HO Scale Structure Kit 933-2973

ASHLAND BLAST FURNACE

Thanks for purchasing this Cornerstone Series® kit. All parts are made of styrene, so use only compatible glue and paint. Please read the instructions and study the drawings before starting construction. Please Note: This kit includes additional parts and some revisions from the original, #933-3054.

No other structure defines the steel works like the blast furnace. Looming hundreds of feet into the skyline, its strange shape and fascinating angles is a stark contrast to newer buildings.

The blast furnace performs the critical first step in making steel, generating temperatures as high as 3500°F (1926.7°C) to melt iron ore and remove impurities. This is done by burning coke in the presence of iron ore and fluxing stone such as limestone or dolomite. The air blast is preheated to improve combustion and generate more heat. The end result is "pig iron," named for an early casting method resembling a mother pig nursing little ones; iron flowed into a large main trench called the "sow," then into several smaller trenches, where it cooled to form "pigs." Pig iron is high in carbon and impurities that make it brittle and must be removed to make steel.

A ton of pig iron requires about three tons (2.7t) of raw materials: nearly two tons (1.8t) of ore, about 1500 pounds (0.6804t) of coke and the rest in flux, plus a few hundred pounds of iron and steel scrap. Finally, four (3.6t) to four-and-one-half tons (4.0t) of air will be consumed. With every ton of iron, 700 pounds (317k) of slag (a lava-like material reclaimed for sale to the construction industry) and six tons (5.4t) of gases are produced. And since part of the charge is always melting, voids are created that have to be refilled constantly.

Meeting this voracious appetite is the job of the ore yard, where ore, flux and coke are stockpiled. Located as close to the furnace as possible, the yard may be served by water, rail, or both with appropriate unloading equipment. Getting raw materials to the furnace is done with special broad gauge rail equipment, or standard hopper cars and older ore jennies. These operate on the high line, an elevated stretch of two (some have three) parallel tracks, on one side of the furnace. This spans storage bins filled with coke, scale, scrap, dolomite, ore and limestone. (Some modern operations eliminate the bins and deliver materials directly by truck and rail.)

Raw materials for the charge (or burden) enter the furnace through the top. They are first weighed, then loaded in proportion aboard wheeled carts called skip cars. As one skip loads, the other is emptied at the top. The skips move swiftly on rails up the skip incline, which is pitched about 10-15°. (Some modern installations now use conveyers.)

Putting the blast into a blast furnace starts at the blowing engine house. Inside, giant air compressors pressurize the cold blast main, a huge pipe that feeds air into three or more stoves. So there's a constant supply of air, the process rotates through each stove; one is on blast, one is being heated and one is on standby. Inside, the air is superheated to 1800°F (982.2°C), then blown through the hot blast main into the furnace, where it forces the coke to burn faster, creating intense heat and reducing gases that melt the charge.

With the furnace charged and the air blast on, combustion begins. This produces reducing gases, consisting mostly of carbon monoxide. Although low in heat value (80-90 BTUs per cubic foot), so much is produced that it's worth recovering. For each ton of iron, there may be 100 to 300 pounds (100-136k) of flue dust suspended in this gas. Rich in iron and coke particles, it is also recovered and sent to a sintering plant.

Furnace gas is transferred to the dust catcher through four offtakes spaced 90° apart in the top. These pipes look like huge slingshots placed upside down and converge in a single downcomer, a large pipe connected to the dust catcher at a 45° angle.

The gas passes through three different units: dust catcher, gas washer and precipitator. Each captures progressively smaller particles of dust. The catcher is a dry system, and like a vacuum cleaner, must be emptied regularly. Older hoppers haul the dust to the sintering plant. The gas washer and precipitator use sprays of water. To reclaim the dust from the water, it's first pumped to a settling operation, and later passes through a Dorr thickener, which resembles the large tanks at your local water works. The water flows into a collecting trough where solids settle to the bottom. The resulting slurry is then filtered and solids piped to the sintering plant.

The heart of the furnace is the hearth, where molten iron and slag collect. Two or three hours before the iron is tapped, slag is drawn off. More will be removed about an hour before the cast, and the balance is tapped with the iron. When the iron is ready, a clay plug in the bottom of the hearth is drilled open. The molten iron flows into a refractory lined iron runner in the cast house, then flows into additional runners that direct it into hot metal cars. Separate runners divert the slag into cinder cars, or in some modern operations, a cinder pit beside the furnace. The cast house is essentially a large covered platform, with open sides and ends to dissipate heat. The roof may be 1/4" (6.3mm) steel or corrugated iron plate, with additional vents and louvers. Out on the floor, workers wear full silvers (and long underwear, even in summer) to protect themselves from the heat.

ON YOUR LAYOUT

Your new Blast Furnace will be the centerpiece of your steel works. For more realism, the stoves can be connected to the Blowing Engine House (#933-2957) using the Blowing Engine House Piping Kit (#933-2958).

If your space is limited, a single furnace can model a stand-alone operation, known as a "merchant iron mill" producing only pig iron. Some supply local customers using hot metal cars, others feed directly into pig casting machines, shipping the pigs to foundries and similar operations in gondolas.

Placing two or more furnaces side-by-side will create an impressive and realistic model! This was done at many works to increase the output of molten iron. Some very creative designs were required to fit everything in the available space.

Steel works often purchased retired switchers from nearby railroads to handle in-plant chores. No two were ever quite alike, with some renumbered and used as-is, others repainted in high visibility schemes, and some extensively modified for their new and demanding work environment.

And a typical blast furnace generates plenty of traffic with an almost constant movement of loads and empties. Scrap gondolas are needed for hauling dust, sand, and rubble, and are often used as safety cars between locos and loads of hot metal. And as production runs nonstop, each furnace requires a large fleet of Hot Metal (Single Car Painted & Numbered #932-3134) and Slag Cars (Single Car Painted & Numbered #932-3144).

Workers must also be properly equipped, and wear heat-resistant suits known as "silvers" on the cast house floor. These can be modeled using Preiser set #590-14205.

For additional ideas to expand your steel modeling, look for the complete series of Ashland Iron & Steel kits including the Hulett Unloader (#933-2966), Rolling Mill (#933-2971), and Coke Oven & Quencher (#933-2972) at your participating hobby shop, see the latest Walthers HO Scale Reference Book or visit us online at walthers.com.

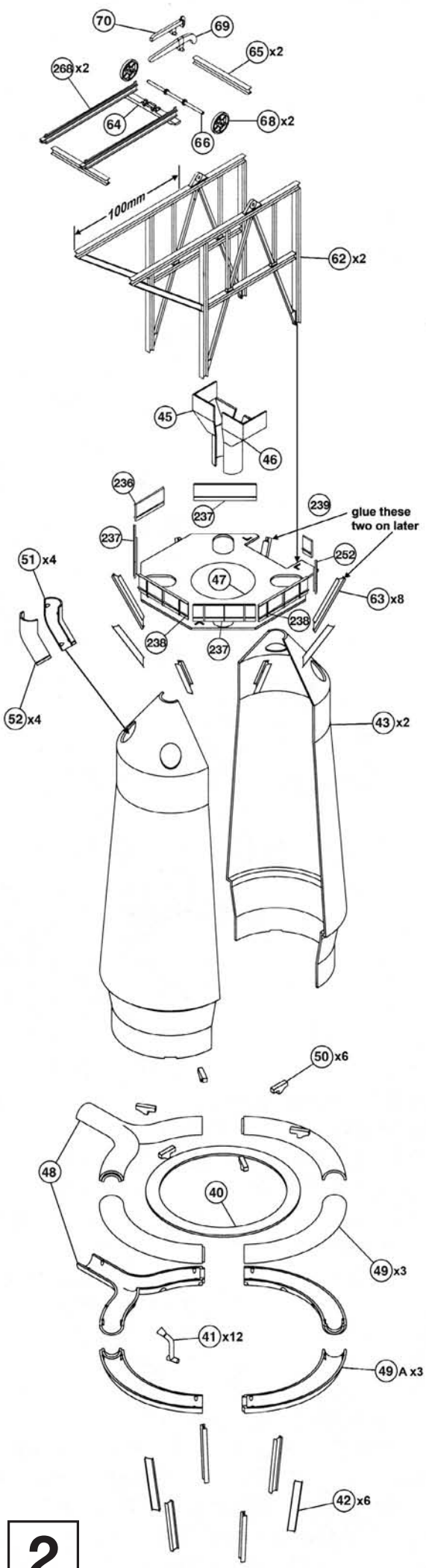


Figure 1

1. Glue the bustle pipes (48, 49, 49A) together to form a circle.

2. Remove the outside beveled edge on the mantle ring (40).

3. Trim 0.5mm from the back (the flat half) of the bustle pipe hangers (50). Glue the hangers to the top of the mantle ring (side without arrows), curved edge down.

4. Turn mantle ring upside down and glue the bustle pipe to the hangers. Make sure that one arrow on the ring points to the pipe inlet.

5. Glue the furnace halves (43) together. Note: After gluing it , set it in the hole in the base (142) so it conforms to the opening; remove it after glue dries. Then slide the furnace into the mantle ring up to the notch in the bottom of the furnace. Align the furnace half joint up with the arrows on the bottom of the mantle ring and glue in place.

6. Glue the lower offtake halves (51, 52) together and then place them into the four holes in the top of the furnace. Next place the bell platform (47) on the furnace, with the offtakes protruding through the holes and the notch in the platform to the back and the bustle pipe inlet points off to the left as shown.

7. Glue the platform supports (63) to the underside of the platform (at the location ridges) as well as to the furnace. Note: Glue those marked on during step 64.

8. Glue the tuyeres (41) to the bustle pipe and furnace. Note: The position is determined by the O marks at the bottom of the furnace.

9. Glue the mantle columns (42) to the bottom of the mantle ring. Note: After glued, test fit these also in place on the floor.

10. Glue the bell hopper (45, 46) together and then in place on top of the furnace with the open side towards the rear of the furnace.

