

# CORINTHIAN METALWORKING

## THE GYMNASIUM BRONZE FOUNDRY

(PLATES 101–106)

DIRECTLY SOUTH OF THE GYMNASIUM in ancient Corinth, a large bronze foundry was excavated between 1967 and 1969 by the University of Texas under the auspices of the American School of Classical Studies at Athens.<sup>1</sup>

Measuring more than nine meters from east to west, the workshop had been dug in hard, red sandy earth and consisted of a rectangular casting pit, 2.31 meters deep, with a flight of steps one meter wide, at the east end, ascending 1.16 m. to a smaller pear-shaped pit, probably the furnace (Pl. 101:a).<sup>2</sup>

The upper dimensions of the casting pit (Fig. 1) are 3.45 m. (north–south) by 5.05 m. (east–west); the floor measures 3.09–3.26 m. (north–south) by 4.14–4.34 m. (east–west). The north wall of the pit has rounded corners plastered over with clay, in which finger-marks are still visible (Pl. 101:b). Mud bricks line the west wall and part of the north wall (Fig. 2).<sup>3</sup> A wall made of irregular stones runs diagonally across the floor of the casting pit from north to south. The furnace pit to the east is roughly square, measuring approximately 1.95 m. on each side, narrowing at the west to the stairway that leads down into the casting pit (Fig. 3).

Six irregular constructions made of stones or tiles consolidated with clay packing were found at different levels within the casting pit and a seventh directly in the furnace pit (Figs. 4, 5; Pls. 101:c, 102:a–c). The earth floor around each of them was burned. These

<sup>1</sup> James R. Wiseman, Director of the University of Texas excavations, kindly gave me permission to publish the foundry, which was first studied by Janet L. Rollins. Her carefully recorded excavation notebooks, thorough reports on the area, and interpretation of the installation have been of great assistance to me and are the basis for my own study of the workshop. I am indebted to Nancy Bookidis and Charles K. Williams, II, Assistant Field Director and Director, respectively, of the Corinth Excavations, for their assistance and encouragement. The drawings are by Grulich, photographs by I. Ioannidou and L. Bartzioti.

Works frequently cited are abbreviated as follows:

- “Corinth: Gymnasium” = J. R. Wiseman, “Excavations in Corinth: The Gymnasium Area, 1967–1968,” *Hesperia* 38, 1969, pp. 64–106
- “Bronze: Athenian Agora” = C. C. Mattusch, “Bronze- and Ironworking in the Area of the Athenian Agora,” *Hesperia* 46, 1977, pp. 340–379
- “Corinthian Metalworking: Forum” = C. C. Mattusch, “Corinthian Metalworking: The Forum Area,” *Hesperia* 46, 1977, pp. 380–389
- Greek Bronze Statuary* = C. C. Mattusch, *Greek Bronze Statuary: From the Beginnings through the Fifth Century B.C.*, Ithaca 1988

<sup>2</sup> See “Corinth: Gymnasium,” pp. 68–69 and J. R. Wiseman, “Ancient Corinth: The Gymnasium Area,” *Archaeology* 22, 1969, p. 222; *Greek Bronze Statuary*, pp. 228–230, 235, 240. In the region of the workshop (foundry) were found pottery dating from as late as the 6th century after Christ and a significant amount of foundry debris. The upper levels of fill within the casting pit contained some casting debris and some pottery, earlier in date, concentrating in the 1st to 2nd centuries after Christ. Near the floor of the installation there was no pottery, only foundry debris.

For a similar workshop in two parts, see “Bronze: Athenian Agora,” pp. 370–371, fig. 7, pl. 93: late 4th century after Christ.

<sup>3</sup> The mud bricks measure approximately 0.40 × 0.40 × 0.06 m.

