CHAPTER 7

INTERPRETATION

THE EXCAVATED EVIDENCE WAS SEDUCTIVELY SIMPLE. Very early in the project, the site seemingly demonstrated the truth of the insurance declaration. Bryan's reconstruction seemed to answer all the questions. We had evidence for a building twenty-four feet wide with ten-foot wings. There was plenty of evidence for rebuilding, to the point where confusing elements merely added confirmation to the straightforward interpretation of this as being the 1869-1874 Collins cannery.

Upon examination, the measurements did not exactly fit the Collins structure. There was clearly a hundred-foot building with a later seventy-foot structure superimposed over it. An older cellar, containing two boilers, predated the second structure and may have been contemporary with the first one (FIGURE 19). Moreover, the boilers were skewed to the alignment of the building foundation.

Interpolating missing features (FIGURE 20), it is easy to see the hundred-foot building, to which the cellar might have belonged. It would be easy to relate this to the first cannery, but for the fact that the last northward extension of the cannery was not 100 feet long. The extensions were 80, 86, and 50 feet long, for a total of 216 feet. The north wall of the last wing must have been near where the north wall was found, or the building would not have fit on the site.

No boiler is documented for the first cannery in the area where two boiler bases were found in the cellar, nor is there any documentary evidence for below-grade boilers in connection wth the cannery. Mixtures of construction materials, recycled building materials, and misaligned elements, further testified to several refittings of the boiler department. The distance of the coal pile from the boiler bases further confounded interpretation.

Insurance descriptions gave ample details of the first cannery, but nothing about the evaporator, which would have been larger than the one at Milford (PLATE 18, PAGE 41). A possible obvious conclusion is that the excavated hundred-foot structure is the building Collins erected for the purpose of drying fruit waste to be used in making jelly.

Instead of being just an incremental addition, as originally supposed, the last phase of the cannery was a complete rebuilding, finished in January 1874 when the policy (Kent County Mutual Policy 4629) was issued. The declaration describes "A two story frame can factory at Lebanon measuring 24 x 216 feet." Instead of a 50-foot increment, this expansion recorded a rebuilding, at least of the north end.

The seventy-foot later building could have been the later cannery, built over the foundations of the first one. Since a robbed-out pier on this alignment was found over the relatively loose cellar fill, the second building could not have been as substantial as the first.

Technological Evidence

Technological evidence is forthcoming from the can waste and the building's architecture, sometimes with surprising results. The active period of this cannery occurred in the middle of a transition from craft to mass production; it follows that the waste should reflect both craft practices and industrial attitudes toward work, waste, and productivity.

Mistakes cause waste, which is why many of the pieces in the current study of waste materials are mal-formed. Just as ceramic scholars have based much of their knowledge upon waster dumps, so canmaking investigators must pay attention to what went wrong, and work backward from the mistake to reconstruct the process that miscarried.