11. Glue the sheaves (68) onto the Sheave rod (66) all the way to, the stops. Then glue each end of the rod into the bearings on top of the trolley supports (62) so that the rod is flush with the outside of the bearing.

12. Glue the small bell beam (70) and the big bell beam (69) to the beam support (64) as shown and then glue this on top of the trolley supports, 100mm from the back of #64 to the front of #62.

13. Glue the braces (65) across the front and back of the trolley supports. Then glue the crane beams (268) in place across the front brace and bell beam support. Note: Glue the beans in between the raised ridges on #64.

14. Glue the finished trolley support on top of the bell platform, using the raised ridges as a guide for positioning.

15. Glue the platform railings (236, 237, 238, 239, 252) in place around the edge of the platform as illustrated.

16. Looking at Figure 2, glue upper offtake halves (53, 53A) together. Then glue the offtake elbows (54, 55) together. Next glue the downcomer top halves (157, 158) together along with the end (159) piece.

17. Glue the elbows (54/55) to the upper offtakes (53/53A) at right angles as shown. Place, do not glue, these into the lower offtakes (from step 6). Then place, do not glue, the downcomer top (157/158) in between the elbows.

18. Glue the platform (56) on top of the offtake elbows with the notched side facing the rear. Line up all of the offtake piping and glue in place. Note: This includes the pipes in step17 that were just placed without gluing.

19. Glue the bleeder valves (58, 59) together and to the platform with the handles facing the front. Glue the railings (57, 61) and top bracing (60) in place.

Note: Figure 3 shows how the two assemblies from Figures 1 and 2 go together.

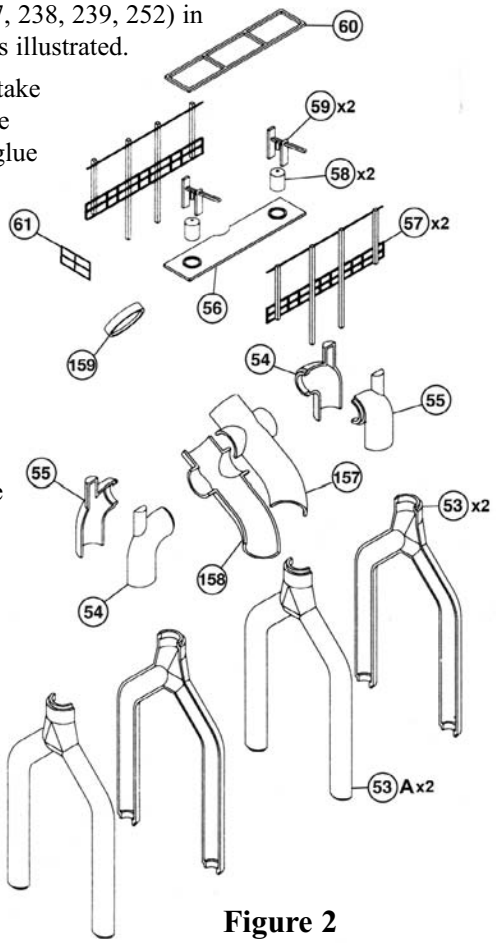


Figure 2

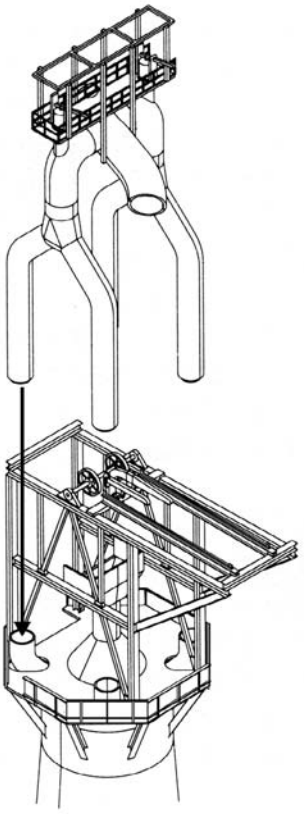


Figure 3

20. Glue the foundation walls (2, 3, 4, 5) together and to the base (1) as shown in Figure 4.

21. Glue columns (11, 12) in place on the base (1) behind wall #2.

22. Glue the side and back walls (7, 8) on the foundation walls as illustrated.

23. Glue the hoist house columns (10) to the small base (14). Then glue the brick walls (17) around all of the columns as shown. Glue the end column to the inside of the side wall (7), using the raised ridge to position correctly. Then glue the floor support beams (149) to front of beams #'s 11 and 12, on top of wall #2, as well as to beams #10, resting on top of the brick walls – see figure 4.

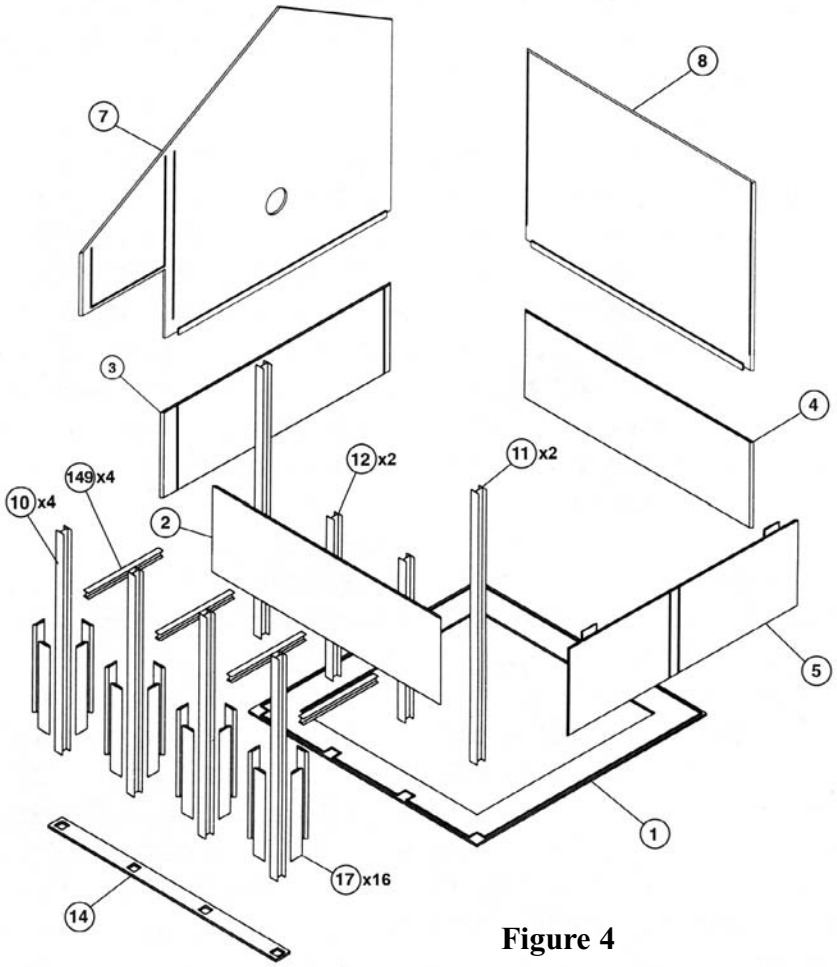


Figure 4

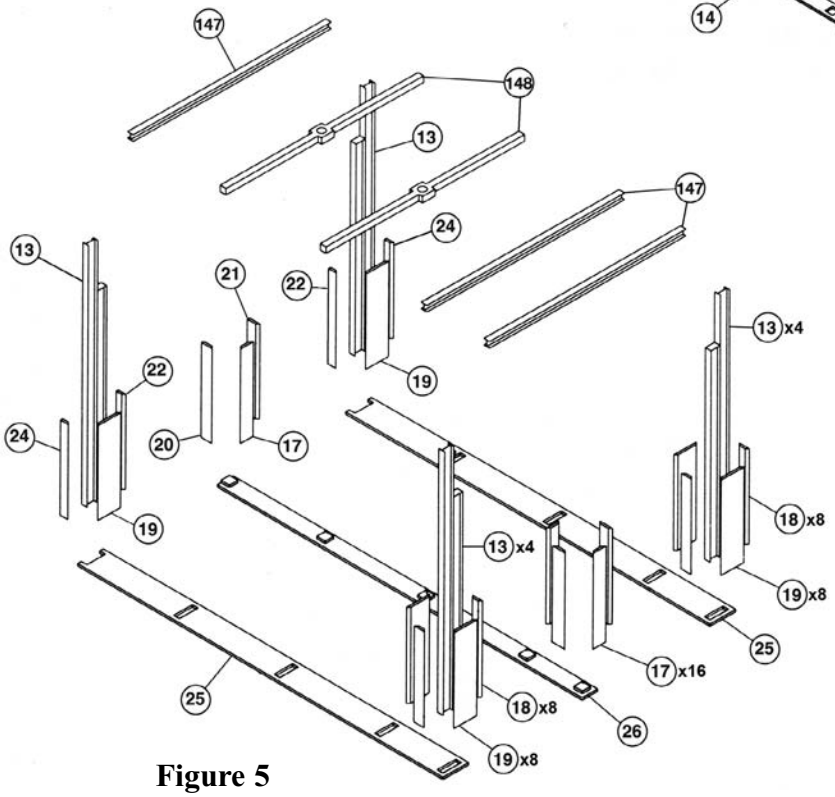


Figure 5

24. Looking at Figure 5, glue all of the cast house support columns (13) - total of ten - to the outside support bases (25). Glue the brick encasements (18, 19, 22, 24) on surrounding the columns as illustrated. Note: Only the end two columns have different encasement parts.

25. Glue the brick encasements (17, 20, 21) together and to the middle base (26). Note: The end encasement is the only one that uses the three different parts.

26. Line up all three bases and begin gluing the floor support beams (147, 148) onto the tops of the encasements in the arrangement shown. Note: Figure 6 shows the completed assembly.

27. Glue the pouring spouts (146) into the pouring holes in the floor (142) at the end of the slag/iron runners. Note: Some filing is needed to the spouts in some of the holes due to the angles.