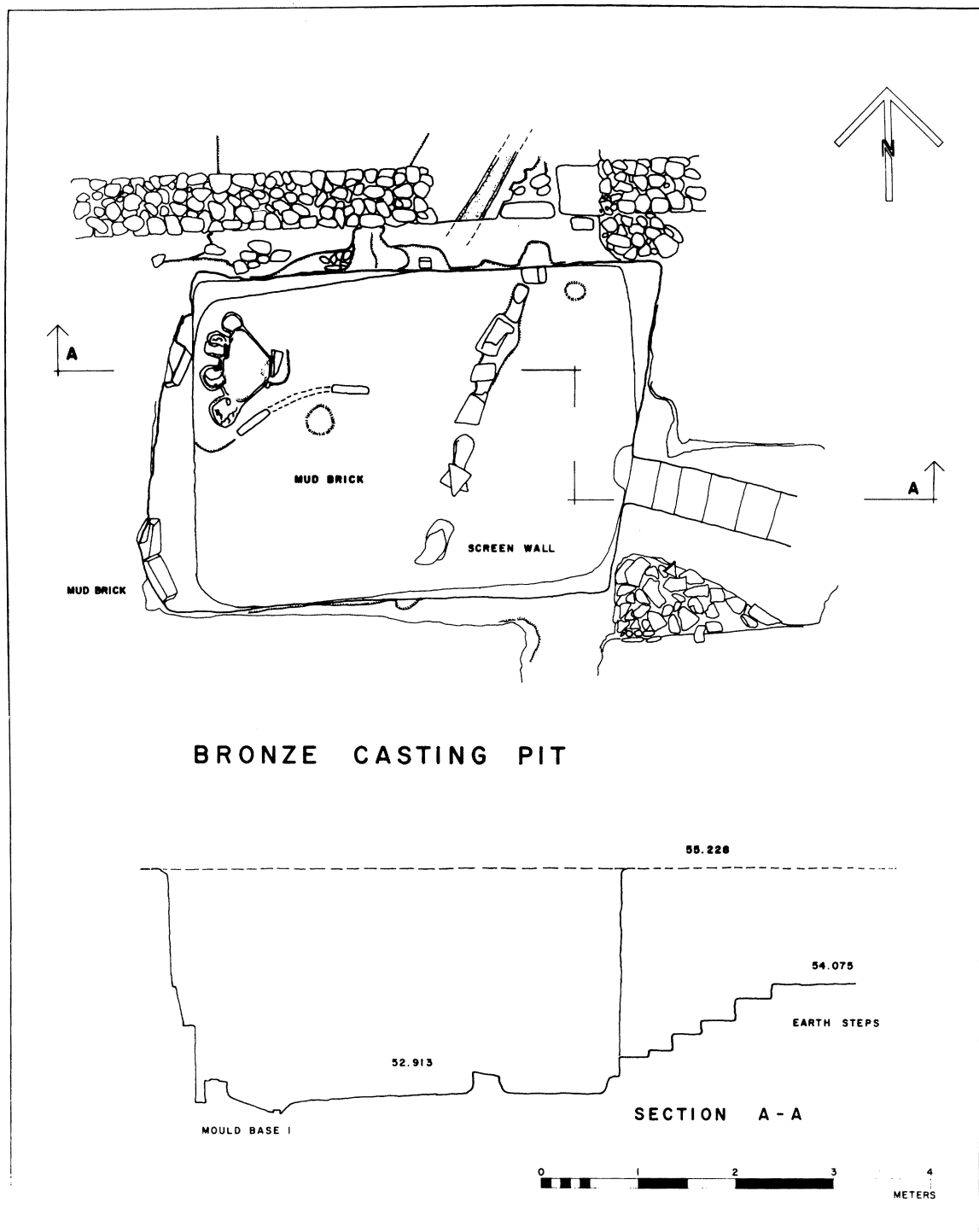


FIG. 1. Plan and section of casting pit

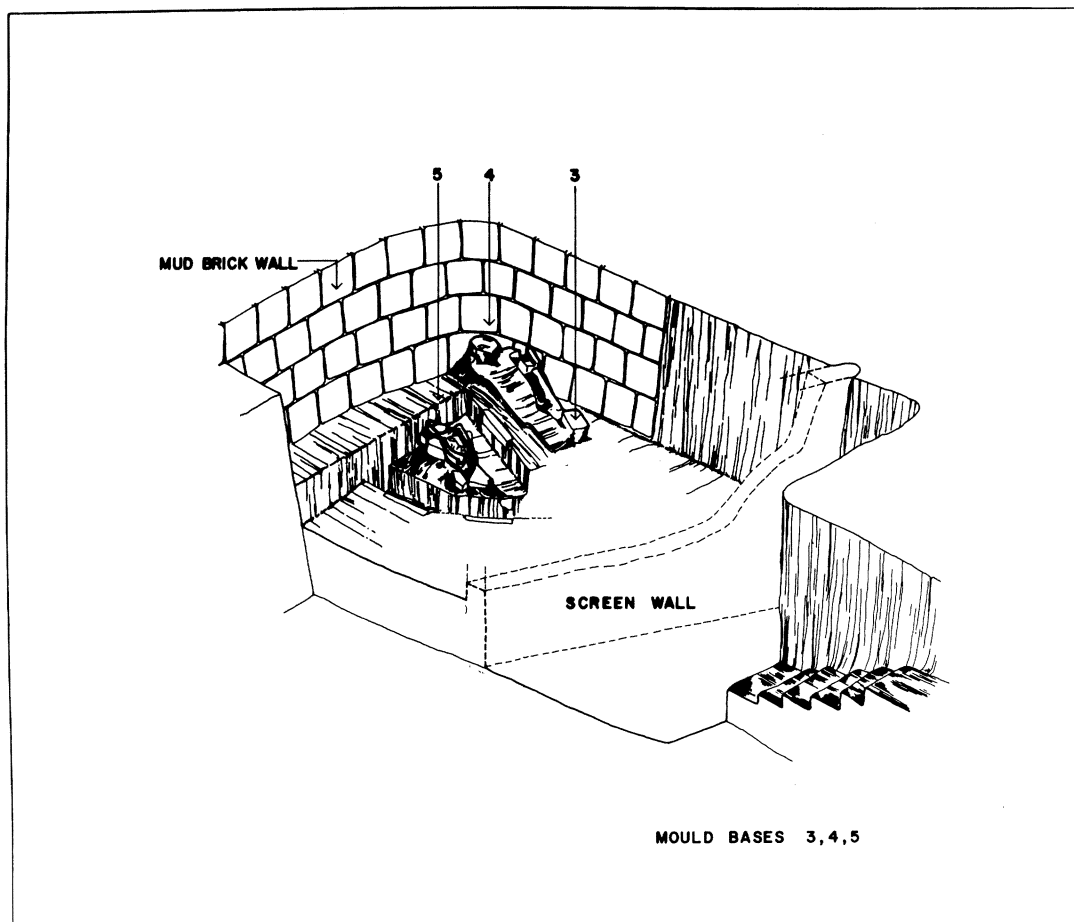


FIG. 2. Isometric drawing of casting pit with mold bases 3, 4, and 5

constructions can be identified as bases used to support molds during baking. Three bases were removed from the pit, but only one of these still retains its original form and dimensions.<sup>4</sup> It is constructed of two thick, rectangular chunks of red mud brick, wrapped and glued together with pale buff clay, which is burned black across the flattened top of the base. An outer wrapping of clay originally continued upwards to support the mold during baking (Fig. 5; Pl. 102:d, e).<sup>5</sup> The mold base is preserved to a height of 0.17 m., with upper horizontal dimensions of approximately 0.15 × 0.23 m.

<sup>4</sup> Mold bases removed from the casting pit are stored in Corinth lots 5956, 5957, 5958. The mold base described here (lot 5956: identified as "Great Mould V") is slightly smaller than the others.

<sup>5</sup> For similar mold bases, see "Bronze: Athenian Agora," pp. 364–366 and figs. 5 and 6: second half of 2nd century B.C.; D 1, p. 356 and pl. 87: 4th century B.C.; G 1, p. 359 and pl. 88: 4th–3rd centuries B.C.; p. 370, fig. 7 and pl. 93: late 4th century after Christ; P 1, p. 374 and pl. 96: 5th century B.C. Also G. Zimmer, "Giesereinrichtungen im Kerameikos," *AA (JdI)* 99 (1984) (pp. 63–83), Gg 4.1, pp. 67–69 and figs. 5 and 6: 5th century B.C.; pp. 76–82 and figs. 14–19: 1st century after Christ; W.-D. Heilmeyer, G. Zimmer, and G. Schneider, "Die Bronzegießerei unter der Werkstatt des Phidias in Olympia," *AA (JdI)* 102 (1987) (pp. 239–299), pp. 257–268, figs. 18, 19, 26: 5th century B.C.

