Oct. 16, 1962 C. W. PROSSER 3,058,543

PORTABLE SCAFFOLDS

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Fig.3.

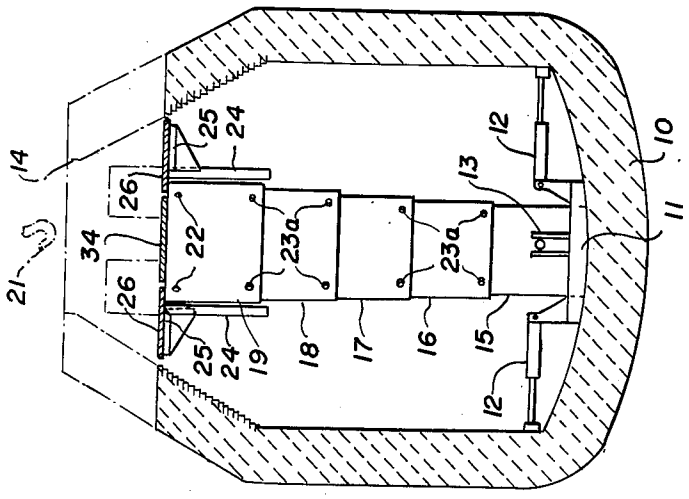


Fig.2.

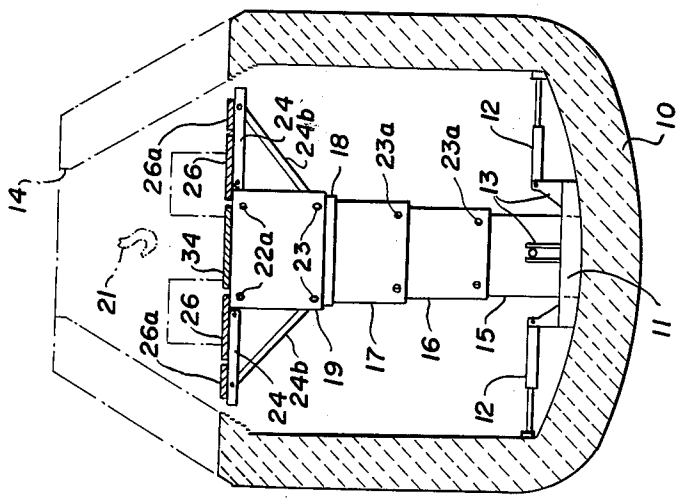
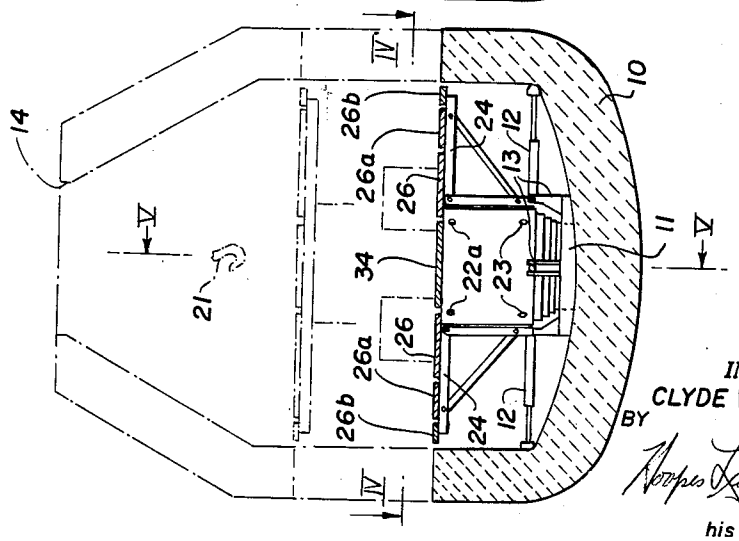


Fig.1.



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Fig.4.

