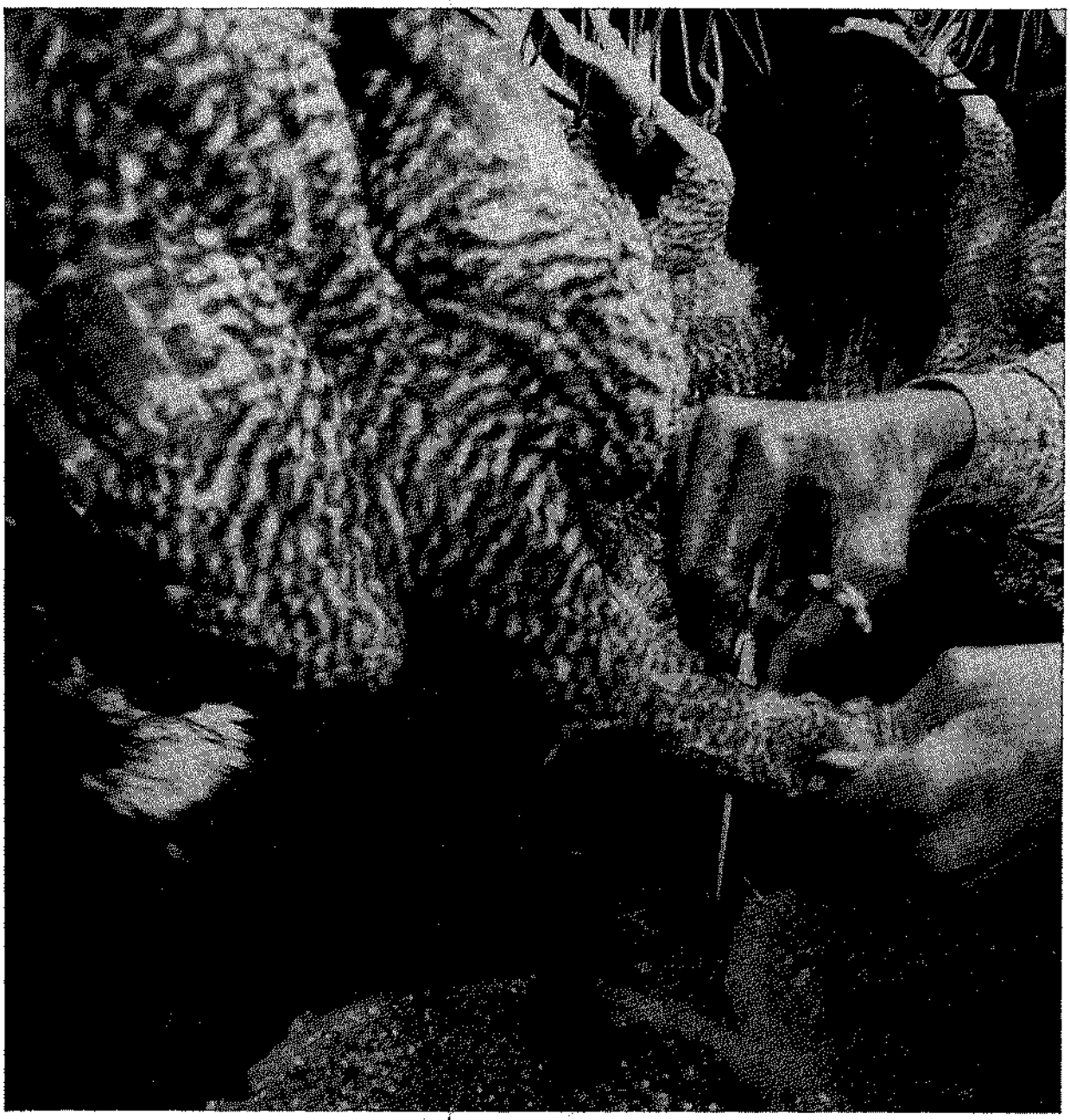
125. Killing Cattle. (Frank Leslie's Illustrated Newspaper, 12 *October* 1878)

126. Nineteenth-Century Relation to Death: Alfred Rethel, 'Another Dance of Death.' Woodcut, 1849. *In contrast to the fifteenth century, the mechanical age has no direct relation to the phenomenon of death; neither therefore does nineteenth-century art. If death is shown intervening, it appears in a literary, if not masquerade-like, guise.* (*Alfred Rethel*, Auch ein Totentanz, 1849)

All this is indifferently crass, cruel, and true. Its directness captures something of the eternal terror of death. The horror resides in the sudden, incalculable destruction of an organic creature.