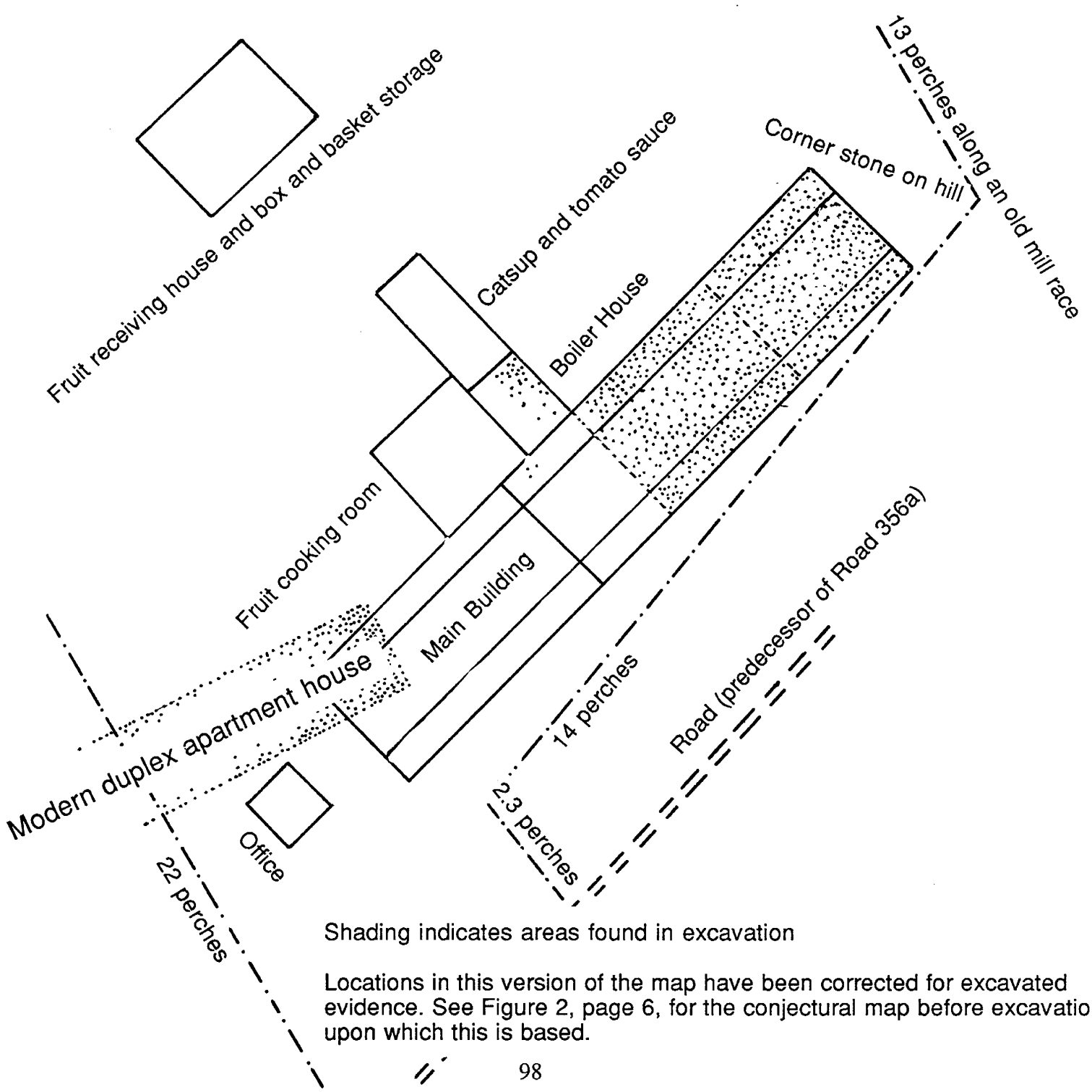
Mechanization

Mechanization is the stage between craft and industry. As an industry passes through the stages of technological development, a manual process will be mechanized until it reaches a productivity plateau where further improvements and economies are impossible or impractical. The next move forward will require introduction of wholly new technology with procedures adapted to machines instead of people; this stage is called automation. The canning industry reached the automation phase around the end of the nineteenth century, with the end of the soldered can.

During most of the nineteenth century, production was increased by streamlining a craft process, speeding up the way an old job was done, but not changing the job itself. By 1883, some can manufacturers could produce 2500 cans per hour, but the underlying technology was no different from the days when a tinker could make 5 or 6 an hour (Busch 1981:97). The 1883 cans themselves were indistinguishable from their handmade counterparts.

Figure 21

Reconstructed ground plan correlated with archæological evidence



Shading indicates areas found in excavation

Locations in this version of the map have been corrected for excavated evidence. See Figure 2, page 6, for the conjectural map before excavation. upon which this is based.

To accomplish such increased outputs, each step had been mechanized, but any mechanized step could be replaced by a traditional tinker using traditional tools. This is classic mechanization, in which the job is broken apart and each part of the job is streamlined and made more productive, but the process itself remains unchanged.

Under the American system of manufacturing, mechanization was accompanied by specialization and standardization. Instead of creating a single perfect piece, as craftsmen strove to do, can makers worked to a standard, seeking to produce components that were merely adequate to the job. Instead of a perfect fit, they worked to acceptable tolerances. Mere adequacy, combined with speed, replaced pride of craftsmanship and patience.

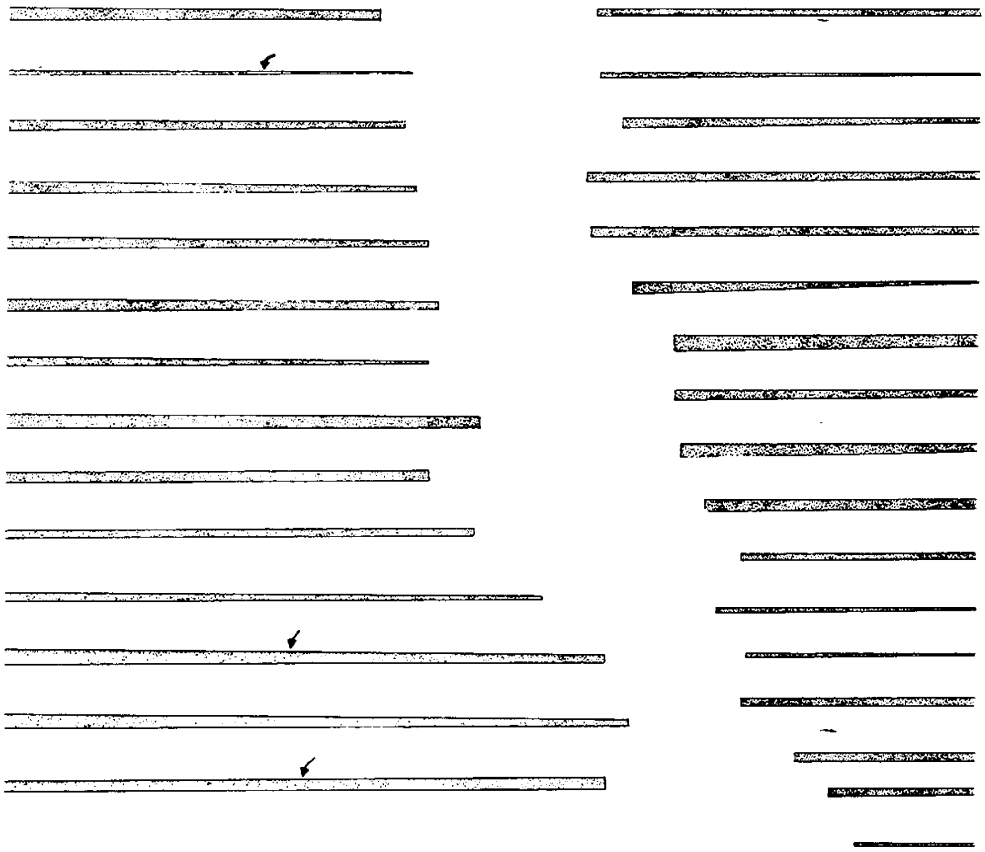
Automation brought a new element: precision and speed that no human could duplicate, and a wholly new product. Modern cans are structurally unrelated to the cans made at Lebanon, even though they are superficially similar.