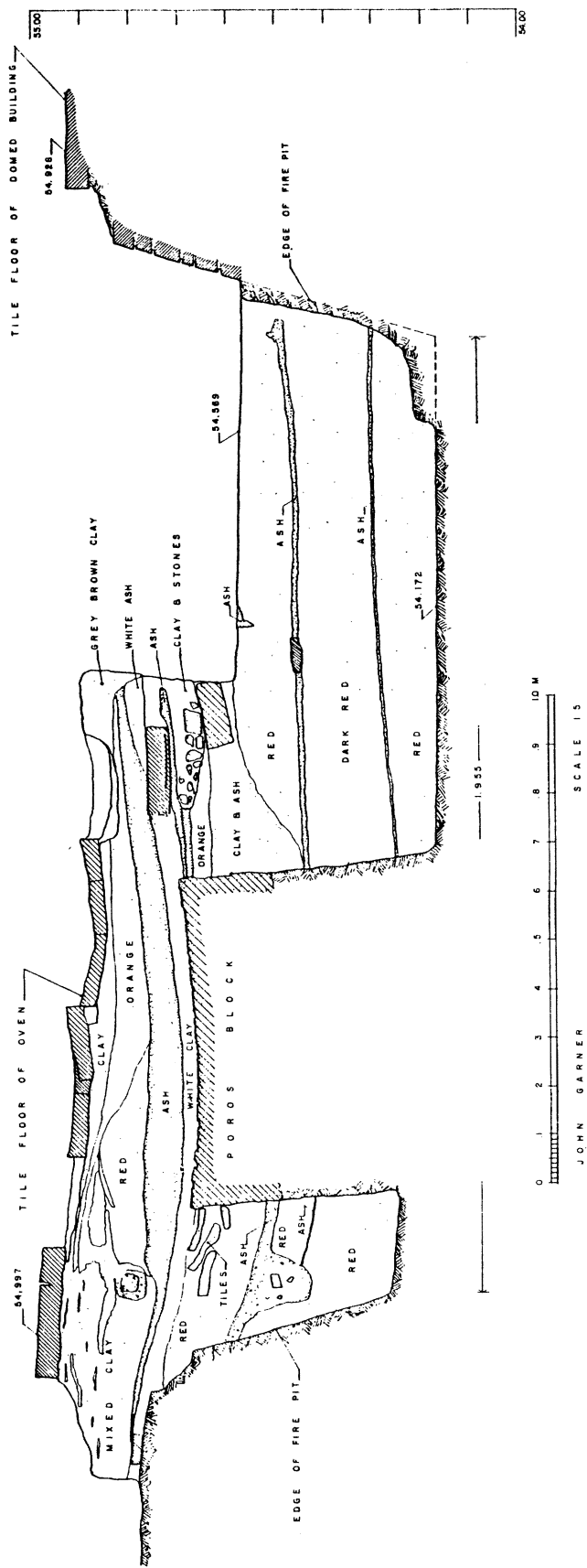


Fig. 3. Section of furnace pit looking north

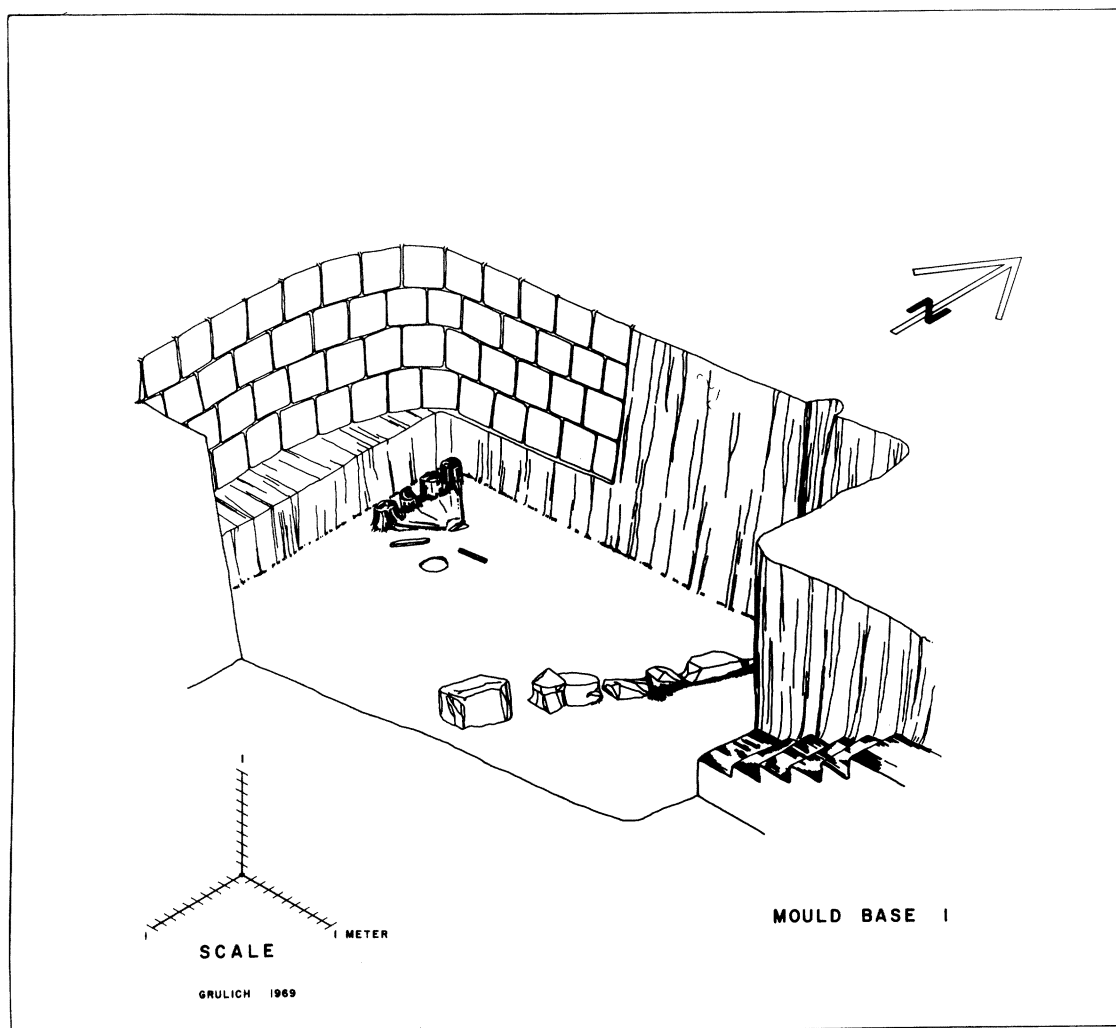


FIG. 4. Isometric drawing of casting pit with mold base 1

The investment molds<sup>6</sup> were packed in sand within the casting pit for the pour, with only the funnels exposed to receive the liquid bronze and channel it into the gate system. The diagonal wall probably served as a screen to reduce the amount of earth packing needed. After the pour, the molds were dug out of the casting pit and broken apart for the removal of the cast bronzes. Jagged edges along the tops of the mold bases attest to this final destruction of the molds.

The furnace pit, reached by the steps (Pl. 102:f), was used for the melting of the bronze alloy. The pit was dug directly adjacent to the casting pit so that the molten bronze need be carried only a short distance to make the pour. The furnace pit had a tile floor; two parallel

<sup>6</sup> The term investment mold is used to refer to the final mold which was built over a cored, completed wax model for baking and casting. For a glossary of terms relating to ancient foundries, see *Greek Bronze Statuary*, pp. 219–240.

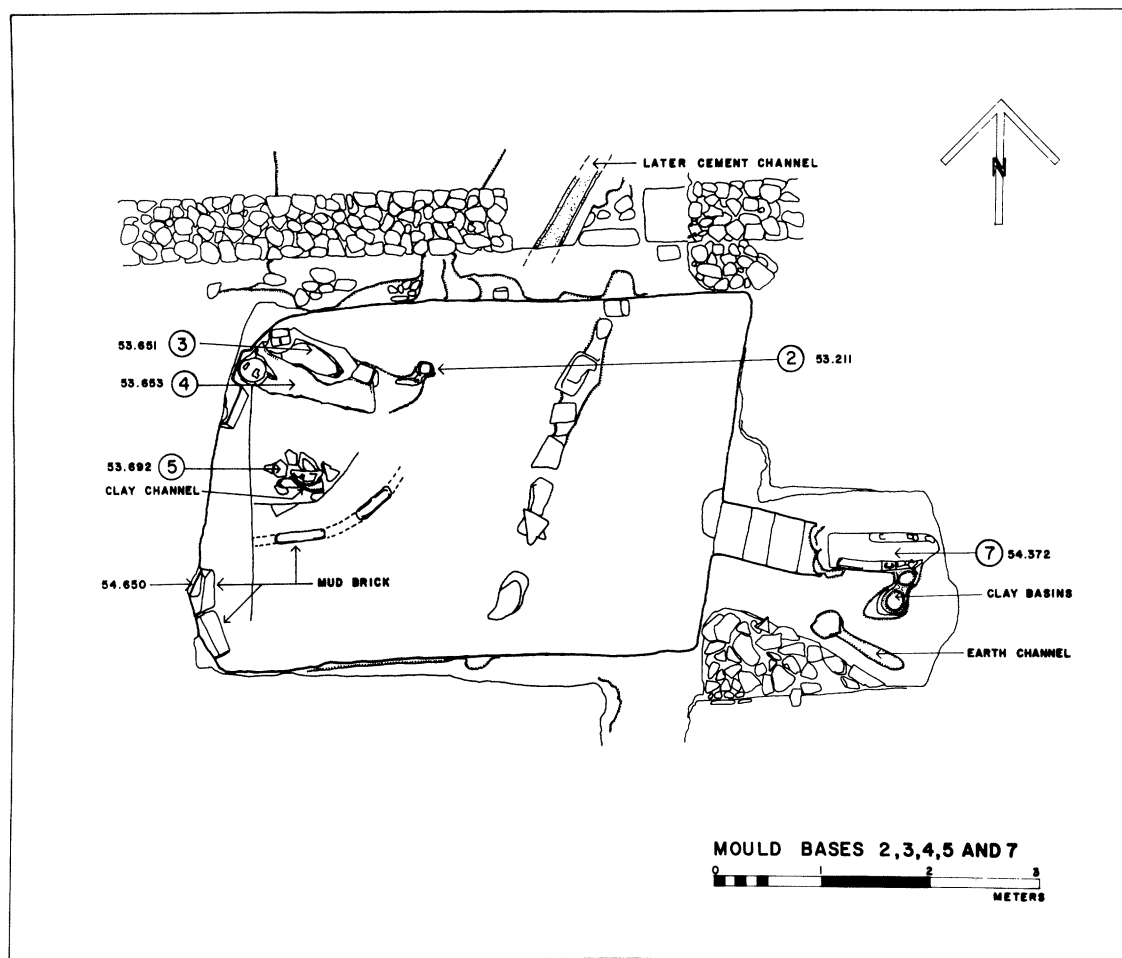


FIG. 5. Plan of casting pit with mold bases 2, 3, 4, 5, and 7

east-west rows of mud brick topped with clay and with tiles coated with clay were perhaps supports for crucibles.<sup>7</sup>

A great quantity of foundry debris was thrown into the workshop as fill and, in fact, was strewn over the entire region. Fortunately, during the excavation of the foundry, particular care was taken to preserve all this material, which bears eloquent testimony to the details of the casting procedure employed here.