The transition from life to death cannot be mechanized if death is to be brought about quickly and without damage to the meat. What mechanical tools were tried out proved useless. They were either too complex or outright harmful. Most of them hampered satisfactory bleeding. Our habit of eating meat only after it has been cleared of all blood must, it is asserted, be traced back to Jewish precepts, since both Greeks and Romans were anxious to keep the precious liquid in the carcass. They strangled the animals, or pierced them with heated spears, so as to prevent bleeding. Yet people would more likely abstain from meat than give up habits that have grown into instincts. Blood terrifies.

Only the knife, guided by the human hand (fig. 127), can perform the transition from life to death in the desired manner. For this operation craftsmen are needed who combine the precision and skill of a surgeon with the speed of a piece worker. It is established how far and how deep the throat of a hog should

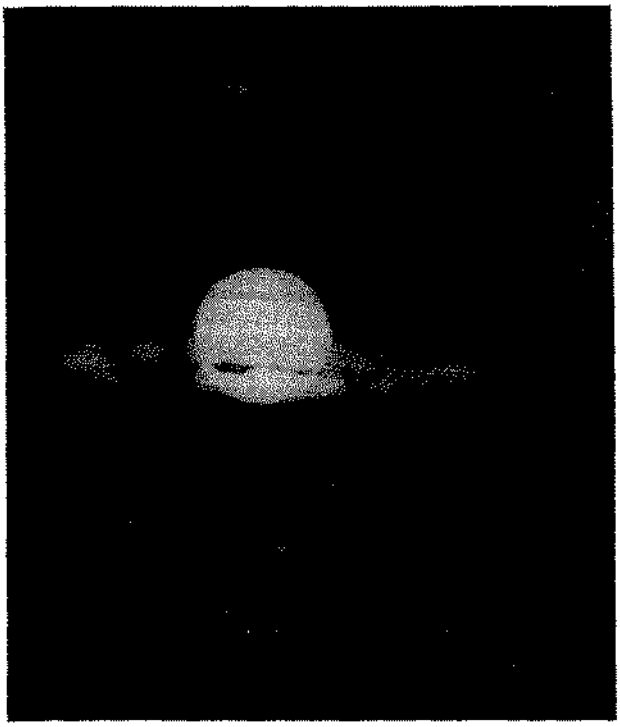


127. Killing Poultry by Hand in the Production Line. 1944. (*Photo courtesy Berenice Abbott*)

he pierced. A false stroke injures the meat product. And it must be done quickly — 500 hogs per hour.[72]

To sever the jugular vein, the sticker seizes the animal, suspended head downward by its forefoot, turns it properly, and pierces the throat about six inches. The same consummate skill and caution must be applied in butchering sheep; these less lively animals are hoisted to the rail in pairs. The stick is performed with a double-edged stiletto, just behind the ear.

[72] *Scientific American*, 21 Aug. 1866. The skill displayed in the then beginning large-scale production could hardly be improved upon subsequently. Even today a sticker cannot kill more than 500 to 600 animals per hour.



128. Death in Its Crassness: Luis Bunuel, 'Le Chien Andalou,' 1929. Cloud Passing the Moon, Eye of a Young Woman About To Be Cut by a Razor. *It is more honest to picture death in its crassness than to involve it in a masquerade. In the surrealistic film* 'Le Chien Andalou,' *Luis Bunuel communicates the idea of death by irrationally related symbols.* (*Courtesy Luis Bunuel*)

129. BUNUEL: 'Le Chien Andalou.' The Eye after the Cut. (*Courtesy Luis Bunuel*)

Cows are no longer taken to pens by the carload to be killed with a pointed spear. When they were, the sticker squatted on boards often placed crosswise over the pens awaiting the moment when he could best thrust the spear between the eyes of his victim. Today a four-pound hammer is used to smash in the skulls of the cattle in a narrow knocking pen; once hit, the animals collapse like wooden blocks. It is then that the workmen fasten the chain around the hind legs and hoist them to the rail, head downward. At the same time, the sticker thrusts a knife into the throat of the unconscious animal. The blood is usually gathered in special containers.