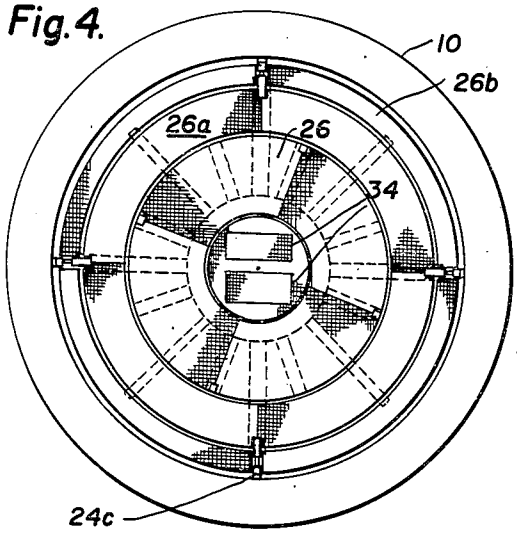


Fig.6.

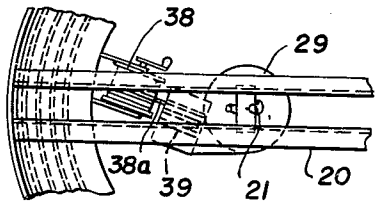
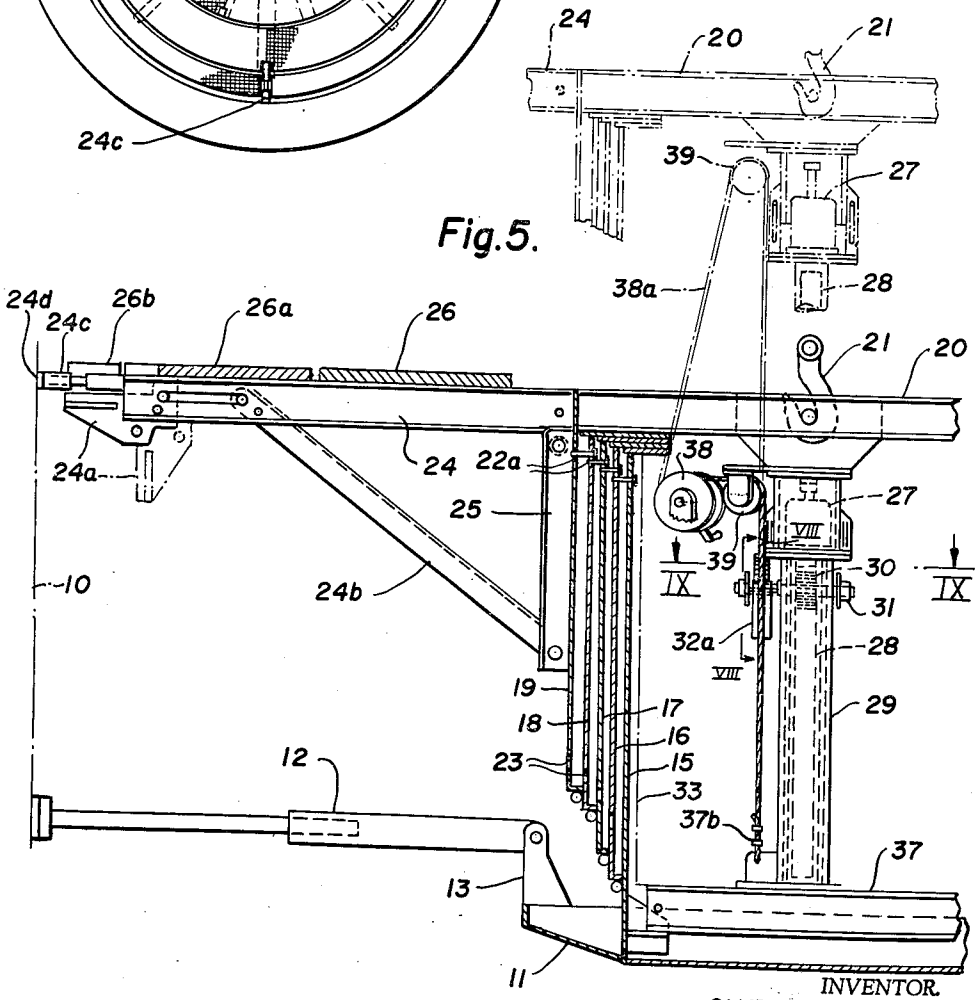


Fig.5.