28. Place the floor in position on top of the foundation walls with the columns coming up through the slots in the floor.

29. Glue the wall (6) to the sides of the columns and the top of foundation wall #5. Then glue the roof supports (38) into the notches in the floor and to the columns, resting on the encasements.

30. Slide the columns from the cast house up through the slots in the floor and glue the columns to the floor and the bases together.

31. Glue the craneways (37) in place on top of the inner columns of the cast house as shown.

32. Glue the railings (201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213) around the floor as shown. Note: Railing #205 must be bent at the groove in the back to fit on the side of the floor.

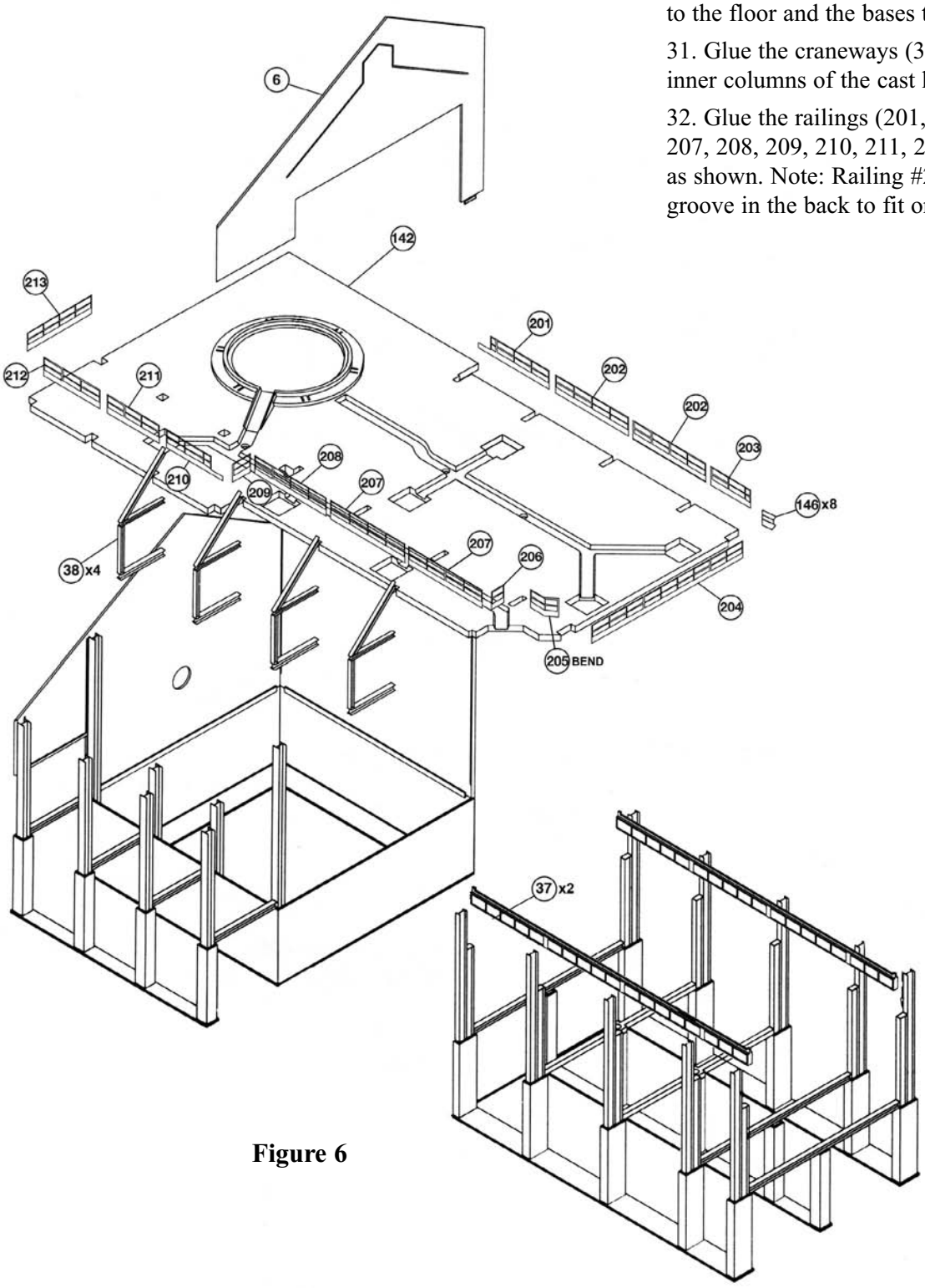


Figure 6

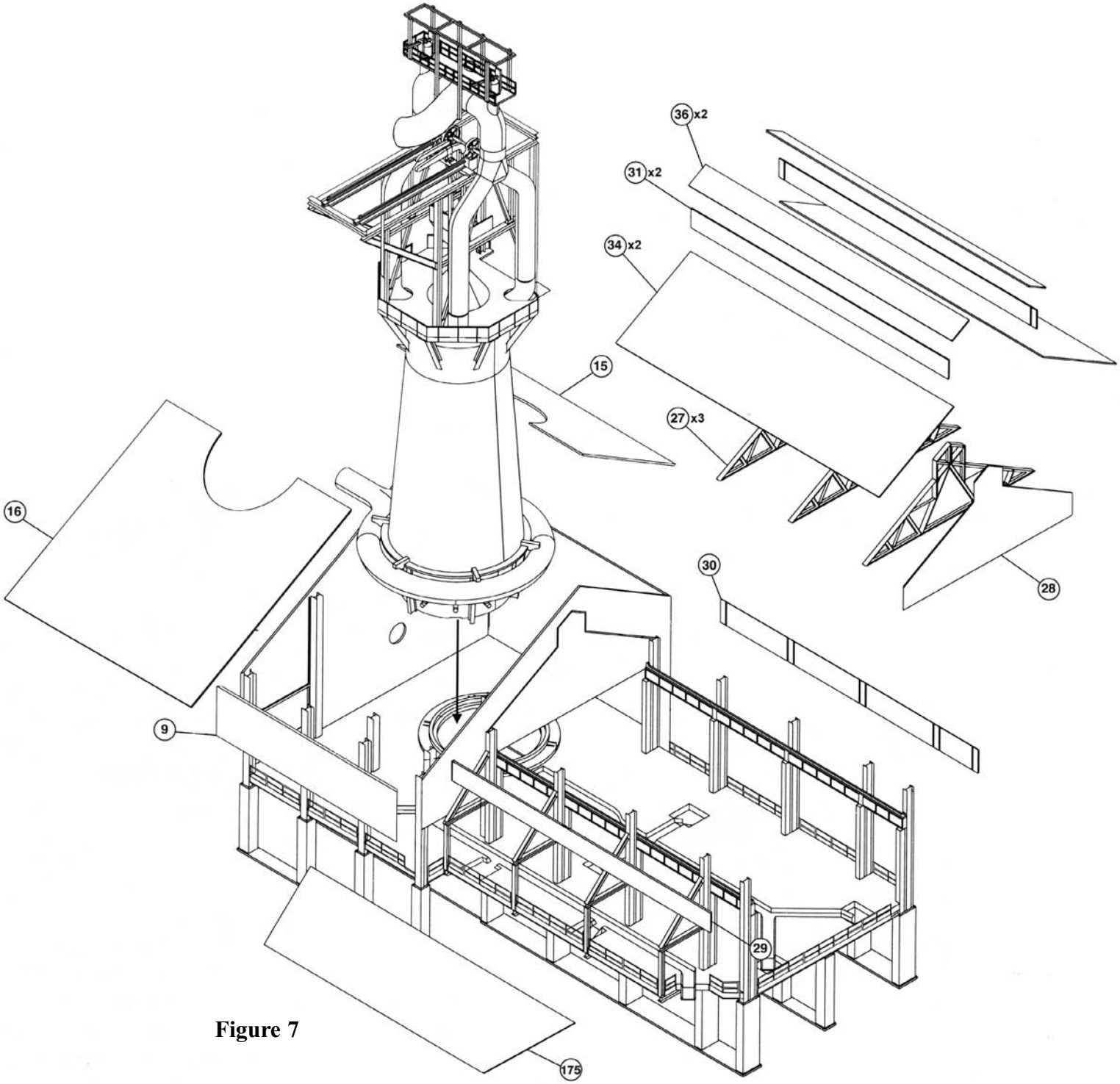


Figure 7

33. Glue the completed furnace in place over the opening in the floor with the bustle pipe going through the hole in the wall. Glue the hoist house roofs (15, 16) on the tops of the walls, surrounding the furnace. Then glue the side wall (9) on.

34. Glue the roof trusses (27) to the top of the middle three cast house columns. Next glue the upper side walls (31) to the trusses. Then glue the lower side walls (29, 30) to the top part of the columns. Now glue the end wall (28) in place.