Automation so completely changes the process that people and manual processes can never be re-inserted. For can manufacturers, this phase occurred very suddenly, around 1900, when the modern sanitary can was introduced. By 1910, most American canmaking was the province of a trust and the small manufacturers were gone. The sanitary can was made by a single machine from a continuous roll of metal, and joined together by crimping methods that would be impossible for a craftsman to duplicate by hand work. Within a decade, the old handmade can was virtually gone from the market, replaced by the food can we know today.

A few holdouts continued to make old-style cans. Stetson and Ellison was one holdout who bought soldered cans for at least a decade after the sanitary can was introduced. Condensed milk was still sold in a can with a turned edge and a soldered vent hole as late as 1936 (Rock 1987:43). Richardson and Robbins of Dover kept making some cans by hand until after World War II.

During the phase represented by the cannery at Lebanon, each aspect of the process was evolving separately, and each plant might include different levels of sophistication at different processes. End-making was a mature technology when the Lebanon cannery was built. As early as 1849, there were foot-powered machines to cut out the ends, and combination dies to cut and shape the ends. Pressing machines could be foot powered or engine powered, but the principle remained the same.

Figure 22



Tinplate trimmings from ER 89

Arrows indicate edges that appear to be the edge of the parent tinned plate. Not shown are 13 additional pieces that were 9 7/8 inches long.

Dimensions, First Row, inches:

Left End	Right End	Length
5/16	3/16	8 13/16
1/8	0	9 1/2
1/4	1/8	9 3/8
3/16	3/32	9 5/8
1/4	1/8	9 7/8
5/16	3/16	10 1/16
1/4	1/16	9 7/8
5/16	3/16	11
7/32	7/32	9 7/8
3/16	3/16	10 7/8
3/16	1/32	12 3/8
[illegible]	[illegible]	[illegible]

Dimensions, Second Row, inches:

Left End	Right End	Length
5/32	1/8	8 5/8
1/8	0	8 1/2
3/16	1/16	8 1/16
3/16	1/8	8 13/16
3/16	1/8	8 3/4
1/4	0	7 13/16
5/16	1/4	6 7/8
3/16	1/8	6 15/16
1/4	1/8	6 3/4
1/4	3/16	6 1/4
1/8	3/32	5 1/2
3/32	1/16	6 1/4
3/32	1/16	5 5/16
3/16	3/16	5 1/2

TABLE 6

CALCULATION OF "IDEAL" CAN BODY BLANK SIZES

SIZE	HEIGHT OF ENTIRE CAN (INCHES)	DIAMETER OF CAN (INCHES)	LENGTH OF SIDE COMPUTED (πD +0.5") *	CIRCUMFERENCE FROM TINSMITH'S RULE **		
#1	4	2 3/4	9.13	8 5/8	+ 1/2 =	9 1/8
#2	4 9/16	3 7/16	11.29	10 3/4	+ 1/2 =	11 1/4
#2 1/2	4 3/4	4	13.07	12 5/8	+ 1/2 =	13 1/8
#3	4 7/8	4 3/16	13.65	13 1/8	+ 1/2 =	13 5/8
New Jersey #3	5	4 1/4	13.86	13 3/8	+ 1/2 =	13 7/8
#10	7	6 1/4	20.135	19 5/8	+ 1/2 =	20 1/8

* These decimal sizes are approximations, predicated upon the relatively generous half-inch side seam overlap observed in some specimens.

** A tinsmith's rule, loaned by Richard Haddick, probably is the type of measuring instrument used by the can makers, and reflects the perceptions of size and accuracy current among the people who made the cans.

End Making Technology

There were two ways to make can ends. In the first method, tops and bottoms were formed with a die that cut the blank and turned down the flange in a single operation. Fill holes in the tops were then punched and shaped in a separate operation. This was the method used at Lebanon, as shown by certain off-center lids (FIGURE 25D) and some trial pieces found among the scrap. A heavier stamping press was required for combination dies, which cut and shaped the fill hole at the same time the end was shaped (Ayars Machine Company c. 1893). Cans made with a combination die should be characterized by much greater accuracy in centering.