The debris which was found scattered in the area above the foundry was lotted before the excavators had identified the installation as a foundry; it ranges in date from the 1st to as

<sup>7</sup> For a similar furnace, see E.-L. Schwandner, G. Zimmer, and U. Zwicker, "Zum Problem der Öfen griechischer Bronzegiesser," *AA (JdI 98)* 1983, pp. 57–80, figs. 3 and 4: Kassope, 2nd century B.C. For crucibles of the type that were probably used in the Corinthian furnace, see Heilmeyer, Zimmer, and Schneider (footnote 5 above), pp. 268–274, figs. 27–32: 5th century B.C.; and "Bronze: Athenian Agora," M8 and M9, p. 372, pl. 94: 4th century after Christ.

late as the 6th century after Christ. These lots combine pottery and a few coins with foundry debris, such as statue fragments and bronze patches used to fill imperfections in finished pieces.

The fill from within the workshop itself is more homogeneous, consisting almost entirely of casting debris and wood charcoal. It can be dated more narrowly, to the late 1st or early 2nd century after Christ, and helps define the period during which the workshop was actually functioning.

Like materials from the fill within the foundry were combined into the same lots, so that they could be studied together, such as mold fragments (lot 5960), pieces of bronze (lot 5421), of iron (lot 5293), and of lead (lot 5292). The workshop contained about eighty bronze drips and 110 lumps of bronze slag; eight lead drips; nearly sixty iron nails and thirty iron lumps, some of them broken nailheads, others slag. Although only one crucible fragment was recovered, at least 330 mold fragments were lotted. There were also approximately 150 props used to support the molds during baking, some made of amphora handles of early Roman type. Animal bones and various other materials, probably related to casting but more difficult to interpret, were also contained in the fill of the workshop.<sup>8</sup>

A representative sampling of debris overlying the foundry was inventoried, including small fragments of six large bronzes, four bits of bronze slag, and seven bronze drips and splashes, as well as seven iron nails, two of which appear to be chaplets, and one hemispherical lump of iron slag.<sup>9</sup> Nearly fifty pieces of investment molds and twelve clay props were also catalogued, as well as two bits of carbon and two pieces of pumice.

<sup>8</sup> Workshop fill: Corinth lots 4866, 4867, 4869, 4874, 4875, 5282–5284, 5292, 5293, 5298, 5360, 5361, 5386, 5421, 5455, 5488, 5489, 5494, 5896, 5956–5960. Lot 5960 contains most of the mold fragments from the fill of the casting pit: 33 trays (measuring  $0.67 \times 0.37$  m.) were saved; 7 trays of the smallest fragments were discarded. Lot 5298 contains brick fragments with bronze drips.

*Inventory:*

Statue fragment: MF 13058.

Patch: MF 13064.

Bronze drips: MF 13078, MF 13080 a, b, MF 13081, MF 13083 a, b, MF 68-317–68-319, MF 68-324 a, b, MF 68-326 a, b, MF 68-327, MF 69-202.

Iron nails: MF 13072, MF 13077.

Bronze slag: MF 13092, MF 13093, MF 68-304, MF 68-315, MF 68-320, MF 68-323.

Iron slag: MF 13098.

Crucible fragment: MF 68-329.

Mold fragments: MF 69-205–69-208, MF 69-210–69-217, MF 69-220–69-227, MF 69-229–69-236.

Gates and funnels: MF 13022, MF 13026, MF 69-218, MF 69-219, MF 69-228, MF 69-237–69-247.

Props: MF 13023, MF 68-275–68-277, MF 68-328, MF 68-331, MF 68-333, MF 69-204, MF 69-248–69-256.

Other related finds: MF 68-313 (bronze nail), MF 68-330 a, b (bronze sheet with rivet), MF 13074 a–d (lead sheets and iron pin), MF 68-278 (iron tube wrapped with clay), MF 13021 and MF 68-332 (pumice), MF 69-209 (bellows nozzle?).

<sup>9</sup> Gymnasium Foundry area: Lots 4526, 4788, 4800, 4817, 4822, 4826, 4841, 4842, 4855, 4858, 4860, 4861, 4863, 4882, 4887, 4890, 5387, 5393, 5400, 5410–5413, 5415, 5452, 5456, 5457.

*Inventory:*

Statue fragments: MF 12923, MF 13059, MF 13084, MF 13085, MF 13095, MF 68-303.

Bronze patches from statues: MF 13024, MF 13025, MF 13027, MF 13060–13063, MF 13065, MF 13066, MF 13082, MF 13086 a, MF 13091. For photo, see *Greek Bronze Statuary*, p. 240.

Eight samples of clay and eight of metal were submitted to spectrographic analysis by Robert H. Brill of the Corning Museum of Glass. As a result, two important preliminary observations can be made: first, that the clays are all of the same or similar origin; and second, that the bits of bronze all have relatively high lead content.<sup>10</sup>

The uniformity and quantity of the material dumped into the workshop suggest that this was a temporary installation, one which was constructed solely for a single large commission and then closed down, in keeping with the usual practice in Greek foundries.<sup>11</sup> The fact that the seven mold bases were found at different levels testifies to the different stages of production and indicates that the bronzes were cast here in pieces, following the accepted procedure. Six of the castings were made in the casting pit proper, the seventh evidently directly in the shallower furnace pit to the east. As each casting was completed, the broken molds, slag, and waste bronze from that operation were dumped into the pit, and the next mold base was constructed on top of the debris from the earlier castings. Thus the pit was gradually filled as the project proceeded toward completion.

What was the nature of the bronze or bronzes produced in this workshop? The numerous broken investment molds which were found in the workshop itself and overlying the entire region, though similar in composition, construction, and clearly monumental scale, are mostly too fragmentary to be readily identifiable. A few of them, however, preserve distinct impressions of lifesized, billowing drapery folds (MF 69-206, MF 69-207: Pl. 103:a, b). The negative impressions of these folds, which had been marked on the wax model, were picked up in the fine slipped inner layer of the investment molds.<sup>12</sup> Other smooth or gently undulating inner mold surfaces may be from the fleshy parts of one or more statues (MF 69-232, MF 69-233, MF 69-234: Pl. 103:c).

The investment molds, made of buff to pink clay, normally consist of two layers, the outer one relatively coarse with inclusions of gravel, sand, small shells, and straw. The thinner and finer inner layer of clay contains more delicate inclusions, such as hair, and is scorched from contact with the bronze, a feature which in some cases extends into the outer layer of clay (MF 69-239: Pl. 103:d). It was applied in liquid form so as to pick up all the details of the wax model. The outer layers of clay were applied by hand, then finished off with some large spatulate instrument.

A number of the molds preserve reddened impressions in their inner surfaces measuring about 0.02 m. in diameter (MF 69-221: Pl. 104:a). These were made by the circular heads of the iron nails that were used to pin the core in place within the mold during the pour. Some of the pins or chaplets are preserved; they have rectangular tapering shafts measuring

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Bronze drips: MF 13101, MF 13067, MF 13086 b, MF 13087, MF 13089 a, b, MF 13090. For photo, see *Greek Bronze Statuary*, p. 235.

Iron nails: MF 13073, MF 13097 a, b, MF 68-306 a, b (= chaplets), MF 68-307, MF 68-308.

Bronze slag: MF 13068, MF 13069, MF 13076, MF 13099.

Iron slag: MF 13100. Cf. "Bronze: Athenian Agora," E 1, pp. 357-358, pl. 87.

Related finds: MF 13088, MF 13094 (bronze sheets); MF 68-310 (bronze wire); MF 68-312, MF 68-321 (tools?); MF 13070, MF 13075 a, b, MF 13079 (lead sheets); MF 13071 a, b, MF 68-316 (lead wire); MF 68-314 (crucible?); MF 69-201 (pumice).

<sup>10</sup> The preliminary report is dated April, 1972. For the material analyzed, see lot 5298.

<sup>11</sup> See, for example, "Bronze: Athenian Agora," p. 377.

<sup>12</sup> See MF 69-205-69-207; lot 5960 L.