35. Glue on the cast house roofs (34, 36, 175) as shown.

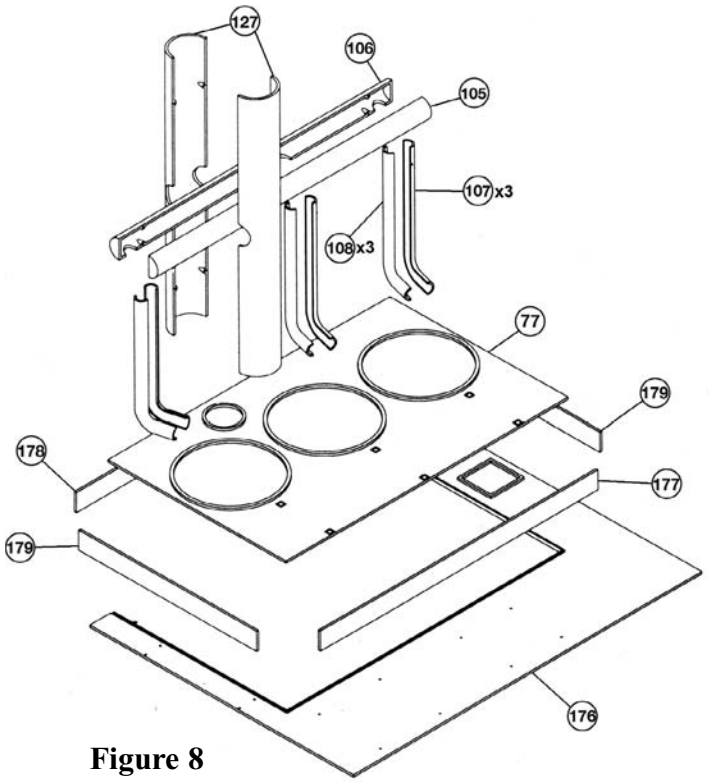


Figure 8

36. Glue the stove base (77, 176, 177, 178, 179) together.

37. Glue the lower stack halves (127) together. Next glue the stack breech halves (105, 106) together and then insert - DO NOT GLUE - into the hole in the lower stack with the holes positioned downwards. Glue the stack riser halves (107, 108) together and then insert them - DO NOT GLUE - into the bottom holes of the stack breech.

38. The front three stove halves (78) need to have two holes cut out. Look at the back of the parts and drill/cut out the holes marked “C” and “D”. On one of the rear halves, drill/cut out hole “A”. The other two rear halves need to have hole “B” opened up. Now glue the front and rear halves together.

39. Position the stoves on the base in the order illustrated in Figure 9. Place the stack piping from step 36 onto the base. When the pipes line up properly and fit into the holes in the stoves, glue all in place.

40. Glue the upper stack halves (128) together and to the top of the lower stack.

41. Glue the elevator (129, 130, 131) together and to the stove base.

42. Glue the stove platform (132) on top of the stoves and below the bottom doors on the elevator. Glue the side (224, 225) and end (223) railings in place.

43. Glue the cage ladders (234, 235) together and then to railing #225 at the openings. Glue the platforms (226, 227, 228, 229, 230, 231, 232, 233) together. Then glue these to the sides of the stoves, below the ladders.