Many of the rejected ends suffered from incomplete flanges, the result of stamping beyond the edge of the sheet. This could have happened if the operator failed to hold the sheet firmly against the edge guide, or if the guide was adjusted too closely.

Squaring

Hot-dipped tin plates come from the mill with irregular edges, sometimes with lumps of tin adhering, even today. Squaring was an essential part of the process of making a can, as of any tinsmithing process. The process does more than simply make the sheet square; it also cuts away the irregularly-coated edges of the tinplate sheet.

TABLE 7

BLANKS AND PRODUCTS

ER	LONG SIDE	SHORT SIDE	HOLES NO.	HOLES DIA.	PRODUCT
4		8 5/8	6	3 3/4	#2 lid
			2	2	medium hole
4	12		6	3 3/4	#2 lid
			2	2 1/16	peach hole
90A	14		6	4 1/2	#3 lid
			2	2 3/8	
90A		8	2+	3 3/4	#2 lid
			1+	2 3/8	
90A		8 1/16	6	3 7/8	
			2	2 3/8	
22.12		10 1/4	2	4 1/2	#3 lid
22.12		10	2	4 1/2	#3 lid
22.12		5	2	4 1/2	#3 lid
7	14		6	4 1/2	#3 lid
			2	2	medium hole
7	12		6	3 3/4	#2 lid
			2	2	medium hole
3	12	8 3/4	6	3 3/4	#2 lid
			2	2 1/16	peach hole
3	12	8 5/8	6	3 3/4	#2 lid
			2	2	medium hole
3	12		6	3 3/4	#2 lid
			2	2 1/16	peach hole
3		8 1/2	6	3 3/4	#2 lid
			2	2	medium hole
90a	16	8	6	4	
			2	2 1/2	

Little slivers of tinplate scrap from the squaring process (FIGURE 22) were found in heaps at several places on the site. Bodies, obviously, needed to be square in order to make a tight fit, but most of the lid-making scrap was also squared, probably to ensure uniform tinplate. Except for the pieces made from scrap, the vast majority of the blanks from the end-stamping process are squared.

Known products of the cannery include New Jersey #3 and #2 tins with peach and tomato holes. It would seem that squaring-up should be done before cutting a side to size, and that there should be some relationship between the waste and the can size. It should be relatively easy to distinguish between

squaring waste and sizing waste. If the waste was produced by the squaring process, all pieces will be tapered. If the waste is the product of cutting squared can side blanks to size, then the waste will be rectangular; most of the waste is therefore from squaring, which is almost an automatic reflex to a tinsmith when he picks up a new sheet of tinplate. Most of Richard Haddick's tinsmithing scrap consists of squaring waste.

Excavated evidence can help us reconstruct the process and materials requirements for the can makers at Lebanon. The ten-inch side of a 10" by 14" sheet would be the bad edge in cold-rolled tinplate, and a 10" by 14" sheet would be just right for making #3 cans. A 14" by 20" sheet would make three New Jersey #3 bodies plus scrap like that shown in Figure 25(a) with two lids; to make an even number of cans would require another sheet, 8" by 16", from which would be cut six lids and two filler caps. This is exactly the evidence found in the waste.

Only three scraps illustrated in Figure 22 are demonstrably from the edge of a sheet of tin, indicating that the tinplate was squared after the sheets were subdivided. Ayars Machine Company advertised floor-standing, foot-powered squaring shears "For cutting bodies of cans and boxes, and for other tin work, ..." Ayars supplied the machine with 20-inch and 25-inch widths.On the same page, bench and hand shears were also offered. The squaring shears had guides on two sides and a guilloutine blade. An automated can-body cutter, illustrated in the *American Machinist* for July 14, 1883, would cut four bodies at once from a single sheet of metal, and would have left little waste when it was properly adjusted.

The guilloutine squaring shears, if used, did not supplant the bench shears at Lebanon. Several pieces of stamped scrap (FIGURES 14A, 21E) were clipped only part-way through, apparently by shears. Several other scraps exhibit short bites from shears. Since it was much easier for an unskilled worker to make accurate squaring cuts with a guilloutine, the open shears must not have been the preferred tool for mass production.

Blank Sizes

Sizes of sheet tinplate, like paper sizes and other standard raw materials, are deteremined by tradition. One of the oldest tinplate sheet standards was sixteen inches square; by the twentieth century, the standard size had become 14" by 20" inches, a "double" of the older 10" by 14" standard sheet (Heite and Heite 1989:106). In the *American Machinist* for July 14, 1883 (PLATE 9, PAGE 27) is a picture of a can-making production line that began with 14" by 20" sheets. In 1951, a former canmaker was reported to have recalled that four bodies could be cut from one of these sheets (Sim 1951). Coiled tinplate today is sold in ten-inch rolls.

By continuing to make traditional can sizes, modern manufacturers perpetuate a system of measurement that depended originally upon sheet tin sizes that are no longer relevant in a world of tinplate on rolls; such survivals remain in almost every industry long after the technological reason for them has disappeared.