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Fig. 9.

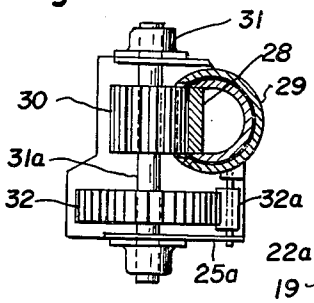


Fig. 10a

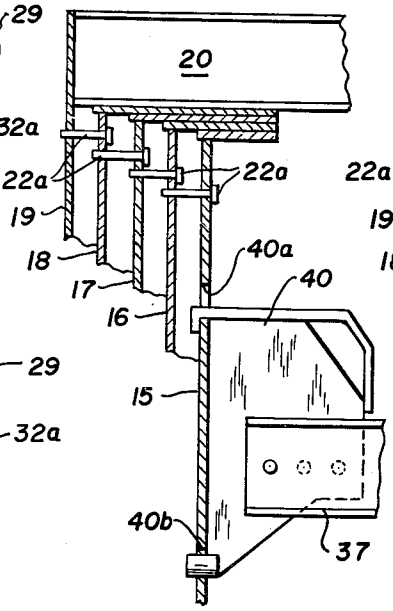


Fig. 10b

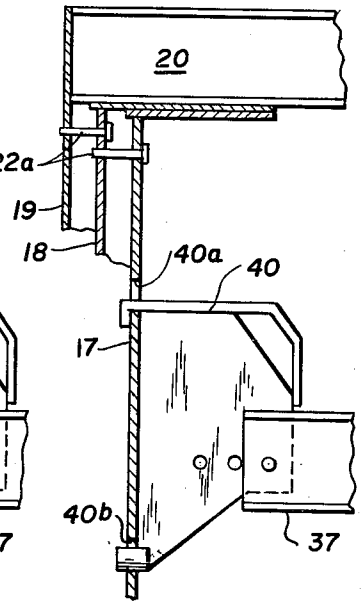


Fig. 8.

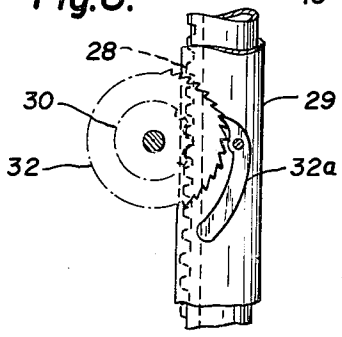
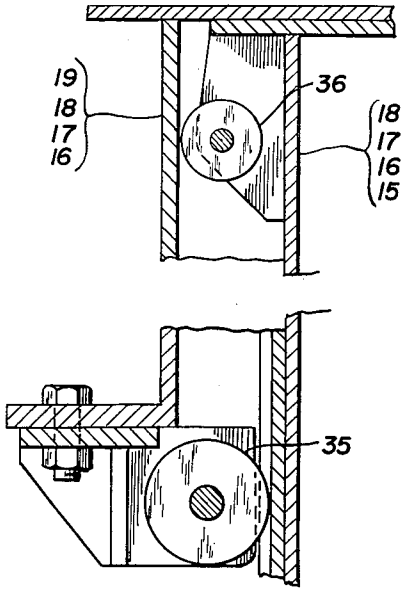


Fig. 7.



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PORTABLE SCAFFOLDS

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6 Claims. (Cl. 182—128)

This invention relates to portable scaffolds and particularly to portable collapsible scaffolds for use in the interiors of vessels having variable internal dimensions.