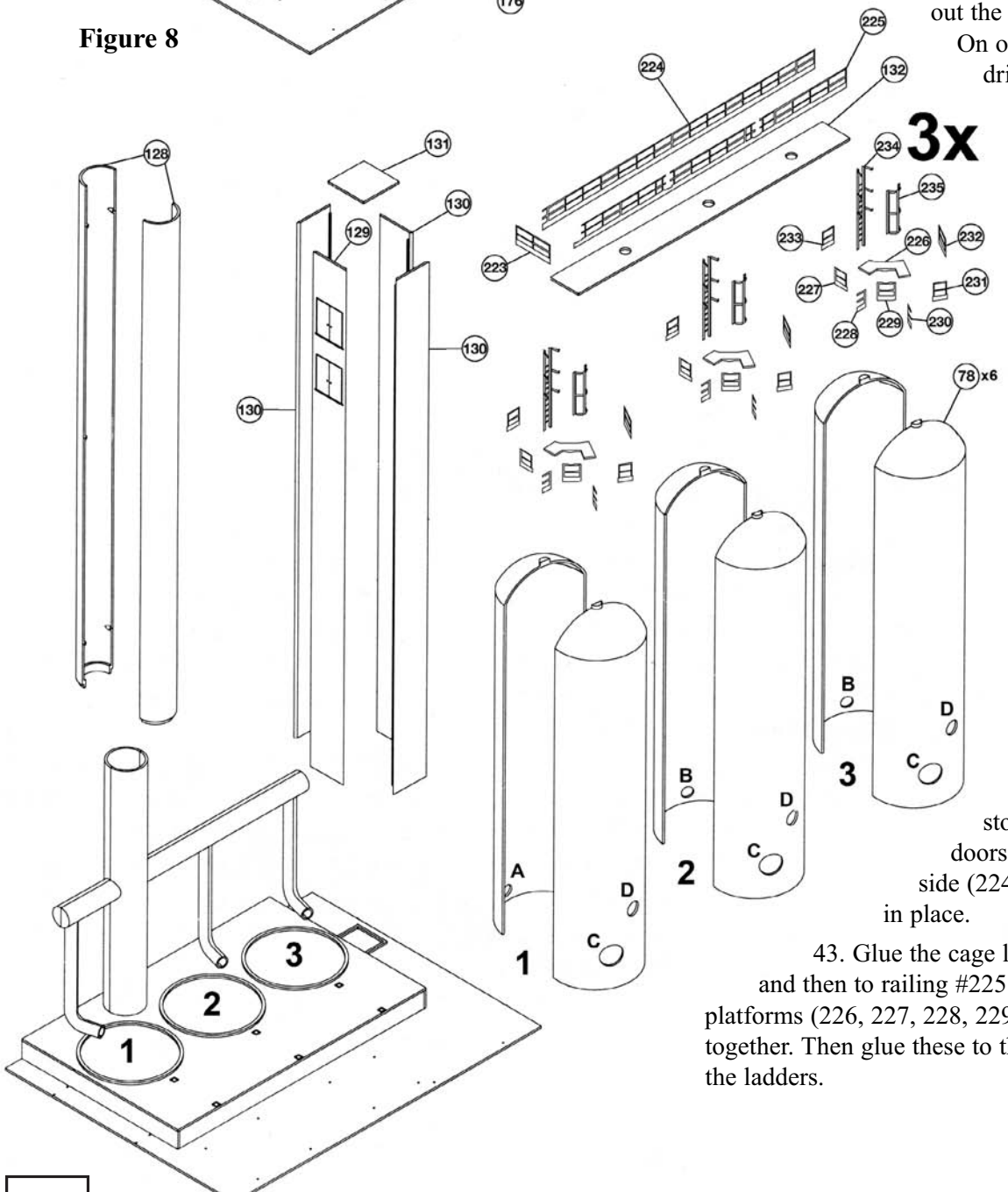


Figure 9

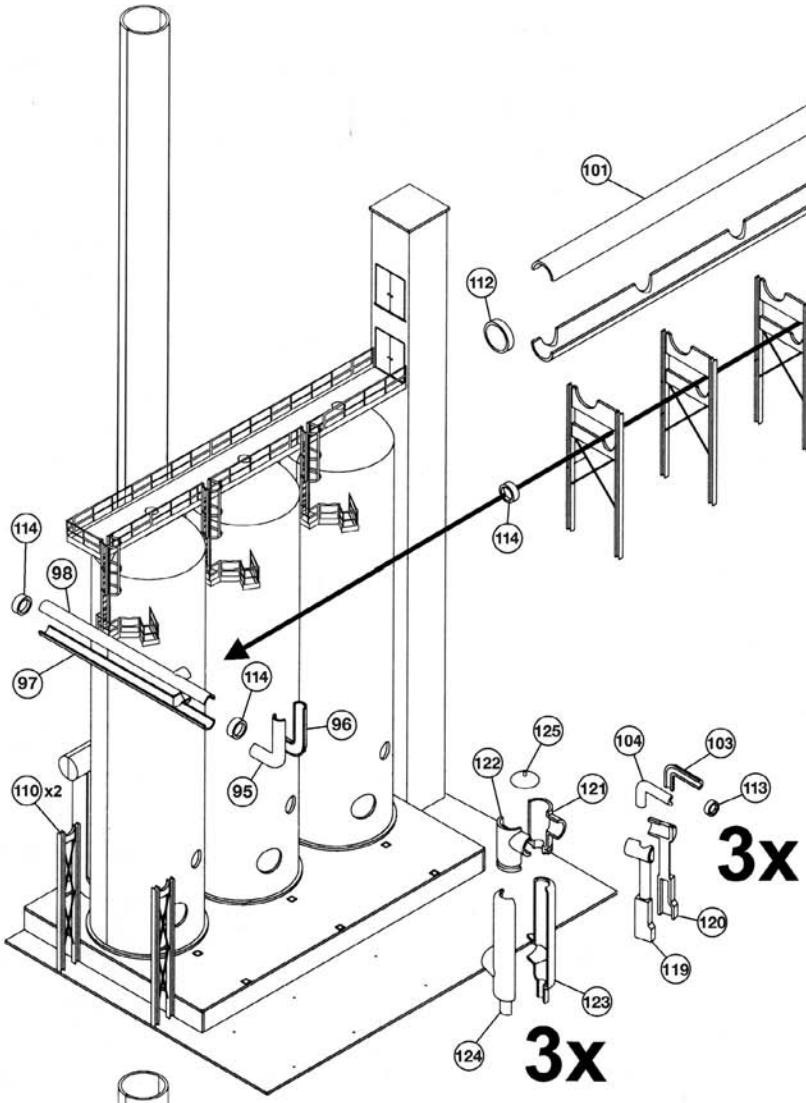


Figure 10

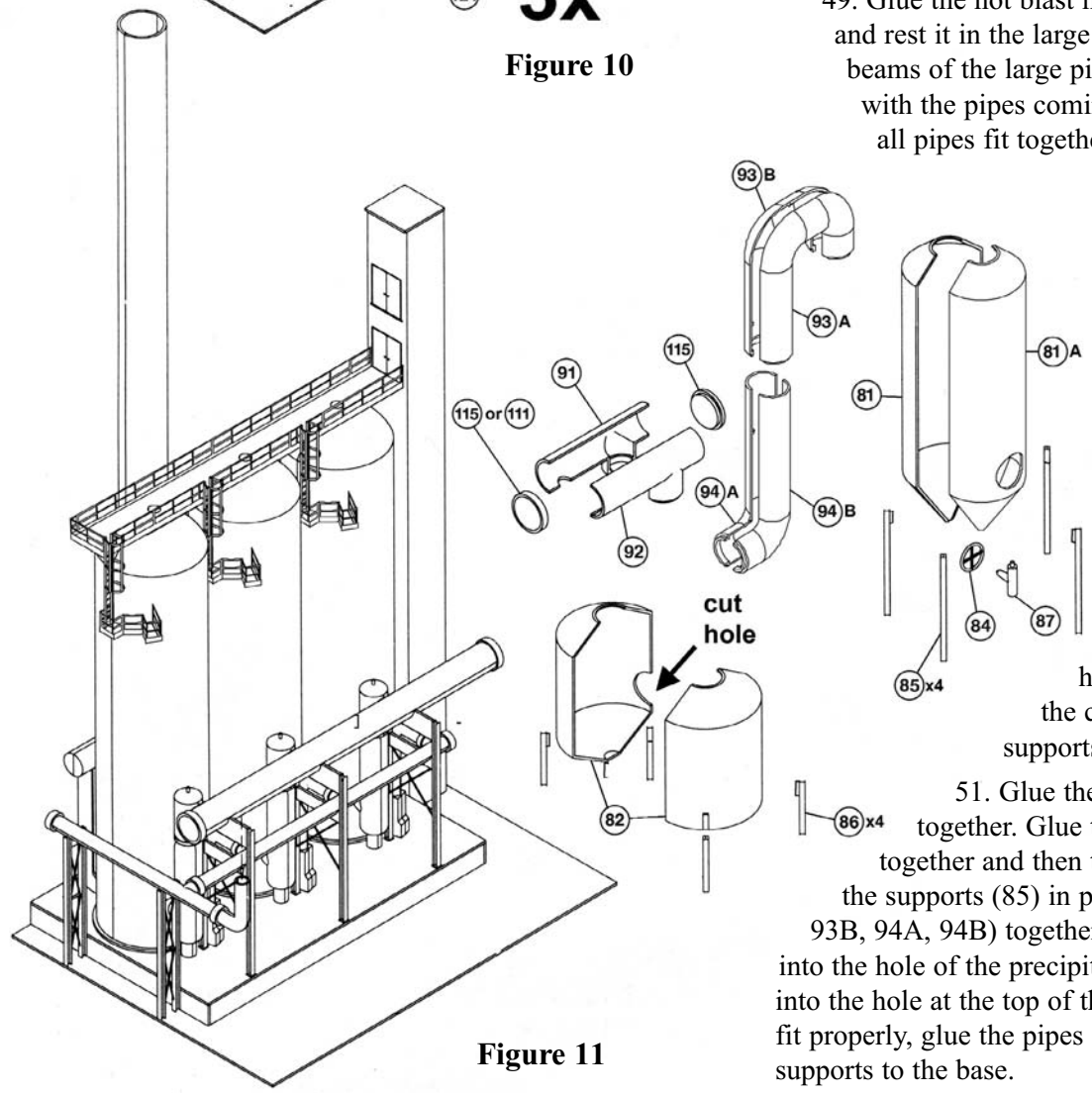


Figure 11

44. Glue the end pipe supports (110) into the holes in the base.

45. Glue three sets of the burner feeds (119, 120) together. Then glue these three, one each, into the three "D" holes in the stoves (see Figure 9). Glue the elbows (103, 104) and coupling (113) together and place, one each, on top of the burner feeds. Note: Do not glue at this time.

46. Glue three sets of the lower stove valves (123, 124) together. Then glue these three, one each, into the three "C" holes in the stoves. Glue the upper stove valves (121, 122, 125) together and place, one each, on top of the stove valves. Note: Again, do not glue at this time.

47. Glue the large pipe supports (109) in place on the base. Note: The legs will fit in the raised squares located on the base.

48. Glue the clean gas pipe (95, 96, 97, 98, 99, 100, 114,117) together and rest it in the round openings on the lower cross beams of the large pipe supports, as well as on top of the end pipe supports. Align the three outlets with the three elbows coming out of the tops of the burners. When all of the pipes fit together properly, glue in place.

49. Glue the hot blast main (101, 102, 112, 116) together and rest it in the large round openings on the top cross beams of the large pipe supports. Align the inlet holes with the pipes coming out of the stove valves. When all pipes fit together, glue in place.

50. Cut out hole, as marked in inside, along edges of both halves of the precipitator (82). Then glue the halves together. Glue the precipitator pipes (91, 92, 111 coupling and/or 115 cap – depending on if you want to extend the pipe using piping kit 933-2958, available separately) together and then on top of the precipitator with the joint lines running in the same direction as illustrated. Glue the supports (86) in place. Place the bottom hole in the precipitator pipe over the clean gas pipe and glue the supports to the base.

51. Glue the gas washer halves (81, 81A) together. Glue the valve (84, 87) assembly together and then to the bottom of the washer. Glue the supports (85) in place. Glue the washer pipe (93A, 93B, 94A, 94B) together as shown. Place the lower end into the hole of the precipitator and the other end into the hole at the top of the washer. When all fit properly, glue the pipes in place and the supports to the base.

52. Glue the dust collector halves (80, 80A) together. Then glue the supports (83) and bracing (88) to the collector. Glue the small base (161) to the bottom of the two supports as illustrated.

53. Glue the collector pipe (89A, 89B, 90A, 90B) together. Note: The upper pipe section is at a right angle to the bottom one. Then place the bottom into the hole in the washer and the top into the hole in the collector. Make sure that the two supports, not glued to the small base, will rest on the main base. When all is aligned as shown in Figure 13, glue in place.

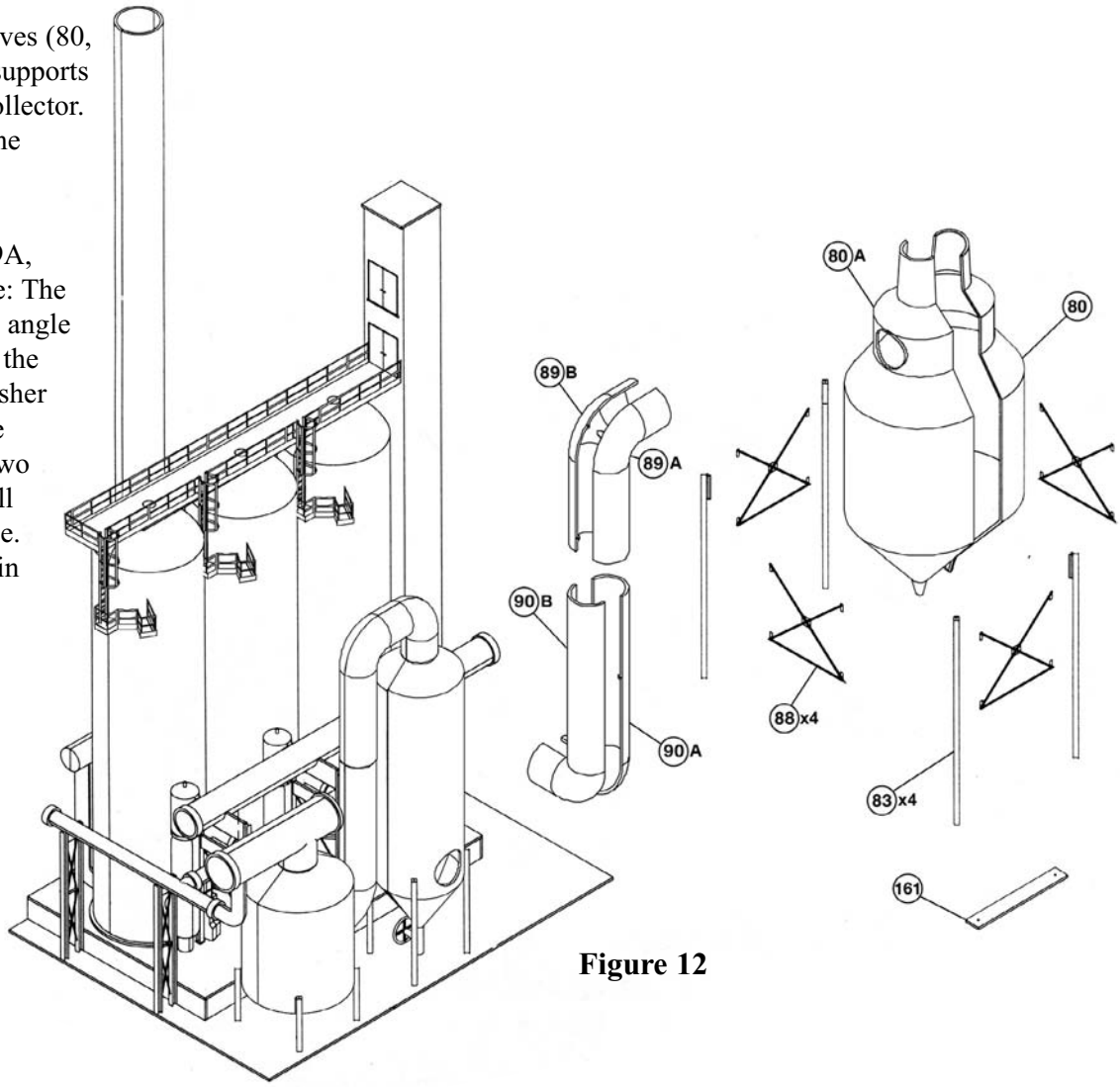


Figure 12

54. Line up the hot blast main with the bustle pipe coming out of the furnace structure; push together to make sure the bases will contact each other. You may need to file down the bustle pipe in order to have the bases flush with each other so when you glue the two together, you will have a strong gluing joint. Note: You may want to keep these separate until you finally position the structure on your layout.