0.029–0.033 m. in length and flat to slightly convex heads about 0.20 m. in diameter (MF 68-306 a, b: Pl. 104:b, top).<sup>13</sup>

The many clay props which these founders used to stabilize the molds during baking testify to their resourcefulness. Some of the props are amphora handles broken from their vessels and wrapped in clay as a means of adapting them to their new function (MF 13023, MF 68-275, MF 68-277, MF 68-328, MF 68-333, MF 69-204: Pl. 104:c, d). Both early Roman oval handles and those from double-handled amphoras of Koan type were used. Other props are larger handmade supports of a type also known from other sites in Greece.<sup>14</sup> Clay channels found beside the mold bases received the molten wax and channeled it out of the molds during baking (Figs. 1, 4, 5). A concentration of wood carbon was found around all the mold bases in the casting pit (Pls. 101:c, 102:d).<sup>15</sup>

Few traces are left from the actual melting process. There is a bit of the rim of a crucible made of buff clay, the gray vitrified inner surface flecked with bronze.<sup>16</sup> One large, heavy piece of lead backed with clay, with a rim and vertical-to-curving wall, may be fill left from another crucible.<sup>17</sup> Of the bronze slag, some of it is lightweight, with vitrification, some is heavier bronze waste with clay and carbon adhering to it.<sup>18</sup> Heavy hemispherical lumps of iron may be tap slag.<sup>19</sup>

There is, however, a great deal of evidence for the transport of the molten metal from the furnace to the casting pit. The excavators found small bronze drips, larger splatters, and even some major spills (Pl. 105:b).<sup>20</sup> As we might expect, these bits of bronze were usually found above the casting pit or high in its fill, since they all would have occurred during the pour when the molds were packed in the pit. A drip may have dirt and charcoal adhering to it,<sup>21</sup> or it may retain the shape of the outside of the funnel down which it dripped.<sup>22</sup> More than one drip or splash shows the textured surface of the sand in which it landed.<sup>23</sup> The broken clay funnels and gate systems with blackened interiors are proof that the bronze reached its appropriate destination within the investment molds (Pls. 103:d, 106:a–c).

The actual statue fragments found in the area of the workshop are at first more difficult to interpret (Pl. 105:c). All but one of them come from outside the workshop, and they are all very different in composition and in thickness, indicating that they come from different castings. They are also broken up into small pieces and are surely not products of this workshop. Instead, they must come from statues which were being broken up for remelting and re-use in this foundry.

<sup>13</sup> Corinth MF 68-306 a, b, and lot 5293. Some Greek founders used iron nails for chaplets, others used bronze: the choice of one or the other metal was apparently a matter of personal preference or of local convention.

<sup>14</sup> *Greek Bronze Statuary*, pp. 229–230 and notes 10–12.

<sup>15</sup> MF 13092, MF 13093; lot 5361.

<sup>16</sup> MF 68-329.

<sup>17</sup> MF 68-314. For Athenian parallels, see “Bronze: Athenian Agora,” L 2, p. 369.

<sup>18</sup> Lightweight: MF 13068, MF 68-304, MF 68-320. Heavy: MF 13099, MF 68-315.

<sup>19</sup> MF 13098, MF 13100. For Athenian parallels, see “Bronze: Athenian Agora,” E 1, pp. 357–358, pl. 87.

<sup>20</sup> MF 13067, MF 13078, MF 13080 a, b, MF 13081, MF 13083 a, b, MF 13086 a, MF 13087, MF 13089 a, MF 13090, MF 13101, MF 68-325.

<sup>21</sup> MF 13069, MF 68-327.

<sup>22</sup> MF 13078.

<sup>23</sup> MF 13080 a, b, MF 13083 a, b, MF 13101, MF 69-202.

There is ample evidence from the Gymnasium Foundry for the finishing of statues after casting. The process involved cleaning the surface of the bronze, joining the cast pieces, repairing flaws, and adding inlays. There are many rectangular bronze patches, which come not from the casting pit itself but from the surrounding area, indicating that coldworking required an open space and that it was done at ground level (Pl. 105:c, d). The patches are in various stages of production: we can readily see that they were cast in open molds, then cut to remove any bronze that had run over the edges of the mold and to fit their spaces, and finally worked smooth.<sup>24</sup> Some of them have just been cast; others are ready for use.<sup>25</sup> Most are rectangular in section, but some are trapezoidal, perhaps to facilitate their removal from the mold or to ensure a tight fit when they were hammered into place.<sup>26</sup>

There are a few pieces of pumice: those with flattened surfaces and greenish coloration were actually used to remove the casting skin and to polish the bronze; one rough chunk evidently did not see use.<sup>27</sup> There is one rasplike bronze instrument, which may also have served to scrape away the casting skin.<sup>28</sup> A number of miscellaneous finds may also have been associated with coldworking. Thin strips and wires made of bronze and lead could have been intended to serve as inlays.<sup>29</sup> It is more difficult to identify the sheet bronze and lead found folded, rolled, and in one case riveted.<sup>30</sup>

The following brief catalogue of objects from the Gymnasium Foundry is intended to be representative of the foundry debris, with reference to similar lotted or inventoried objects and to related objects from other ancient foundries in Greece.

## CATALOG

All dates are in the Christian era.

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| <p>1. MF 69-239. Funnel Pl. 103:d<br/>Max. pres. H. 0.170; max. pres. Th. 0.053; est. diam. of lip <i>ca.</i> 0.070 m.<br/>Part of lip and wall of wide shallow funnel, made of two layers of clay, self-slipped within. Scorched; bronze adheres to surface.<br/>Similar piece: MF 69-238.<br/>Lot 5960A: <i>ca.</i> 70 mold fragments of various types.<br/>Unpublished.<br/>For references to published funnels and gate systems from other sites in Greece, see <i>Greek Bronze Statuary</i>, pp. 222–223.</p> | <p>2. MF 69-242. Funnel with y-gates Pl. 106:a<br/>Max. pres. dim. 0.180; max. pres. Th. 0.050; D. funnel 0.020; diam. funnel 0.060, gates <i>ca.</i> 0.020, 0.010, 0.015, 0.010 m.<br/>Three joining fragments. Tiny funnel directly joining two pairs of y-gates. Most of outer layer of clay missing; layering indistinct; interior scorched.<br/>Similar to MF 69-240.<br/>Lot 5960N: <i>ca.</i> 20 funnel fragments.<br/>Unpublished.</p> |
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<sup>24</sup> Patches: MF 12923, MF 13004, MF 13024, MF 13025, MF 13027, MF 13032, MF 13060, MF 13061, MF 13062, MF 13063, MF 13065, MF 13066, MF 13086 a, MF 13091; see Pl. 105:d.

<sup>25</sup> Just cast: MF 13024, MF 13027, MF 13061–13063, MF 13065. Ready for use: MF 13025, MF 13060, MF 13064, MF 13082, MF 13086 a.

<sup>26</sup> See MF 13063, MF 13082.

<sup>27</sup> Used pumice: MF 13021, MF 69-201. Unused pumice: MF 13113.

<sup>28</sup> MF 68-321.

<sup>29</sup> MF 13059, MF 13070, MF 13071 a, b, MF 13075 a, b, MF 68-310, MF 68-316.

<sup>30</sup> MF 13074 a–d, MF 13075 a, b, MF 13079, MF 13088, MF 13094, MF 68-330 a, b.