The problem of removing and replacing the linings of bottle type vessels such as Bessemer converters, blast furnaces, L.D. vessels, ladles and the like has been complicated by the lack of a satisfactory scaffold structure. Such vessels ordinarily vary in diameter from top to bottom and in some cases may be small at the top, large intermediate the top and bottom and small again at the bottom. The blast furnace is typical of such a structure. Other combinations of internal diameter may, of course, be readily found when such variations in diameter occur; the top work surface must, of course, vary in order that the workmen may be properly positioned with respect to the wall surface being worked on. This creates a problem of proper cantilever construction in order to support the work surface at the large diameters and yet be in a position to continue the scaffold to the smaller diameters. In the past, scaffolding such vessels for internal lining has been difficult and expensive because of the need to build continuous scaffolding, first to remove the old lining, then to remove the scaffold piece by piece as the lining is removed and then to start again at the bottom to rebuild the scaffold.

The foregoing problems have long been recognized but no really satisfactory scaffold has heretofore been proposed. It has been proposed to overcome this difficulty by suspending a platform on ropes which extend through the mouth of the vessel to a winch arrangement on a superstructure over the vessel. Such a structure is shown in Jordan Patent No. 2,346,033, assigned to Bethlehem Steel Corporation. A modification of this structure is that of Putnam Patent No. 2,710,418. However, these scaffold structures require some continuous suspension means extending through the vessel mouth; they are much less stable than a bottom supported scaffold; the likelihood of accident is greater and the upper working surface is obstructed with support cables.

I have invented a scaffold structure which overcomes the aforementioned problems and which is simple, inexpensive and readily portable. Preferably, I provide an unobstructed work platform with a base, telescoping cylindrical support members, one about the other, with the cylinder of smallest diameter fixed to the base, a top main frame on the top of the cylinder of largest diameter, folding frame members on the main frame, flooring members removably on said frame, means for raising the cylinder successively and means for locking the bottom of one cylinder adjacent the top of the next inner cylinder.

In the foregoing general description, I have set out certain of the objects, advantages and purposes of my invention; other objects, purposes and advantages will be apparent from a consideration of the following description and the accompanying drawings in which,

FIGURE 1 is a vertical section through a furnace to be lined showing a preferred form of scaffold of my invention in lowest collapsed position;

FIGURE 2 is a vertical section of the furnace of FIGURE 1 with the scaffold in partially raised position and extreme sections of platform removed to reduce the diameter of platform;

FIGURE 3 is a vertical section of the furnace of FIGURE 1 with the scaffold in fully extended position, removable sections of platform removed and main floor beams folded at side of cylinder;

FIGURE 4 is a section on the line IV—IV of FIGURE 1;

FIGURE 5 is an enlarged segmental section on the line V—V of FIGURE 1 and shows safety cage base in first position;

FIGURE 6 is a segmental top plan view of the scaffold lift bar arrangement;

FIGURE 7 is a segmental section at the top and bottom of adjacent segments showing the top and bottom rollers;

FIGURE 8 is a segmental section of the pawl and ratchet lift on the line VIII—VIII of FIGURE 5;

FIGURE 9 is a section of the pawl and ratchet lift on the line IX—IX of FIGURE 5;

FIGURE 10*a* is an enlarged segmental section through the walls of the hollow members showing the removable base bracket in second position;

FIGURE 10*b* is an enlarged segmental section through the walls of the hollow members showing the removable base brackets in a fourth position.

Referring to the drawings, I have illustrated a furnace **10** to be lined having a main body portion and a tapered neck. A scaffold base **11** is adapted to rest on the bottom of the furnace and is provided with radially extensible stabilizing arms **12** pivoted on posts **13** fixed to the base. The base is of a diameter small enough to enter the opening **14** at the end of the tapered neck. A plurality of cylinders **15**, **16**, **17**, **18** and **19** held together by a series of removable pins **22***a* and telescoping one about the other are nested on the base **11**. The larger cylinder **19** is provided with a lift bar **20** to receive a crane **21** whereby the entire unit may be inserted into the furnace and extended in the furnace. Each of the cylinders **15** through **19** are provided at top and bottom with cooperating openings **22** (top) and **23** (bottom) through which lock pins **23***a* may be inserted from the interior of the cylinders to hold the cylinders in extended position. The top of the outer cylinder **19** is provided with sixteen pairs of hinged arms **24** and **25** of different lengths, all adapted to fold against the sides of the cylinder. When extended these arms are adapted to receive removable gratings **26** and **26***a* and **26***b* which serve as a work surface. The length of short arms **25** is determined by diameter of platform at highest work level. The long arms **24** are provided with hinged end pieces **24***a* which may be pivoted down to the position shown in chain line in FIGURE 5.