Killing itself then cannot he mechanized. It is upon organization that the hurden falls. In one of the great packing plants, an average of two animals are killed every second — a daily quota of some 60,000 head. The death cries of the animals whose jugular veins have heen opened are confused with the rumbling of the grcat drum, tbe whirring of gears, and the shrilling sound of steam. Death cries and mechanical noises are almost impossible to disentangle. Neither can the eye quite take in what it sees. On one side of the sticker are the living; on the other side, the slaughtered. Each animal hangs head downwards at the same regular interval, except that, from the creatures to his right, blood is spurting out of the neck-wound in the tempo of the heart heat. In twenty seconds, on the average, a hog is supposed to have hled to death. It happens so quickly, and is so smooth a part of the production process, that emotion is harely stirred.

What is truly startling in this mass transition from life to death is the complete neutrality of the act. One does not experience, one does not feel; one merely ohserves. It may he that nerves that we do not control rebel somewbere in the suhconscious. Days later, the inhaled odor of hlood suddenly rises from the walls of one's stomach, although no trace of it can have clung to the person.

How far the question is justified we do not know, nevertheless it may be asked: Has this neutrality toward death had any further effect upon us? This hroader influence does not have to appear in the land that evolved mechanized killing, or even at the time the methods came about. This neutrality toward death may he lodged deep in the roots of our time. It did not hare itself on a large scale until the War, when whole populations, as defenseless as the animals hooked head downwards on the traveling chain, were ohliterated with trained neutrality.

MECHANIZATION AND GROWTH

Around 1930 a new development begins and is now on the threshold of fuller realization. It points to a new epoch whose trend is away from the mechanical. It centers, as we have suggested, around man's intervention with organic suhstance. Animals and plants are to he changed in their structure and in their nature. The field of genetics, responsible for this radical intervention, is an offshoot of hiology, with which it came into heing.

From the heginning man has interfered with nature hy domestication and hreeding. He molded to his will the character of wild animals and wild plants. He domesticated them. He raised oxen and capons for his purposes. In Antiquity, he coupled the mare and the ass, creating the sterile mule. The Arabs

of the thirteenth century are said to have artificially inseminated pedigree mares. For the hatching of eggs, the Chinese used haskets filled with warm rice and the Egyptians employed ovens. The American Indians hred corn with notable success.

The eighteenth century opened the field of geneties as it did that of mechanized agriculture, by scientific experiment and analysis. From the discovery that plants are sexual organisms (Camerarius, 1694), from the analytical hybridization of plants (Thomas Fairchild, 1717; Vilmorin Andrieux, 1727) [1] to the revolutionary experiments and discoveries of Gregor Mendel (1865),[2] interest in these experiments never fell off. The late eighteenth century extended genetics to the artificial insemination of mammals.

Thus the principles of genetics as such are not new. Geneties follow the usual path from handed-down experience to scientific experiment. The subject remained in this stage for a long while. What was to occur in the time of full mechanization is beyond all comparison with the earlier phases. It is a far deeper interference with organic growth. The structural alteration of plants and animals proceeds at a tempo that, compared to what existed before, almost eliminates the time factor. The dimensions grow to the gigantic.

This revolution bears some similarity to the revolutionizing of tools and implements a century earlier, when they were of a sudden reshaped or transformed into mechanisms. The impetuous tempo of the present development and the sensitiveness of the realms affected promise even more shaking consequences.

Seed

In the time of full mechanization, the plants that yield us food or clothing are restored to prominence. By special measures, particularly those intervening in their fertilization, we alter their structure and productivity. Wheat, oats, barley, sugar-cane, cotton, fruits, and vegetables are made more hardy and more resistant to drought and parasites. The soy hean, although introduced early in the last century, assumes a new significance. But most conspicuous of all are the results in corn hreeding.