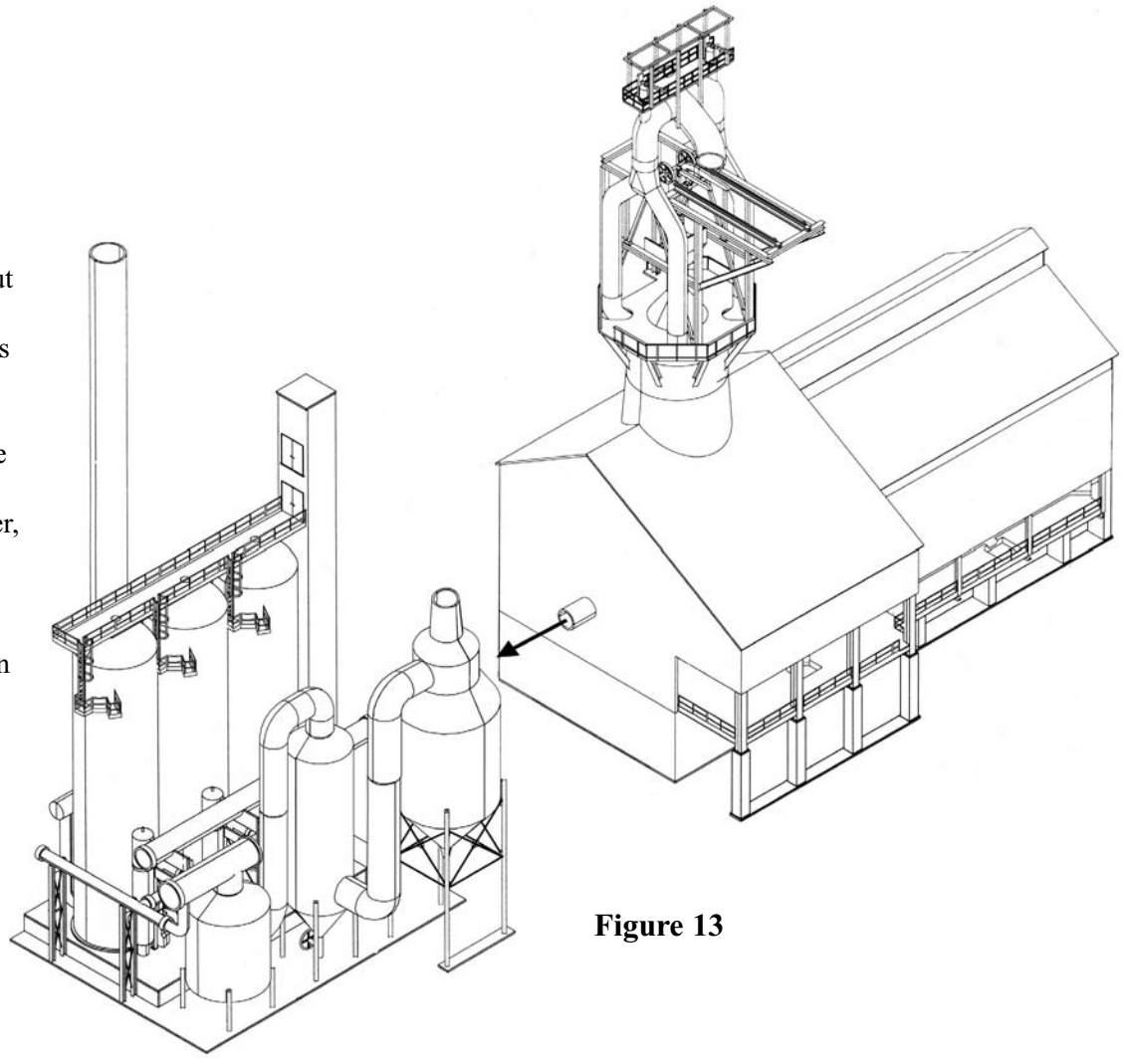


Figure 13

55. Glue the railings (240, 241, 242, 243) around the edge of the upper elevator walkway (133). Note: Bend railing #243 at the groove on the back to follow the edge of the walkway. Then glue this to the elevator below the top set of doors. Also, when both the stoves and furnace are glued together, glue the other end of the walkway to the bell platform, in the opening between the railings.

56. Glue the railings (255, 256, 257, 258, 259, 260, 261, 262) in place around the trolley support walkway (254). Then glue this to the tops of the support I-beams with the back edge running along the rear brace #65. See figure 15 for another view of the walkway in place.

57. Glue the side stairway (214, 215, 216, 217, 218, 219, 220) together as shown and then to the side of the floor by the railing opening.

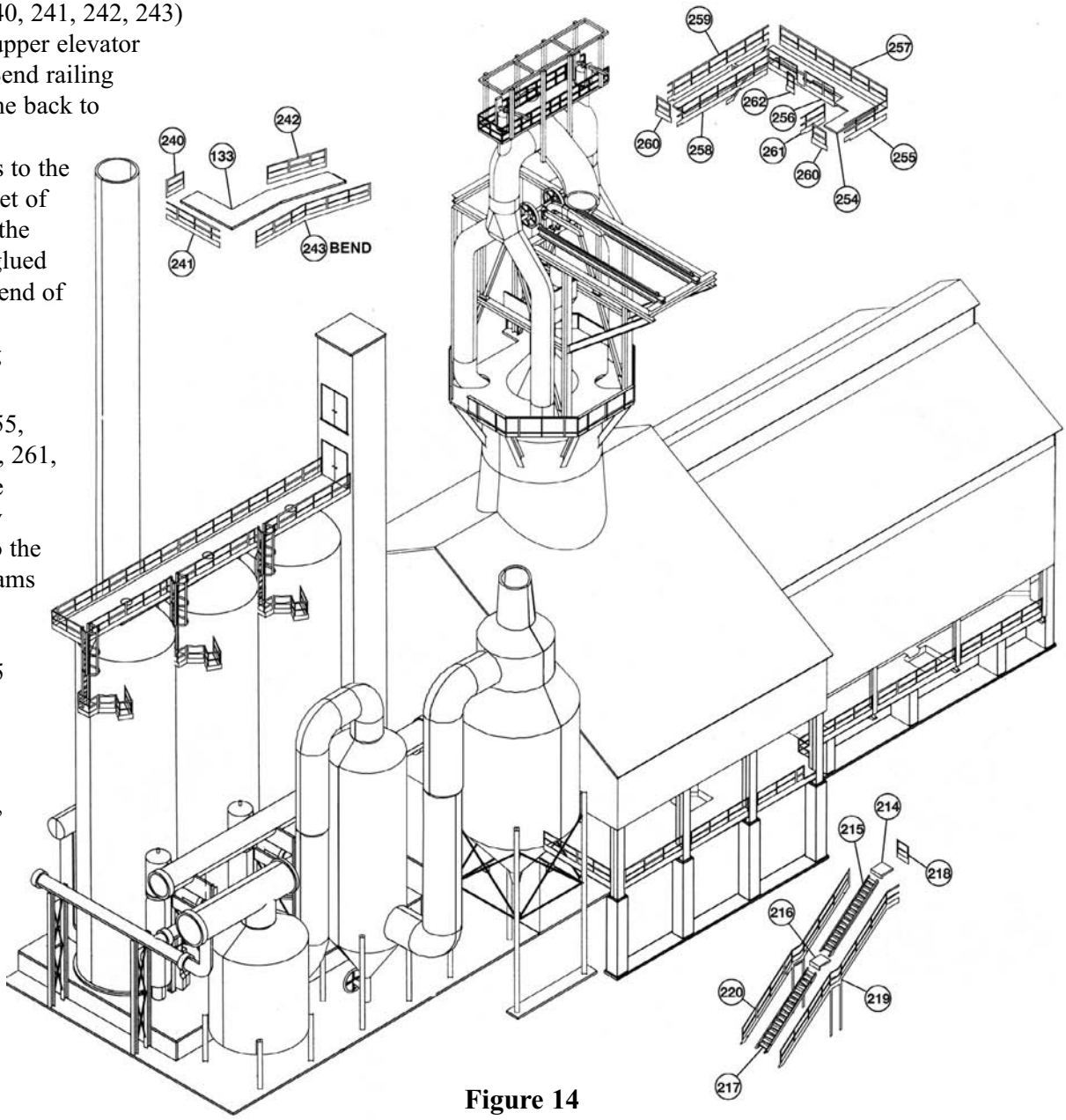


Figure 14

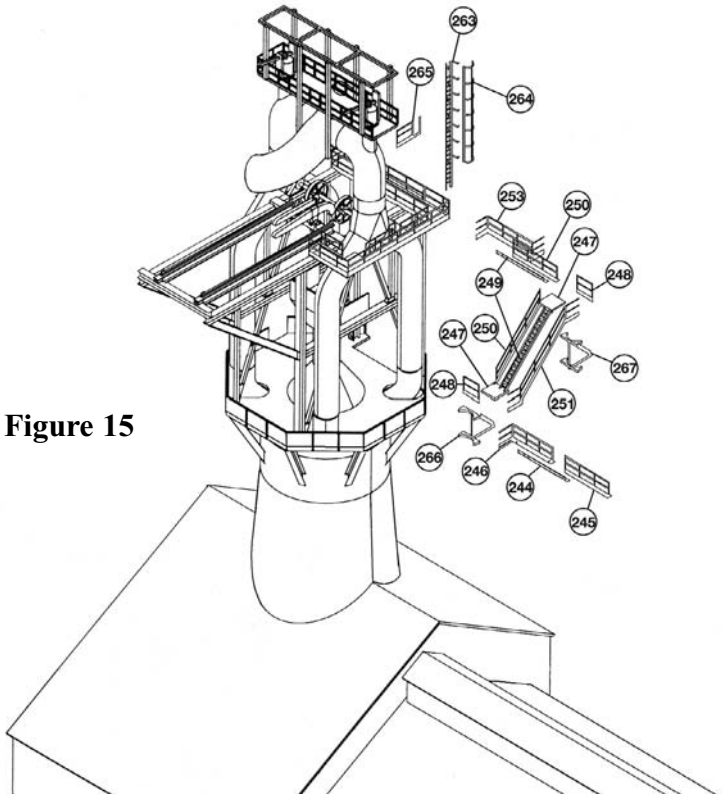


Figure 15

58. Glue the end railing (265) in place on the end of the offtake platform. Glue the cage ladder (263, 264) together. Then glue the ladder in front of the opening on #265 and in front of railing #262 on the trolley support walkway.