3. MF 13022. Y-gates Pl. 106:b  
Max. pres. dim. 0.100; diam. gate at top 0.020, gates at bottom 0.018, 0.017 m.  
Conical fragment with slightly concave channel around top, serving as funnel into single gate, which divides into two within. Light pinkish buff clay constructed in two layers; interior scorched. Traces of bronze around funnel.  
No lot noted. From high levels.  
Unpublished.
4. MF 69-245. Y-gates Pl. 106:b  
Max. pres. dim. 0.146; diam. gates 0.011, 0.012 m.  
Four joining fragments. Tiny flattened area at top may be outer layer of funnel leading to single gate, which divides. Below, one gate divides again at break. Pinkish buff clay; interior scorched.  
Lot 5960A: 69 mixed mold fragments. Lot 5960N: *ca.* 20 funnel fragments.  
Unpublished.
5. MF 69-237. Partial gate system Pl. 106:c  
Max. pres. dim. 0.263; diam. vertical gate *ca.* 0.012 m.  
Seven joining fragments. Vertical gate with parts of two other gates leading off it at slightly upward angles. Fine buff clay; interior self-slipped. Scorched red to black.  
Lot 5960A: 69 mixed mold fragments.  
Unpublished.
6. MF 69-206. Mold fragment Pl. 103:a  
Max. pres. dim. 0.264; max. Th. 0.030, outer layer *ca.* 0.022, inner layer *ca.* 0.005 m.  
Seven joining fragments, reinforced with modern plaster; broken all around. Made in two layers of buff clay: some sand in outer layer; finer, scorched inner layer. Interior surface, where preserved, incised with wide, shallow, swirling drapery folds.  
Similar pieces: MF 69-205, MF 69-207.  
Lot 5960L: a number of similar mold fragments, constructed in two to three layers.  
Unpublished.
7. MF 69-207. Mold fragment Pl. 103:b  
Max. pres. dim. 0.167; Th. outer layer *ca.* 0.019, inner layer *ca.* 0.007 m.  
Two joining fragments, broken all around. Made in two layers of clay: coarser one on exterior; inner layer burned red. Traces of bronze along breaks. Interior surface incised with impressions of wide, swirling drapery folds.  
Similar pieces: MF 69-205; MF 69-206.  
Lot 5960L: a number of similar mold fragments, constructed in two layers.  
Unpublished.
8. MF 69-213. Mold fragment Pl. 103:c  
Max. pres. dim. 0.091 m.  
Two joining fragments, broken all around. Made in two layers of clay: exterior orange to gray; interior scorched. Two holes through outer layer probably imperfections. Concave inner surface rasped in crosshatched pattern.  
Similar pieces: MF 69-212, MF 69-214.  
Lot 5960: sections G, I, M contain similar pieces.  
Unpublished.  
For other rasped inner surfaces, see "Bronze: Athenian Agora," p. 352, pl. 85; *Greek Bronze Statuary*, pp. 224-225.
9. MF 69-221. Mold fragment Pl. 104:a  
Max. pres. dim. 0.298; diam. holes 0.020 m.  
Seven joining fragments, reinforced with modern plaster; broken all around. Straw and hair inclusions; scorching. No inner surface remains. Two round holes 0.080 m. apart, with flattened reddish bases: these are impressions of heads of nails used as chaplets.  
See MF 68-306 a, b (14; Pl. 104:b) for iron nails with heads which fit these impressions.  
Similar pieces: MF 69-220, MF 69-222, MF 69-223.  
Lot 5960N: several similar but smaller mold fragments, each with one nailhead impression.  
Unpublished.
10. MF 69-232. Mold fragment Pl. 103:c  
Max. pres. dim. 0.121; max. pres. Th. 0.032 m.  
Broken all around. Two layers of clay; cracks in scorched inner surface. Smooth curving inner mold surface with strongly marked ridge at one side *ca.* 0.001 m. wide.  
Similar piece: MF 69-231.  
Lot 5960I: similar but smaller mold fragments.  
See also Lot 5960G.  
Unpublished.

11. MF 69-233. Mold fragment Pl. 103:c  
Max. pres. dim. 0.131; Th. outer layer 0.008, inner layer 0.003 m.

Three joining fragments. Broken all around; only two inner layers preserved. Charred inner surface; traces of bronze. Finger marks on back suggest attachment of one layer of clay to another.

Lots 5960G + M: some inner mold surfaces, either smooth or preserving marks of rasped wax; all constructed in two layers.

Unpublished.

12. MF 69-234. Mold fragment Pl. 103:c  
Max. pres. dim. 0.110; max. pres. Th. 0.030 m.

Scorching; cracks in smooth inner surface. Part of concave edge *ca.* 0.015 m. wide; below this, inner mold surface curves abruptly.

Lot 5960G. Compare lots 5960I + L and lot 5960J for similar exterior.

Unpublished.

13. MF 13072. Iron chaplet(?) Pl. 104:b  
L. shaft 0.025; diam. head 0.030–0.035 m.

Iron nail with tapering rectangular shaft and round convex head. Badly corroded.

Lot 5293: 56 iron nails, 26 iron lumps.

Unpublished.

14. MF 68-306 a, b. Iron chaplets Pl. 104:b  
a: L. shaft 0.029; diam. head *ca.* 0.020 m.  
b: L. shaft as bent 0.033; diam. head *ca.* 0.020 m.

Two short iron nails with tapering rectangular shafts and round, flat to slightly convex heads, set or bent at an angle to shafts. Corroded but intact.

See mold fragments MF 69-220, MF 69-221 (9; Pl. 104:a), MF 69-222, MF 69-223, and lot 5960N for impressions which fit heads of these chaplets.

Lot 5293: 56 iron nails, 26 iron lumps.

Unpublished.

15. MF 13073. Iron nail Pl. 104:b  
Max. pres. L. 0.666; diam. head *ca.* 0.018 m.

Thick iron nail, with rectangular tapering shaft and round conical head. Badly corroded.

From lot 4788: area overlying foundry. 6th century. Added to iron in lot 5293.

Unpublished.

16. MF 13097 a, b. Iron nails Pl. 104:b  
a: Max. pres. L. 0.067; diam. head *ca.* 0.030 m.  
b: Max. pres. L. 0.046; diam. head *ca.* 0.031 m.

Two large iron nails with rectangular shafts and round, flat heads.

Lot 4788: 56 iron nails, 26 iron lumps. From area overlying foundry. 6th century.

Unpublished.

17. MF 68-275. Prop (amphora handle) Pl. 104:c

Max. pres. dim. 0.085 m.

Fragment of double rolled vertical amphora handle of Koan type, broken at both ends, made of pink gritty clay. Handle is wrapped with fine buff clay, with part of a resting surface preserved at one end, other end broken. Partly scorched on resting surface.

Similar pieces: MF 13023, MF 68-276, MF 68-277, MF 68-331, MF 68-333, MF 69-204 (Pl. 104:c and d).

Lots 5455 (*ca.* 60 examples), 5896, 5897. Late 1st to early 2nd century.

Unpublished. MF 68-333 published in *Greek Bronze Statuary*, p. 230 and fig. A19.

Comparanda: Zimmer (footnote 5 above), p. 78.

18. MF 69-250. Handmade prop Pl. 105:a  
Max. pres. dim. 0.095 m.

Roughly modeled vertical prop with one flat, spreading end. Coarse buff to pinkish clay was formed around slender rectangular object, now lost. Interior scorched to red; flattened end black from burning.

Similar pieces: MF 69-248, MF 69-249, MF 69-251–69-256 (Pl. 105:a).

Lot 5960GG, HH: *ca.* 58 pieces of props.<sup>31</sup>

Unpublished.

Compare: "Bronze: Athenian Agora," p. 356; *Greek Bronze Statuary*, pp. 229–230.

19. MF 13101. Bronze drip Pl. 105:b  
Max. pres. dim. 0.103 m.

Intact. One side rough from landing on sand, the other smooth but lumpy, having dripped from above.

From area of bronze foundry, just beneath plowed soil. No lot noted.

Similar pieces: MF 13067, MF 13069, MF 13076, MF 13078, MF 13080 a, b, MF 13081,

<sup>31</sup> Lot 5960 contains mold fragments, props, and mold bases from all levels of use in the workshop.

MF 13083 a, b, MF 13086 b, MF 13089 a, b, MF 13090, MF 68-317, MF 68-319, MF 68-325, MF 68-326 a, b, MF 68-327, MF 69-202 (Pl. 105:b).

Lot 4860: above foundry.

Published photograph: *Greek Bronze Statuary*, p. 237.

20. MF 13024. Bronze patch(?) Pl. 105:c

L. 0.030; W. 0.006; Th. 0.004 m.

Rectangular bronze patch with one smooth surface, one rough. Cast in open mold; jagged edges then cut off. Bent; broken at one end.

No lot noted: from casting pit.

Similar pieces: MF 13027, MF 13061, MF 13062 (Pl. 105:d).

For other patches, see "Corinthian Metalworking: Forum," p. 384.

21. MF 69-201. Pumice

Max. pres. dim. 0.061 m.

Small piece of pumice, all five sides flattened and greenish from use in polishing bronze.

From outside area of bronze foundry. No lot noted.

Similar pieces: MF 13021, MF 13113.

Unpublished.

Compare: "Bronze: Athenian Agora," pp. 353, 356.

22. MF 12923. Bronze statue Pl. 105:c  
fragment

Max. pres. dim. 0.053 m.