'Hybrid corn,' states the Bureau of Agriculture Economics, 'is as important among plants as the tractor is among machines.' [3]

[1] J. Oppenheimer, 'A Historical Introduction to the Study of Teleostian Development,' *Osiris*, vol. 2, 1936, pp.124–48, makes mention of the following eighteenth-century work in the field of genetics:

1761: Koelreuter performs the artificial fertilization of plants and obtains hybrids by this means.

1763: Jacobi reports on the fertilization of fish eggs (*Hanover Magazine*, 1763).

1785: M. E. Bloch, *Ichtyologie*, Berlin, 1785, with chapter 'On the Manner of Hatching [Fish] Eggs.'

[2] *Versuche ueber Pflanzenhybriden*, 1865.

[3] *Technology on the Farm*, U.S. Govt. Printing Office, Washington, August 1940, p.21.

By virtue of the American climate, corn forms the most important feed for livestock. Its improvement and rise in production within a few years border on the marvelous. The first attempts to raise hybrid corn commercially were in the 'twenties. It did not become available in quantity before the early 'thirties. Then, within four years, 1935 to 1939, a fivefold increase occurs. The area sown with hybrid corn is extended from about a half-million acres to twenty-four million acres. This represents over a quarter of the total production.[4]

Hybrid corn clusters around the coh in exceptional abundance and regularity. It is more prolific (15 to 30 per cent), more resistant, and more handsome.[5] A noteworthy fact was observed in the second generation of corn sown freely in the fields; it lost some of its desirable characteristics. The farmer must therefore purchase his seed from raisers, in whom seed-production tends to become increasingly centered.

The Egg

One instance at least may serve to show how the eighteenth century took analysis and experiment as its starting point in the mechanization of growth.

The Egyptians were masters in the use of incubators for chickens. Even in more recent times they had not quite forgotten their skill. In the eighteenth century, Berma, a village of the Nile Delta, still lived by artificial chicken raising, the secrets of which had heen handed down from fatber to son. Thirty thousand fowl were hatched at a time, Réaumur reports, and sold by the hushel.

Just as exotic flowers were transplanted to northern climes, so a native of this Egyptian village was brought to Florence by the grand duke of Tuscany, that the court might enjoy young chicken in all seasons. In 1747 Antoine Ferchault de Réaumur, the great natural scientist, addressed the Paris Academy on the topic of chicken incuhators, with sensational success, as his biographer tells us, for to have roast chicken on the table the year round was at that time a tempting dream.[6]

[4] In some parts of the corn belt, in Iowa, for instance, hyhrid corn amounts to 77 per cent. Cf. *Technology on the Farm*, op.cit. p.136.

[5] To regulate the crossing and to develop the varieties as desired, the ears must be prevented from becoming accidentally fertilized and the female plants from fertilizing themselves. In normal circumstances the matured pollen grains would fall by the laws of chance from the corn tassels on the silk ear shoots and fertilize them. Male and female plants are therefore separated. Between every two or four feminine rows one masculine row is placed. The tassels of the female plants are pulled before they shed any pollen. This process is repeated at regular intervals, so that the whole field is fertilized exclusively hy male plants of determined quality. At harvest time the male plants are eliminated, and only the grain on female cobs is used for further raising. This process — inhreeding — has to be continued for five to seven years. Described in further detail in *Technology on the Farm*, op.cit. ch. 21, and in more popular form in William R. Van Dersal, *The American Land, Its History and Its Uses*, New York, 1943, pp.54–7.

[6] Jean Torlay, op.cit. pp.303–14.

Two years later Réaumur published his handsomely engraved book, translated into Englisb the following year.[7] Iu the foreword, he tells amusingly how tbis experiment began. A friend in the diplomatic service had given him a precise account of incubating as practiced in the Egyptian village. He soon knew that this was not going to be bis metbod. He would engage no Egyptian experts, as princes might. His own thermometer would take the place of the Egyptian's secret. At first he used the natural warmth of a dung heap in which be sank a barrel containing the incubator (fig. 130). Then he experimented with the baking oven of a neighboring nunnery; and finally he built himself a wood-heated cylindrical 'stove' affording equable radiation. Even today American farmers state a preference for the coal-heated cylindrical brooder rather than the electrical type, which, they tell us, may be inadequate in cold weather.