59. Glue the bell platform stairway (244, 245, 246, 247, 248, 249, 250, 251, 252, 253) together. Start from the bottom and work up. When completed, Glue the stair platform braces (266, 267) underneath the two platforms (247). Glue this completed assembly in place, the braces along the sides of the upper offtakes, the bottom stair on the bell platform and the upper stairs to the trolley support walkway.

60. Glue the lower downcomer halves (153, 154) together. Then glue the middle downcomer halves (155, 156) together. Fit these two together and place in between the upper downcomer and the dust collector. When they fit in position, glue in place.

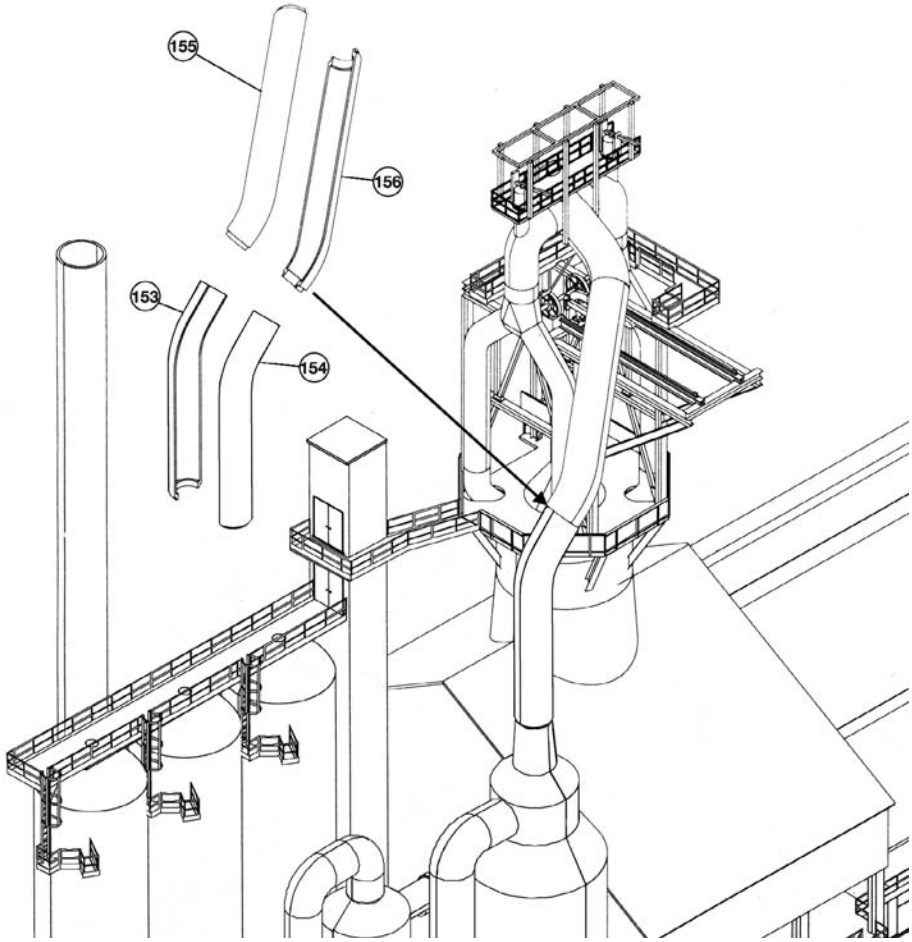


Figure 16

61. Glue the curved rails (76) to the skip hoist floor (71), rails pointing to the right of the illustration. Note: The curved rails will curve under the floor. Glue the side trusses (72) on top of #71. Note: One of part #72 has holes in the side. Glue that piece in the position shown.

62. Glue together the skip cars (73, 74, 75) and glue them in between the rails, where you wish, on the skip hoist floor.

63. Glue the skip hoist base (160, 171, 172) together.

64. Glue the skip hoist in place on the back of the bell hopper, the curved rails hanging over the edges of the inside of the hopper. The hoist floor will also rest against the rear edge of the bell platform. Once in position glue skip hoist base underneath. See Figure 18. Then glue the remaining two platform supports (63) - from step 7- in place.

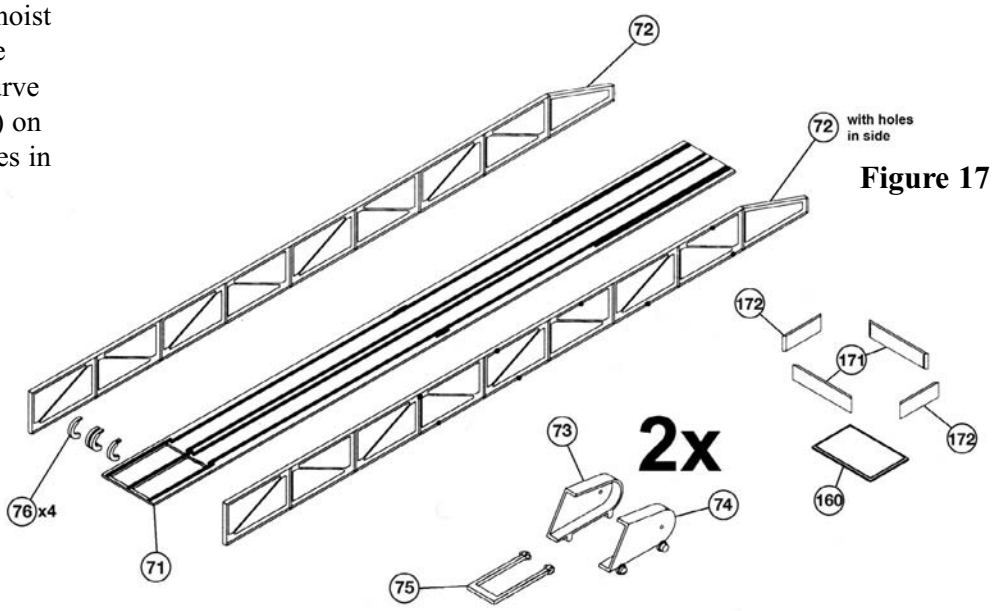


Figure 17

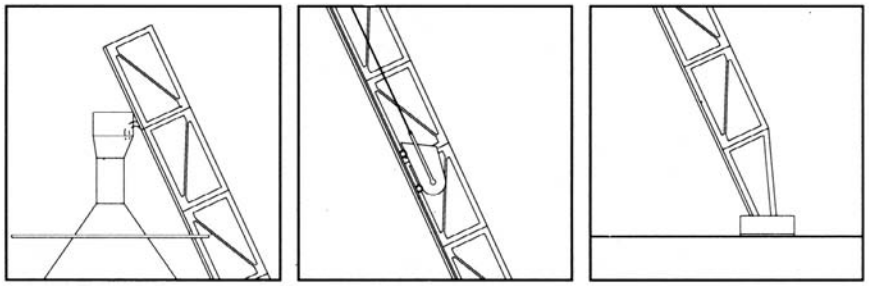


Figure 18

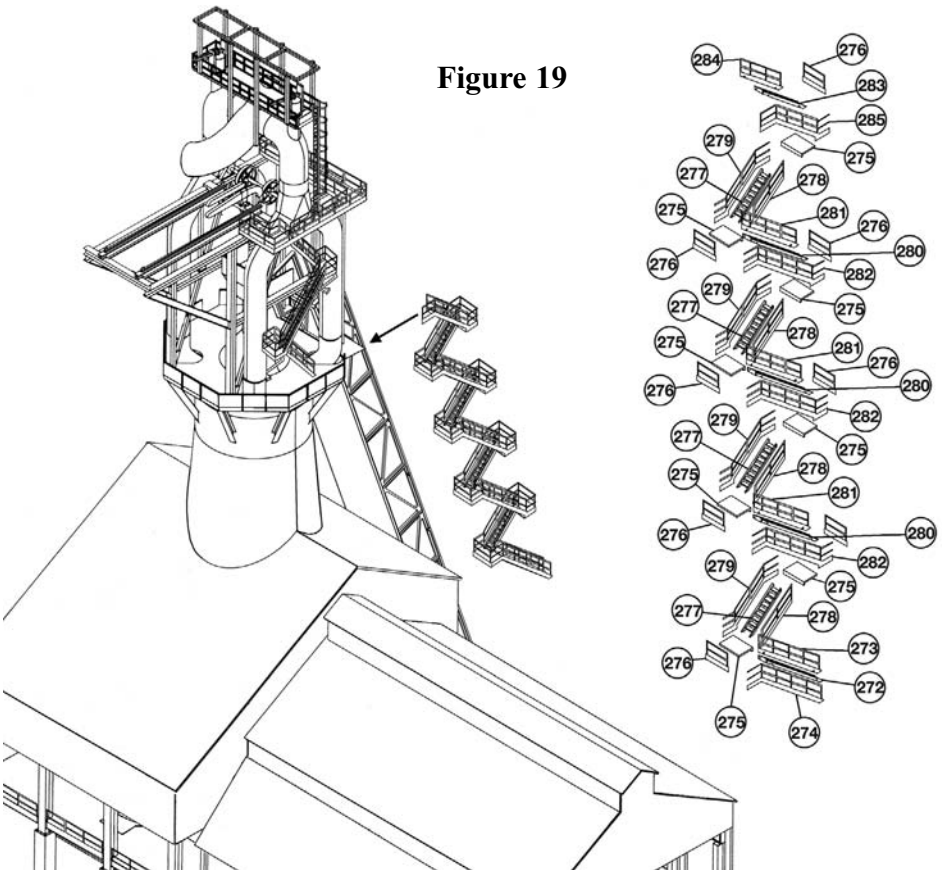


Figure 19

65. Following the illustration in Figure 19, starting at the bottom, glue the skip hoist stairway together. The parts breakdown is as follows: platforms (275); end railings (276); inside railings (273, 278, 281, 284); outside railings (279, 282, 285); stairs (272, 277, 280, 283). Once completed, glue in place along the side of the skip hoist and to the right end of the bell platform. Note: The pegs on the sides of parts #279 will fit in the holes on the side of truss #72.