Some of the blanks for can lids were 8 by 16 inches, or half the traditional 16-inch square plate size (FIGURE 24). It would be possible to get four #2 1/2 or smaller can sides out of this size of sheet. A 14" by 20" sheet would produce only three New Jersey #3 or #2 1/2 can bodies, or four #2 can bodies.

Of particular interest are fragments used to make #3 lids (TABLE 7) with surviving dimensions of 5, 10, and 14 inches. Two sides of a #3 can cut from a squared 14" by 20" (roughly 13 1/2" by 19 1/2") sheet would leave pieces 5 7/8" by 13 1/2", or 13 5/8" by 3 3/4", which were not observed. The #2 lid blanks listed in Table 2 appear to have been originally about 12" by 8 5/8", which is roughly two can bodies of this size. A double of these sheets would measure 12" by 17 1/4", or four can bodies from a sheet with leftovers measuring 3 1/2" by 17 1/4" and 13 1/2" by 2 1/2". These pieces were not found in quantity. A few blanks, like the one at the top of Figure 25, seem to be mis-cut can bodies, rather than intentional blanks.

Thus it is apparent that a sophisticated system of mass-production layout was being employed, in which a single sheet was not perceived as creating a specific number of whole cans of a certain size. Instead, blanks were squared, sized, and stockpiled in a way that would utilize virtually the whole sheet, depending upon the can part to be manufactured. This would explain why no small rectangular scraps were found

Comparing the standard sizes with the squaring-up waste illustrated in Figure 22, direct correlations are difficult to find. The most numerous size in that particular dump was 9 7/8 inches, which most closely corresponds to twice the height of a New Jersey #3 can. The 9 7/8 inches probably comes from a 10" by 14" sheet.

Figure 23
Scrap from ER 90a

A. End of a blank, from which two pieces, each 4 1/2" in diameter, have been punched. This is the end of a larger blank.

B. This piece of scrap has been used as the source for one filler-hole cap; it has been broken off a larger piece.This fragment was 4 13/16" on one side, which could have been a mis-cut can body.