Irregularly cut piece of bronze of uneven thickness. At the cuts, parts of three rectangular holes for patches with neatly cut edges and smooth interiors, one with pockmark at base, the flaw the patch was to cover. A fourth rectangular patch remains *in situ*. One larger hole for polygonal patch. Apparently from a large bronze statue that was cut up for re-use.

Lot 4855: burned deposit overlying foundry. 6th century.

Published photos: "Corinth: Gymnasium," pl. 20:d; *Greek Bronze Statuary*, p. 240.

23. MF 13095. Bronze statue Pl. 105:c  
fragment

Max. pres. dim. 0.047; Th. 0.003 m.

Cast piece of bronze, broken all around, with tear-drop-shaped channel for inlay. Two narrow rectangular cuttings, one containing part of patch.

No lot noted: from fill overlying foundry. 6th century.

Published photo: "Corinth: Gymnasium," pl. 20:d.

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a. Casting pit and stairway from north



b. Casting pit: mud-plastered wall surface at northeast, showing finger impressions



c. Mold base 1 from south



a. Mold base 4 from south



b. Casting pit: mold bases 2, 3, and 4, and mud brick in west wall, from northeast



c. Mold base 5 in museum



d. Mold base 3 and adjacent mud-brick channel, from west

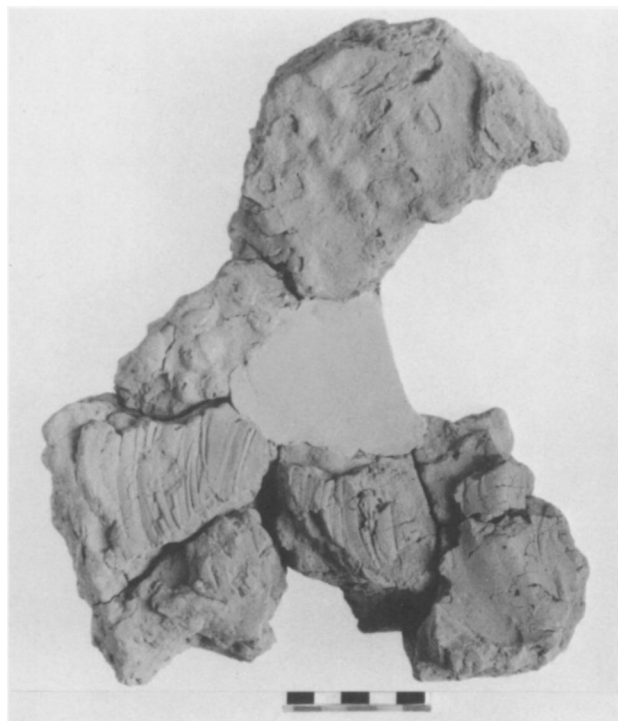


e. Mold base 6 and burned circular hole, from north

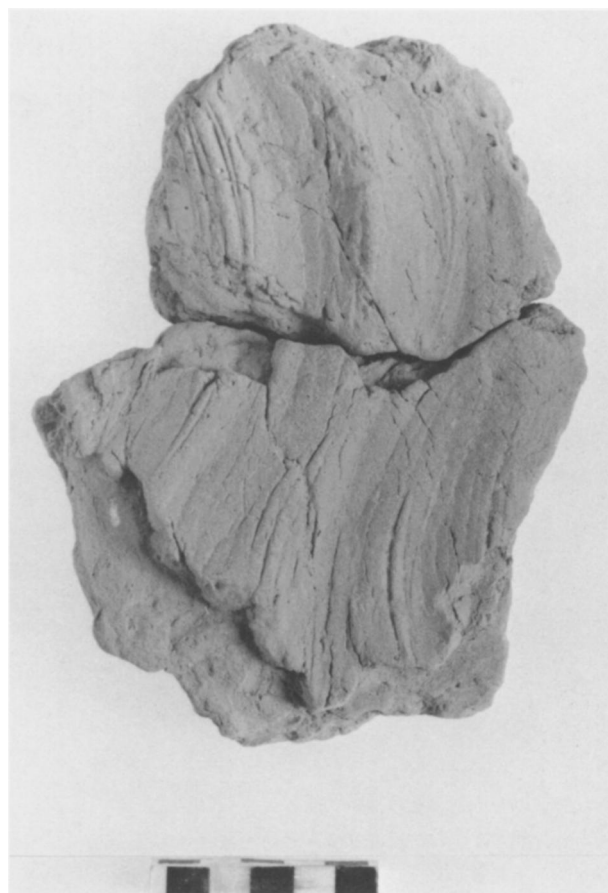


f. Steps, from west

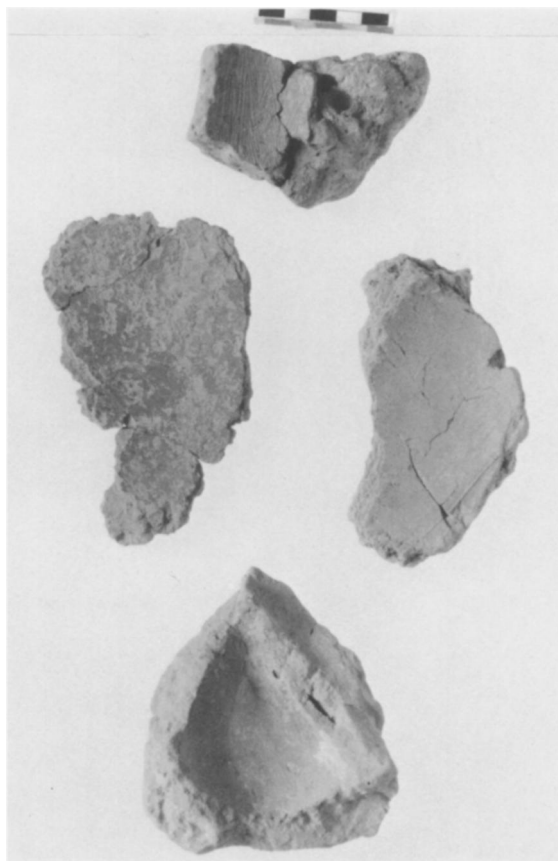




a. Mold MF 69-206



b. Mold MF 69-207



c. Molds: top, MF 69-213; left, MF 69-233; right, MF 69-232; bottom, MF 69-234

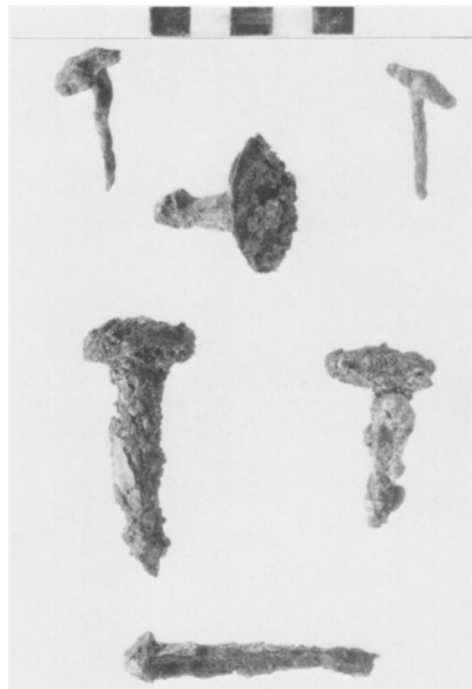


d. Funnel MF 69-239





a. Mold MF 69-221, with chaplet holes



b. Iron chaplets and nails: top, MF 68-306 a, MF 13072, MF 68-306 b; center, MF 13097 a, MF 13097 b; bottom, MF 13073