66. Glue the high line bridge cross beams (165) into the slots of the central beams (164). Next glue the end beams (163) in place. Then glue on the side beams (162). Glue the supports (168) in place between the gussets on the bottom of the side beams. Now glue the walkways (169) on top of the crossbeams, one flush with the side beam on each side and one in the middle. Glue the railings (221, 222) on to the side walkways.

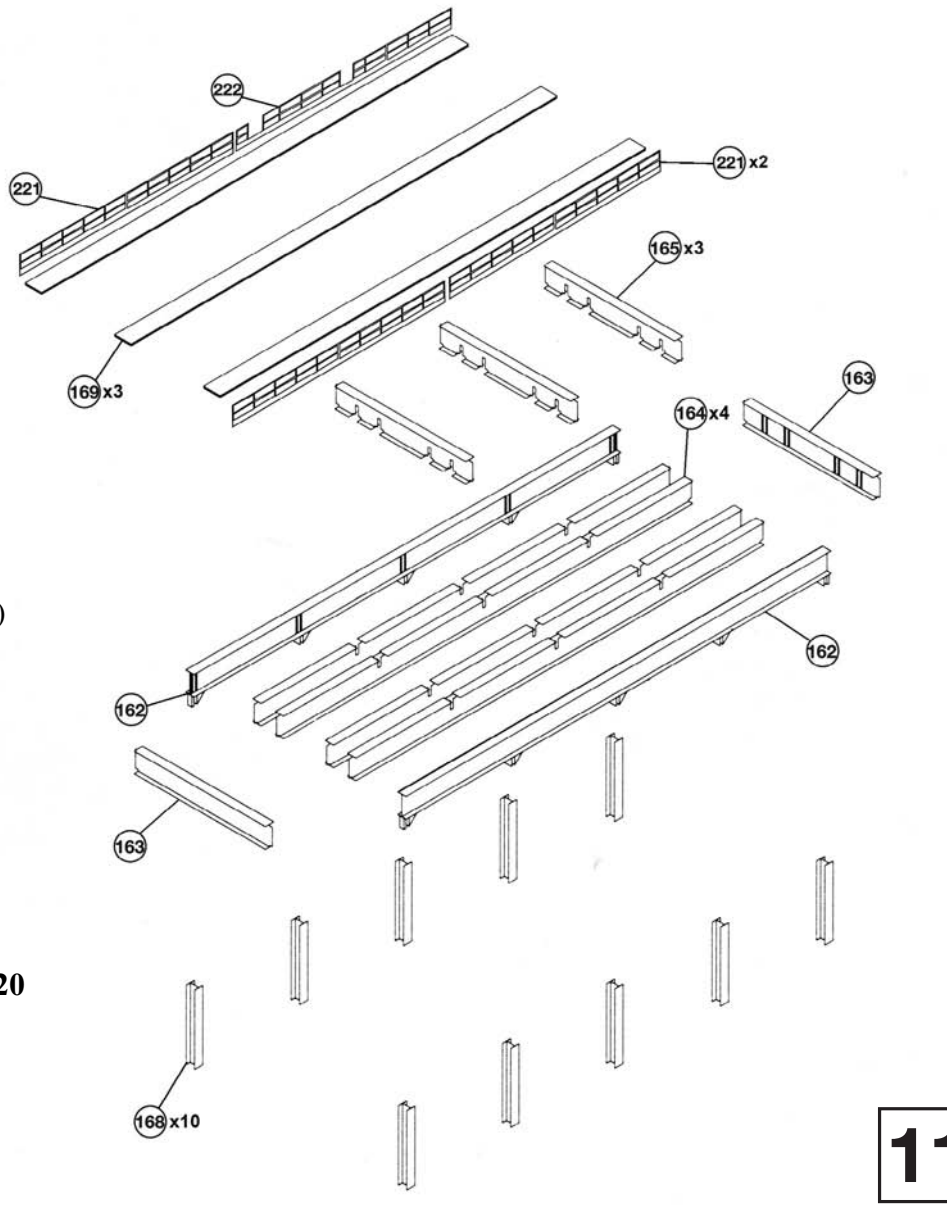
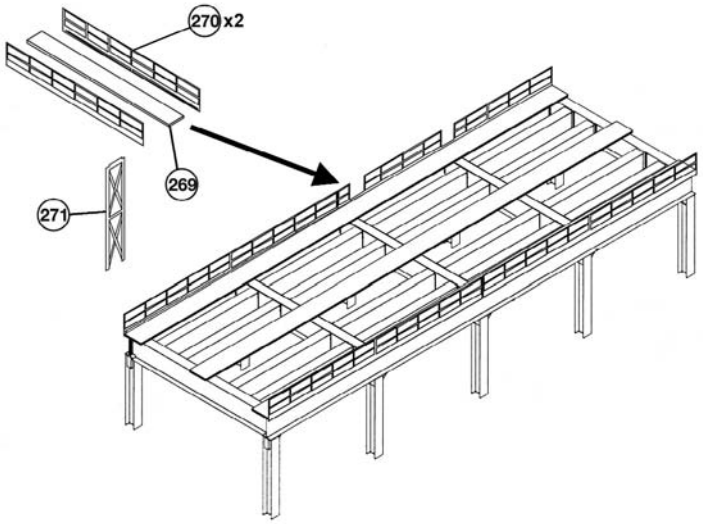


Figure 20

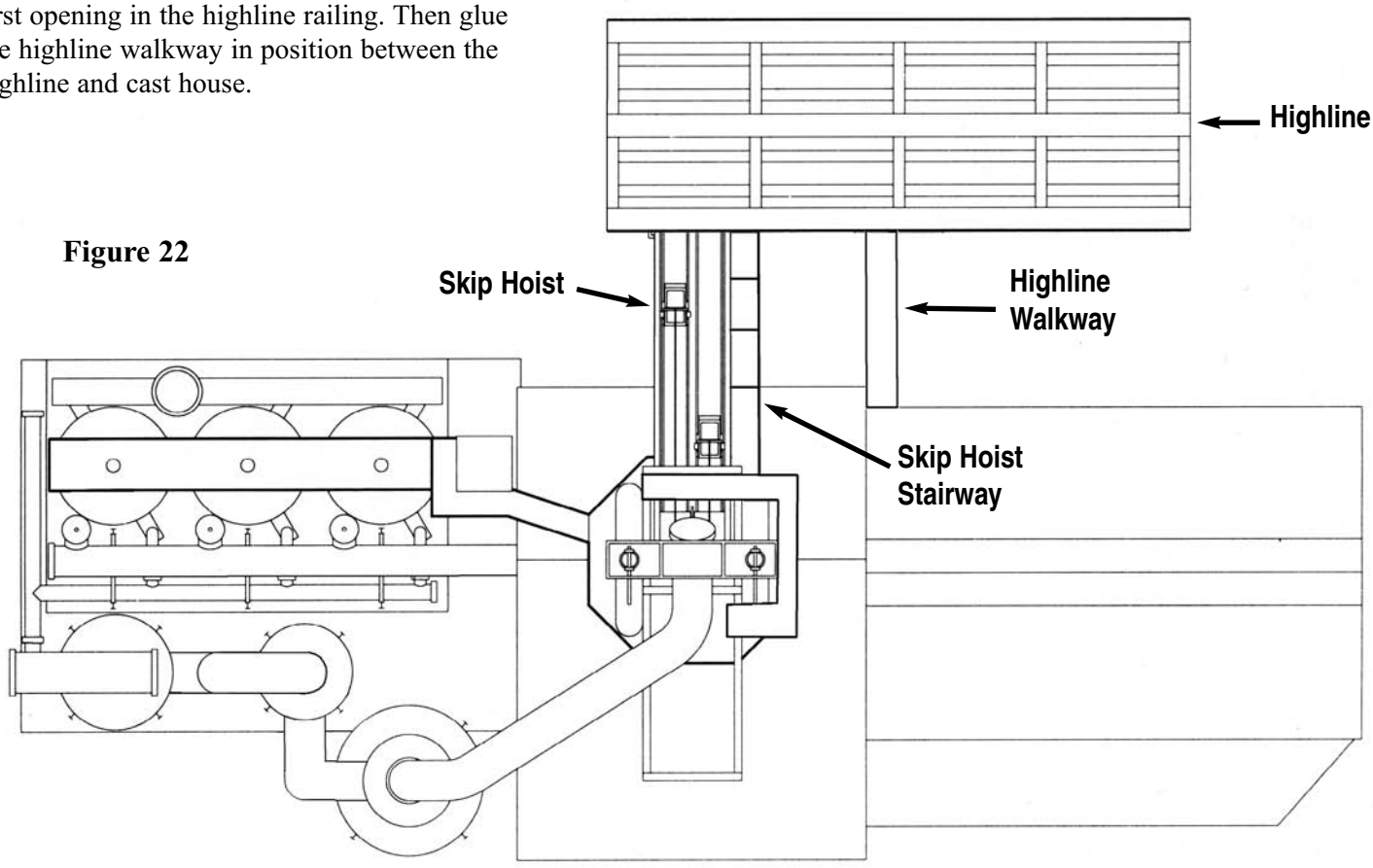
Figure 21



67. Glue the highline walkway (269, 270) together. Then glue the support (272) underneath in the middle.

68. Place the highline over the skip hoist base with the skip hoist stairway positioned at the first opening in the highline railing. Then glue the highline walkway in position between the highline and cast house.

Figure 22



DECALING

1. After cutting out the decal, dip in water for 10 seconds, remove and let stand for 1 minute. Slide decal onto surface, position and then blot off any excess water.

2. Lightly brush Micro Sol® on top. This will soften the decal, allowing it to comform to irregular surfaces. DO NOT TOUCH DECAL while wet!

3. When decal is thoroughly dry, check for any trapped air bubbles. Prick them with the point of a small pin or hobby knife blade and apply more Micro Sol®.