One cannot read Réaumur's book without excitement, for in this banal matter the observation of the great savant is powerfully projected upon tbe slightest details. He knows precisely how the chicken breaks out of its sbell, bow the embryo forms; and he devises the 'artificial mother.'

In a half-darkened room of a St. Louis food factory, we have seen low wire cages, housing cbicks that had emerged from the incubator a few days earlier. In tbe brooder was an inclined rubber cloth, electrically heated. The chicks crawled under tbis cloth, which took the place of their mother's wings in warming their lungs. Now, in mid-eighteenth century, Réaumur notes the same fact when he lines a box with lamb's fleece (fig. 130), inclines its ceiling like the rubber cloth in the twentieth-century brooder, similarly imitative of the hen's wings, and calls tbe whole device 'artificial mother.'

Around 1944, only 15 per cent of the chicks produced in the United States were brooded by bens. Tbe other 85 per cent were incubated in some 10,000 hatcheries. In the electrically heated and thermostatically controlled incubators of today each unit contains some 52,000 eggs. They can be attended by one man. Réaumur's hatching device was immovable. The sbelves of tbe modern incubators revolve on an axis, regularly changing the position of the eggs as the hen might, thus preventing tbe embryo from sticking to the shell. The average farm flock is of about 100 hens. Some hatcheries have a capacity of over a million eggs. Ten thousand chick factories produce some 1.6 billion chicks yearly.

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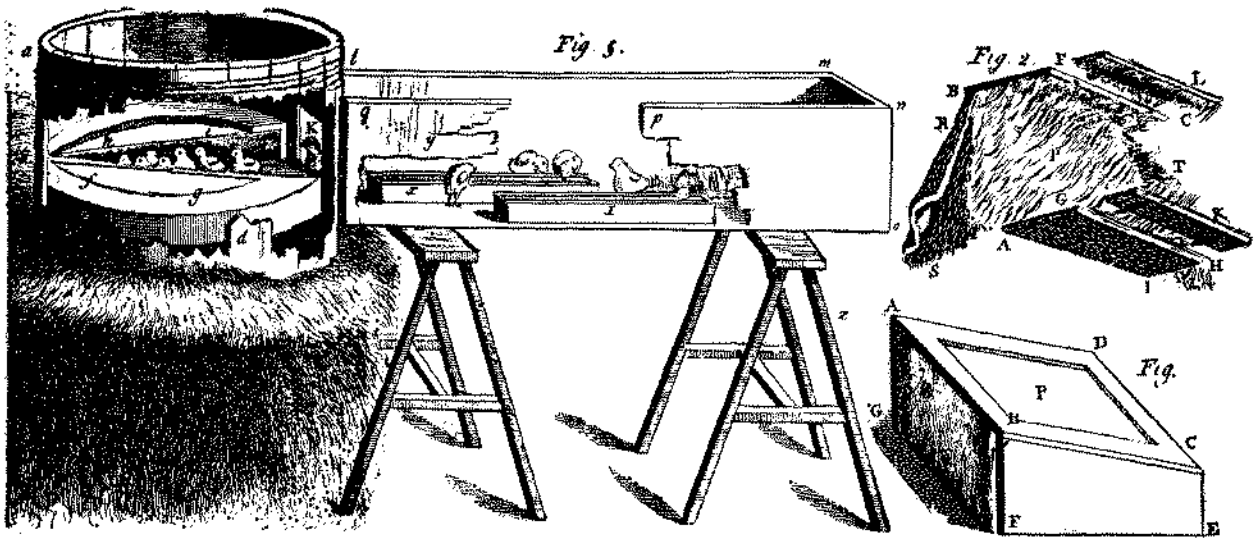
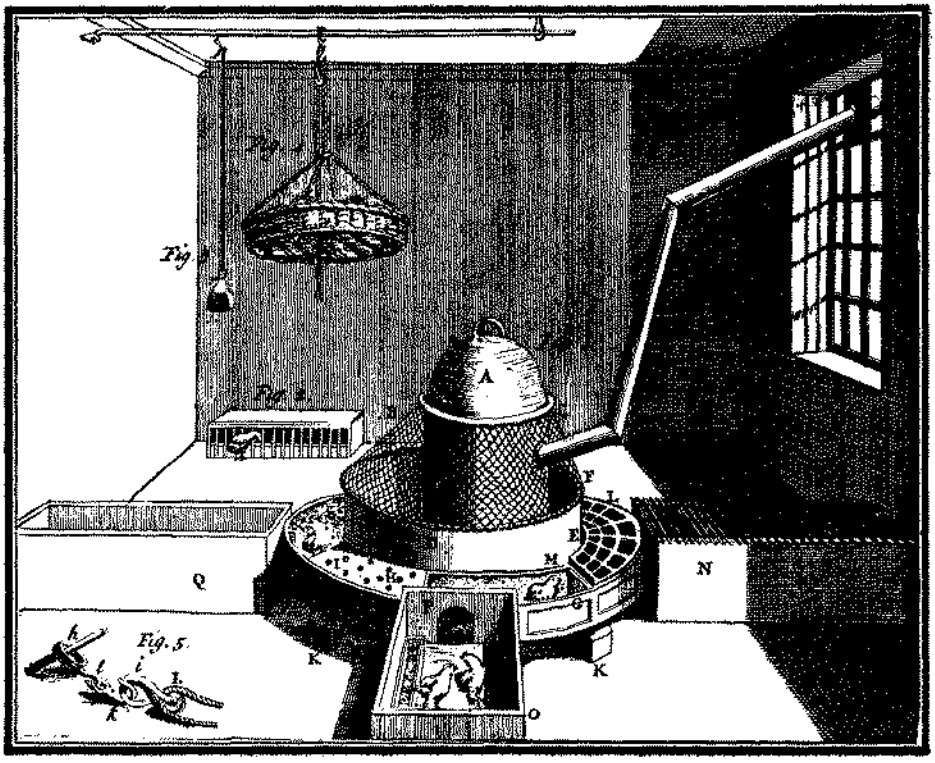
[7] Réaumur, *L'Art de faire éclore des œufs et d'élever en toute saison des oiseaux domestiques par la chaleur du fumier et par celle du feu ordinaire*, Paris, 1749.