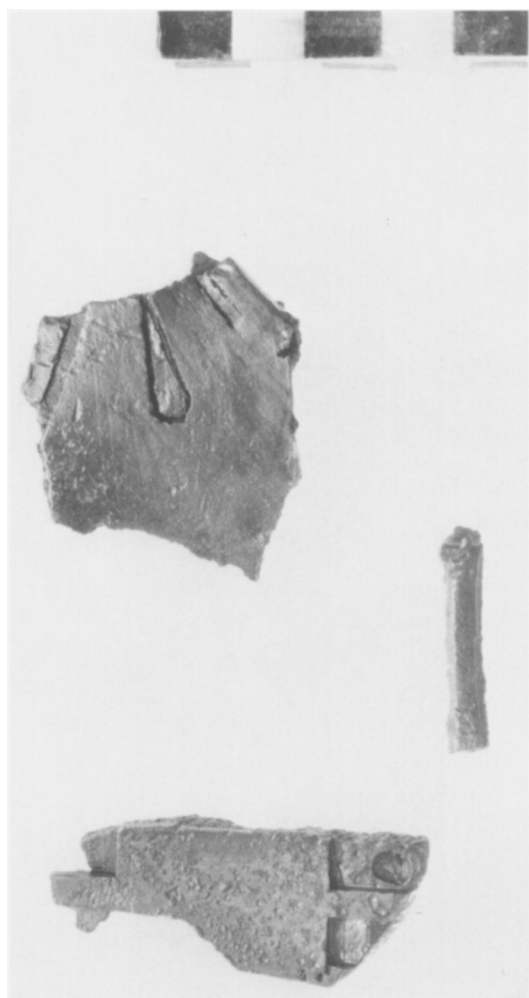
c. Amphora handles: top, MF 68-328, MF 68-277; bottom, MF 13023, MF 68-275



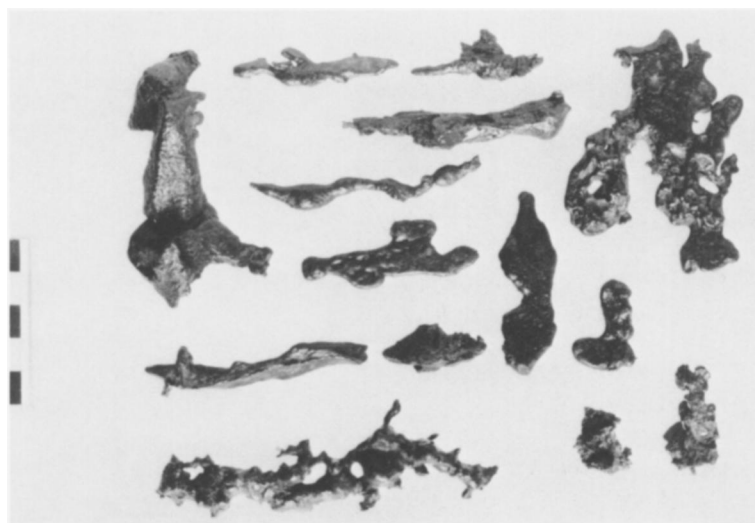
d. Amphora handles: left, MF 68-333; right, MF 69-204



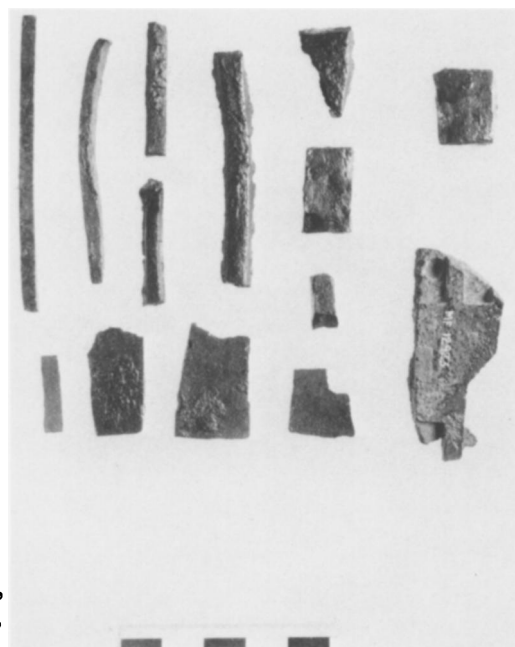
a. Handmade props: MF 69-249, MF 69-250, MF 69-251



c. Bronze statue fragments: top, MF 13095; bottom, MF 12923. Patch(?): right, MF 13024



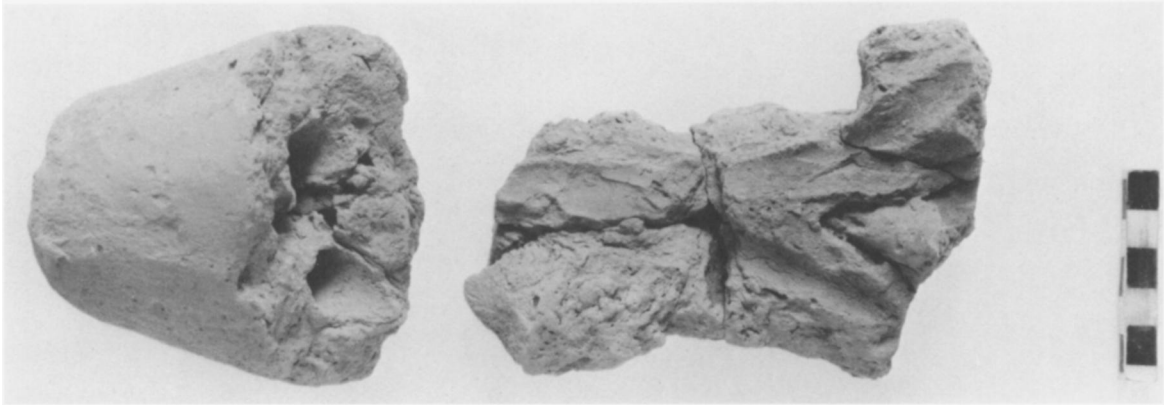
b. Bronze drips: left to right, top to bottom, MF 13080 a, b, MF 13083 a, b, MF 13086 a, MF 68-325, MF 13081, MF 13087, MF 13101, MF 13090, MF 13089 a, MF 13067, MF 13078



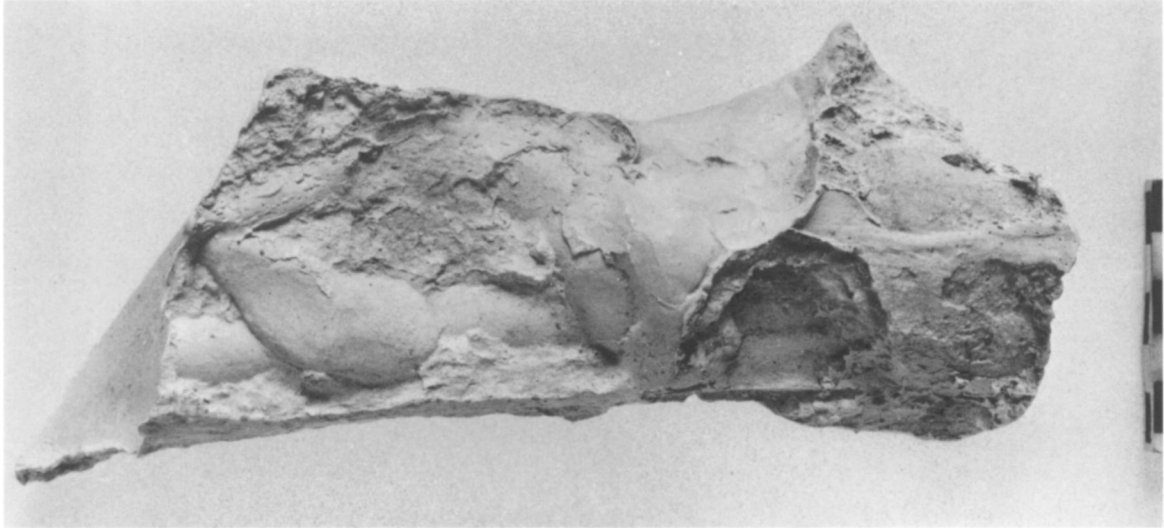
d. Patches: left to right, top to bottom, MF 13004, MF 13086 a, MF 13062, MF 13024, MF 13063, MF 13061, MF 13065, MF 13027, MF 12923, MF 13066, MF 13060, MF 13032, MF 13091, MF 13025



a. Funnel with y-gates MF 69-242



b. Gate systems: top, MF 13022;  
bottom, MF 69-245



c. Plaster cast of gate system MF 69-237