C. In this example, a rejected bottom has been re-used to provide two caps.

D. The purpose of this wire, possibly a bail, is not known.

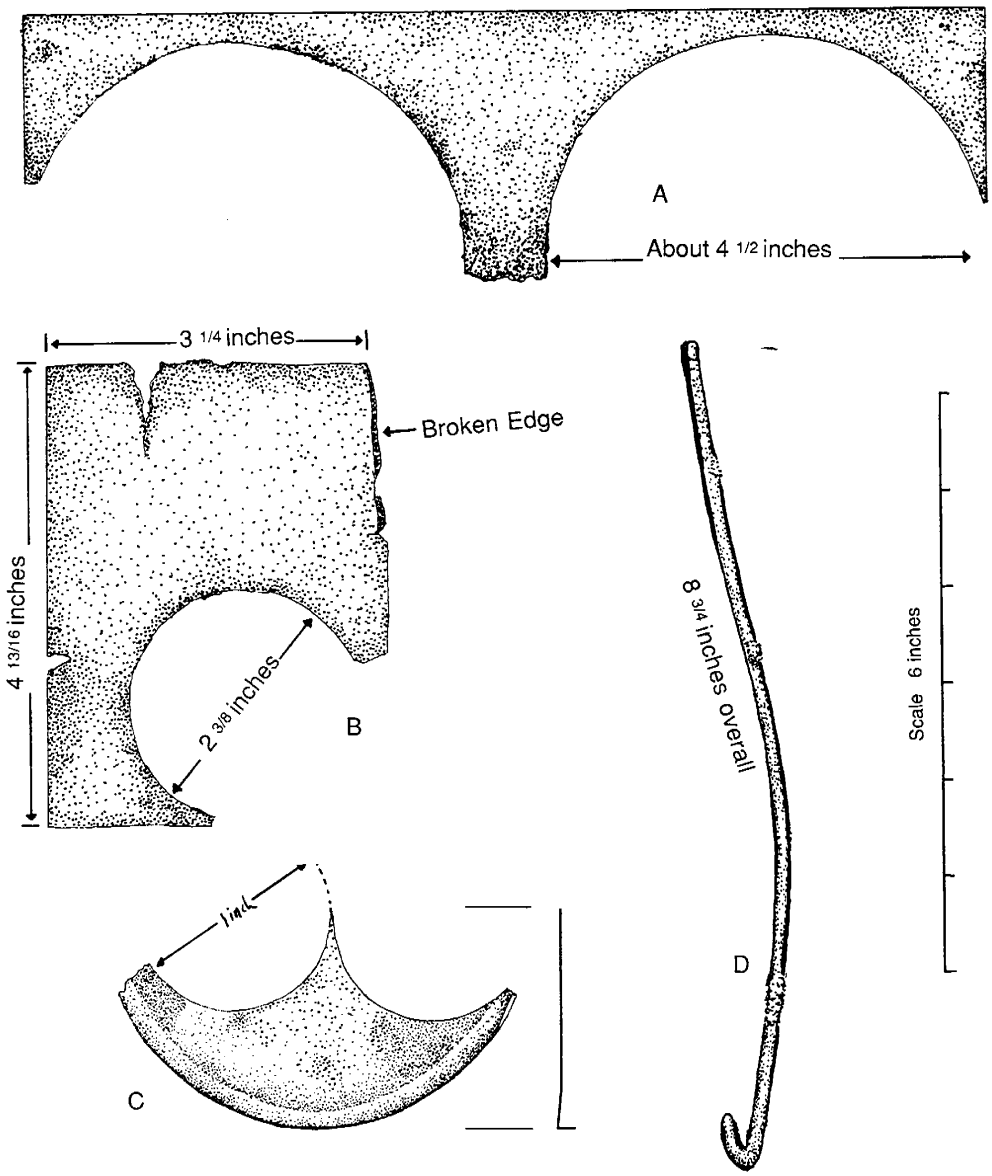


Figure 24

Typical large scrap

A. Sheet, originally 8" by 16", from which six #2 ends and (probably) two caps have been cut. The 8" dimension indicates that this sheet was not squared; the top edge could be the rough edge, avoided by the operator who stamped out a cap without using the typically close spacing foujnd on the sides of the sheet.

B. Squaring waste, 1/2" by 13 1/2", resulting from squaring a 14" by 20" sheet.

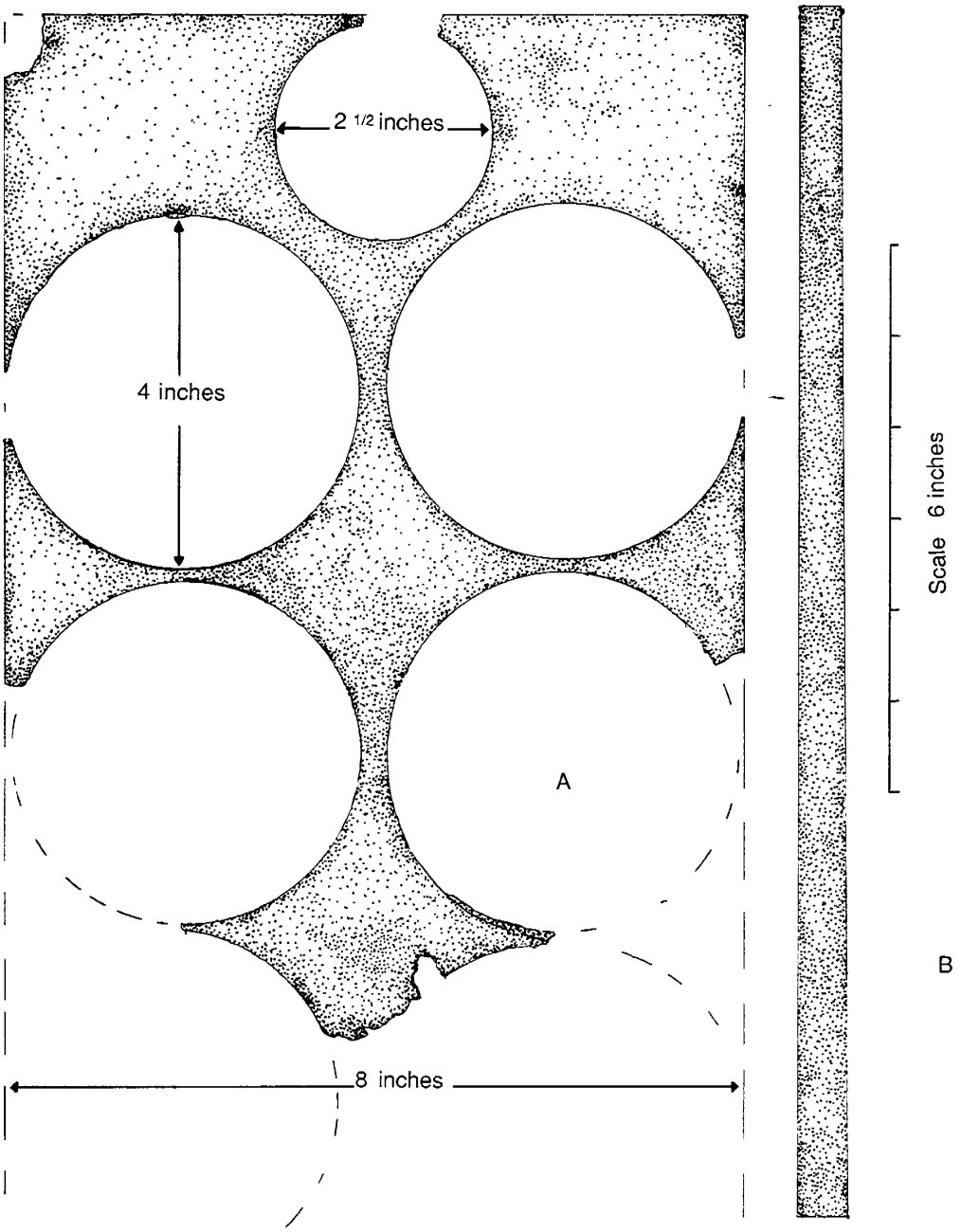


Figure 25

Scrap from ER 89

A. Odd-shaped piece of scrap from which two New Jersey #3 ends have been stamped. The piece was subsequently cut again with shears.