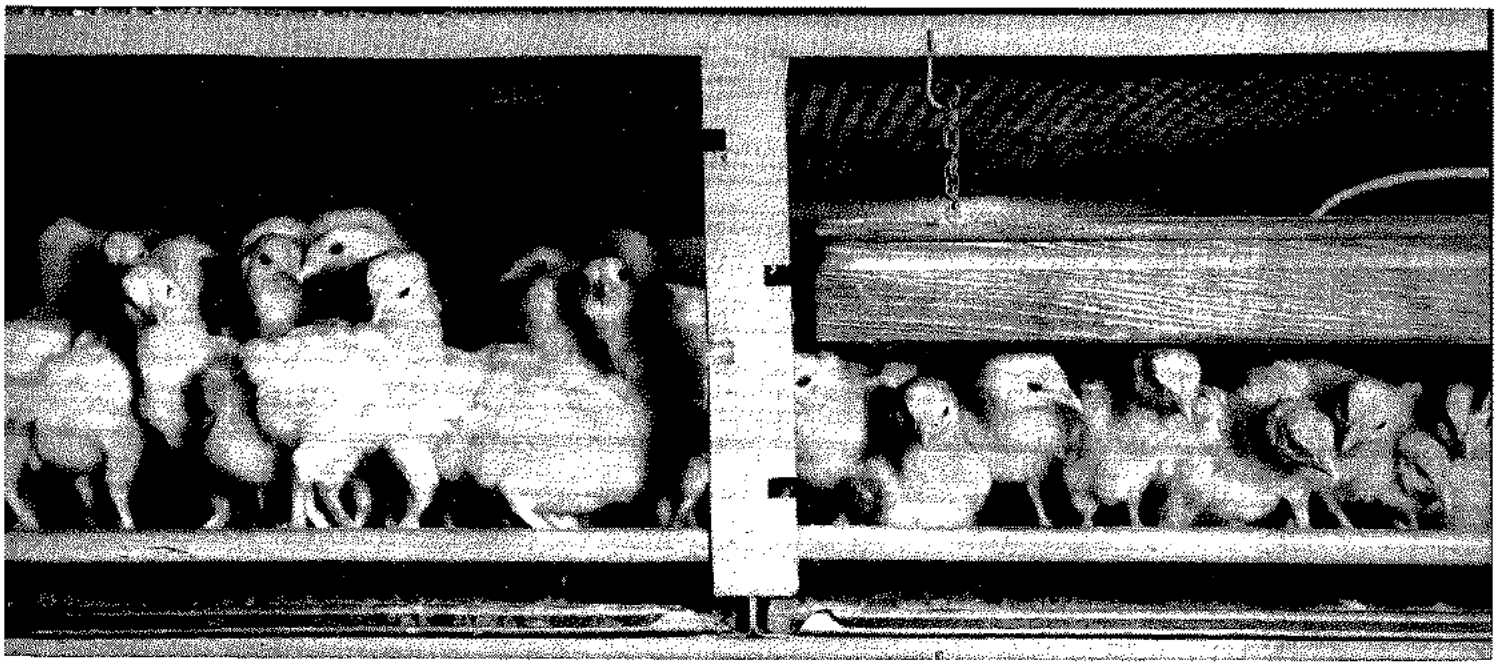


130. Intervention into Organic Substance: Réaumur, Artificial Mother. *c.*1750. *Réaumur's experiments were suggested by the Egyptian 'artificial mothers,' just as his century's effort to exploit steam and the atmospheric vacuum forms a parallel trend to Alexandrian technology. Perhaps oven hatching originated in the technically advanced Ptolemaic period; the practice was maintained until Réaumur's day in villages of the Nile delta.*

Left: *Artificial mother formed of barrel with fleece-lined chamber placed over a dung heap.* Right: *Artificial mother formed of 'a wooden frame against which a lambskin P is nailed, whose woolly side is within the mother; a loose curtain that falls almost quite to the bottom of the mother, and stops the whole front of it in such a manner that it takes not from the chicks the liberty of getting under the mother. They remove and lift it up easily.'* (*A. F. de Réaumur*, The Art of Hatching and Bringing Up Domestic Fowl at Any Time of the Year, *London*, 1750)



131. RÉAUMUR: Artificial Mother. *c.*1750. *'This plate exhibits the inside of a hot-room designed to bring up chicks in, and which may be as usefully employed to hatch them. A, marks the cover of a stove whose body is cylindrical. By taking off that cover one puts wood into the stove when it is wanted.'* (*Ibid.*)



132. Artificial Mother in the Time of Full Mechanization: Electrical Brooder, 1940. *Between* 1918 *and* 1944 *artificially hatched eggs in the United States increased from twenty per cent to eighty-five per cent of the total. The electrically heated incubator unit contains about* 52,000 *eggs.* (Hawkins Million Dollar Hen, *Mount Vernon, Illinois*)

The tremendous increase in artificial hatching comes with the time of full mechanization. From 1918 to 1944, artificially hatched eggs increase from 20 per cent to 85 per cent of the total. One reason given for this is that after 1918 young chicks could be sent through the mails. Actually, the rise is in keeping with the general trend. Mass production and rearing chicks from selected eggs are more profitable. One danger is the dissemination of disease; careful control is necessary. Another is that of unscrupulous dealers.

To keep production as regular as possible, artificial light is used in the laying houses on autumn and winter mornings, to stimulate the ovaries. Although this does not increase the total production, it equalizes it so far as possible throughout the year, and makes possible poultry processing in mechanized plants — introduced toward the 'thirties. The delicacy the Grand Duke of Tuscany was at pains to provide for his court is now available to all.

Before the advent of mass production in poultry raising, chicken used to cost about twice as much in winter as in summer. Now freshly killed poultry is available the year round. A mechanism is being sought that will mechanically separate the bones from the meat.