B. Piece of scrap from which #2 ends were stamped

C. A can end with a hole that virtually fills its entire area, possibly to provide a fill hole for fancy goods, such as asparagus, which Collins added in 1874.

D. New Jersey #3 end, with a fill hole off center, indicating that two punching processes were employed rather than a combination die. This piece has been cut in two.

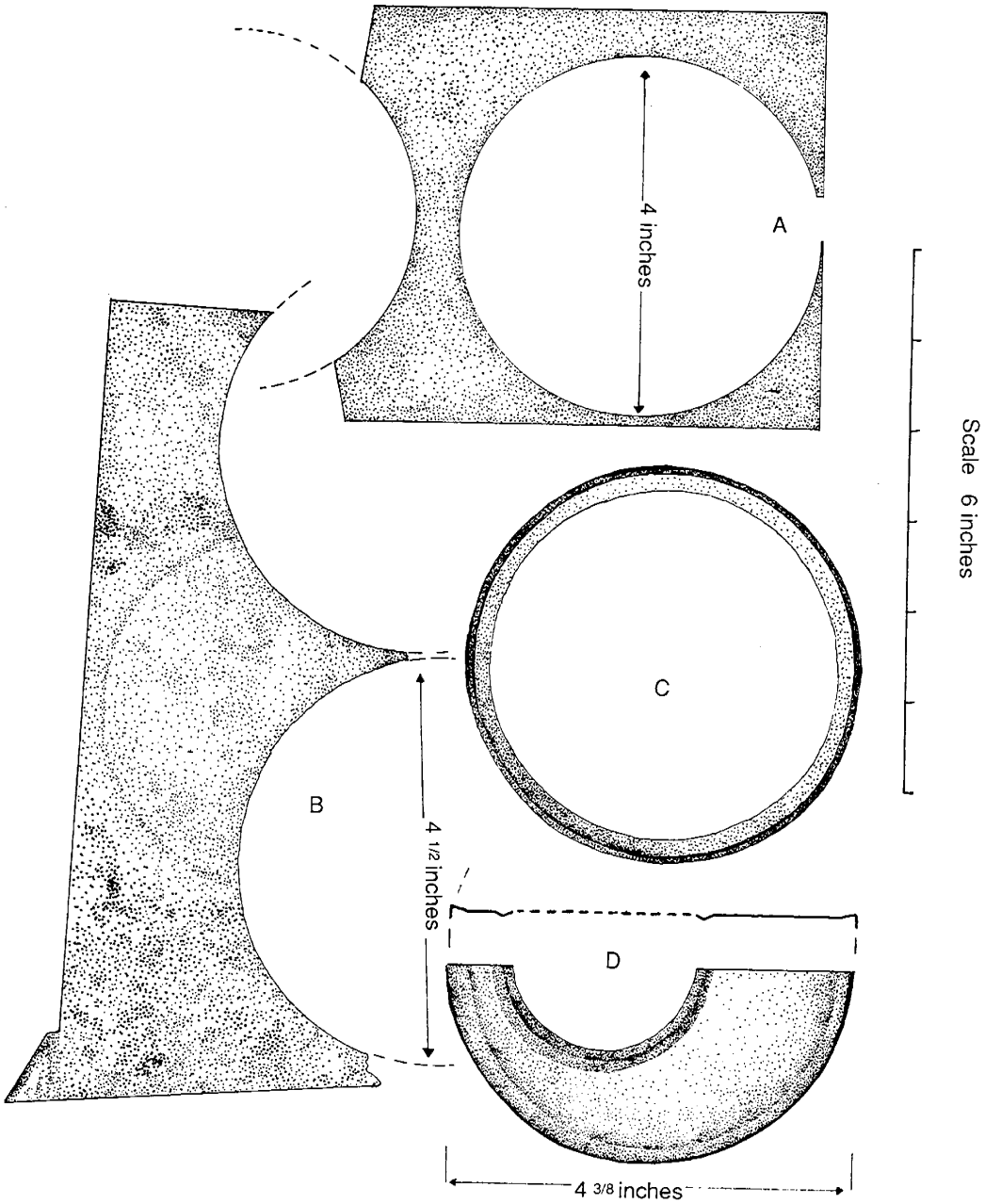


Figure 26

Tool remains

A. Piece of tile, with tool marks, apparently a soldering aid.

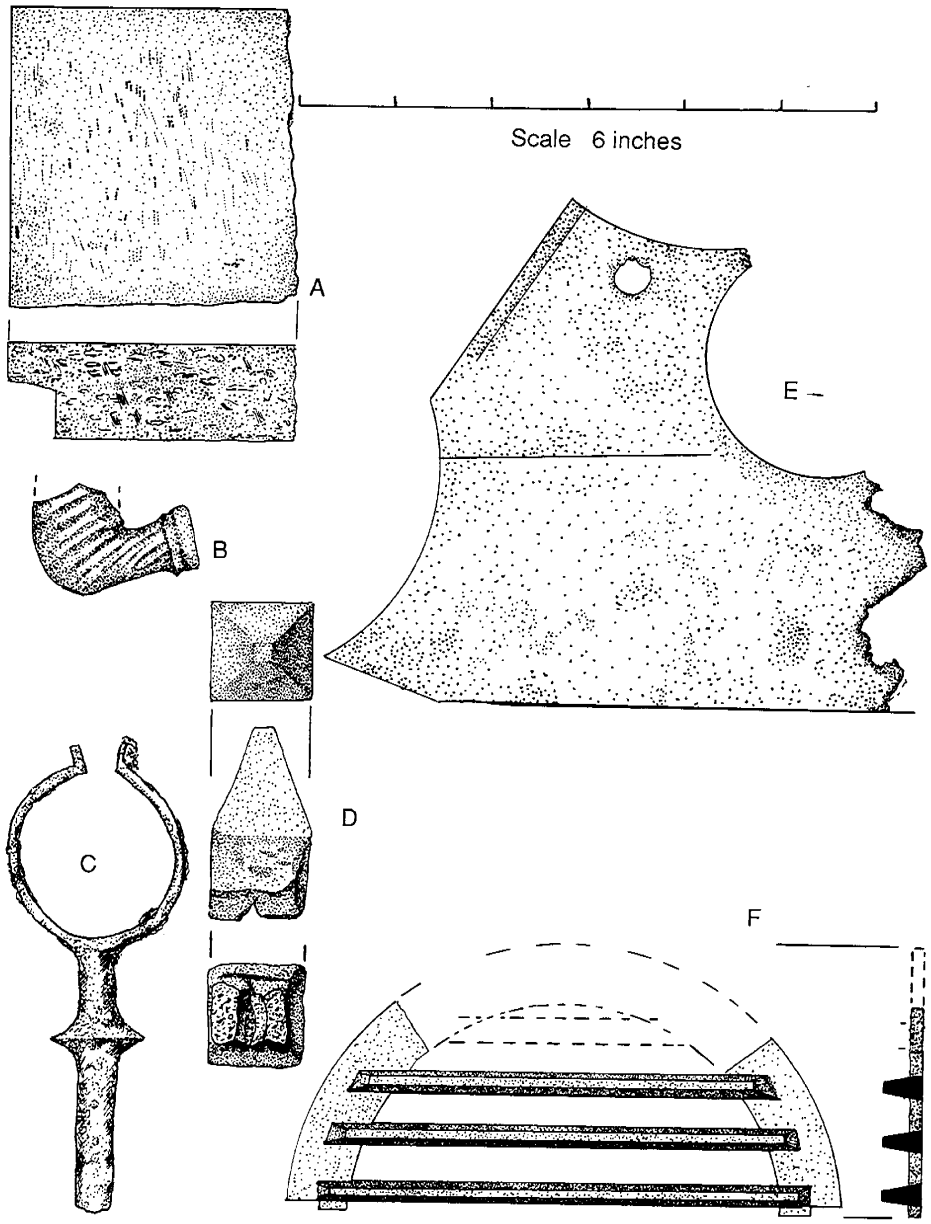
B. Fragment of a Pamplin-type clay smoking pipe, ER 88c.

C. Pipe hanger, ER 88a.

D. Three views of a soldering copper, ER74.

E. Much-mangled piece of scrap, from which three items have been punched. It was also cut with shears several times in seemingly random directions, ER 91.

F. Half of a non-ferrous grate, possibly the fire grate from a charcoal soldering tool heater of the type distributed by Ferracute, ER 91.



Almost none of the specimens in Figure 22 can be matched to one of the dimensions of a can side, unless the strip's length is roughly double the height of a can (Table 6). It would therefore appear that can sides were squared up to the double-height dimension and then split horizontally. Since there are few if any groups of identical scraps, it appears that each sheet of tinplate was shaped separately.

Tools

Precious few actual tools survived the fire and subsequent scavenging. A broken soldering iron (FIGURE 26D) is made of copper, the preferred metal. The Ayars catalogue listed three styles of soldering iron, including this one, and bar copper for those who made their own.

A pipe hanger (FIGURE 26C) found in the cellar is a relic of the steam pipes that must have run under the floor. Two parts of a grille, one illustrated (FIGURE 26F), could have been the bottom of a charcoal-fired device used to heat soldering irons. A piece of tile (FIGURE 26A) discolored by heat and covered with small nicks, evidently was a working surface. The absence of tools from the ruins may cast doubt upon the 1884 newspaper account of the second fire, which stated that the plant had been leased to a new operator and was about to resume operations.

Plate 46

This photo of the Ellendale cannery, taken in 1924, shows the lightweight construction and accretional building "plans" typical of country canneries. Like the Lebanon cannery, this example is standing on piers and is lighted by cupolas; a cupola is mentioned in an account of the first fire. In a conflagration, the cupola would have provided draft for the flames.