When it is desired to use the scaffold the entire assembly is lowered through the opening **14** in the top of the furnace by crane hook **21**. The stabilizing arms **12** are extended to engage the outer walls of the furnace. Arms **24** are raised to their extended position, pinned in place with knee braces **24***b*, and removable gratings **26**, **26***a* and **26***b* are placed thereon. Stabilizers **24***c* are placed at platform level to bear against the furnace walls with rollers **24***d*. When it is necessary to raise the scaffold the hook **21** is lowered to engage lift bar **20**, the top stabilizers **24***c* released, the 4-pins **22***a* are removed, and the nested cylinders are raised until the opening **22** in the top of the bottom cylinder and the opening **23** in the bottom of the next to bottom cylinder are approximately in alignment. The openings **22** are brought into precise alignment by hydraulic jack **27** mounted on top of a rack **28** slidable in a carrier **29** carrying a pinion **30** in engagement with rack **28**. The pinion **30** is on shaft **31***a* carrying a toothed ratchet wheel **32** engaged by a pawl **32***a* on the carrier **25***a*. When the openings **22** and **23** are aligned, the lock pins **23** are inserted. The lock pins are inserted from a safety cage **33** suspended in the center of the top cylinder and entered by a hinged cover **34** in the top grating. In order to facilitate movement of the several cylinders with respect to one another rollers **35** are provided on the bottom of each cylinder engaging

the outer wall of the next smaller cylinder and rollers **36** are provided at the top of each external wall of each cylinder to bear on the inner wall of the next larger cylinder. This is repeated until the taper portion of the interior is reached. At this point the hinged ends **24***a* of the long arms **24** are dropped to a vertical position as shown in chain line in FIGURE 5 gratings **26***b* are removed from the vessel. To extend work platform to top position the long arms **24** are dropped to side of top cyilnder and gratings **24***b* are removed from vessel.

The bottom of the carrier **29** is mounted on a beam **37** carrying the base of cage **30**. A hand winch **38** mounted on carrier **29** in cage **30** is provided with a cable **38***a* reeved over a sheave **39** on the lift bar **20** and connected to a clevis **37***b* on beam **37**. After the pins **23** have been inserted to complete a raised section of the scaffold the beam **37** and with it floor of cage **30** is raised a distance substantially equal to the last rise in the scaffold and beam **37** is held by a removable bracket **40** inserted in holes **40***a* and **40***b* in the side wall of the cylinder next below the last one elevated.

In the foregoing specification I have set out certain preferred embodiments of my invention. It will be understood, however, that this invention may be otherwise embodied within the scope of the following claims.

I claim:

1. A portable scaffold particularly adapted for use in vessels having an opening smaller than the interior diameter comprising a base adapted to pass through said opening, a plurality of hollow elongated members telescoping within one another, cooperating lock means on the top and bottom of each said member adapted to hold the bottom of one member adjacent the top of the next smaller member in extensible position, support arms hinged at the top of the largest member adapted to be raised to the horizontal position and held there, removable grating means on said arms, rack means axially of said hollow elongated members suspended from the top member, adjustable beam means on the bottom of said rack selectively attachable to each member and jack means in the rack means whereby the top member may be adjustably positioned with respect to the other hollow members.

2. A portable scaffold particularly adapted for use in vessels having an opening smaller than the interior diameter comprising a base adapted to pass through said opening, a plurality of hollow elongated members telescoping within one another, a lift beam at the top of the largest of said members, cooperating lock means on the top and bottom of each said member adapted to hold the bottom of one member adjacent the top of the next smaller member in extensible position, support arms hinged at the top of the largest member adapted to be raised to the horizontal position, locking means to hold said arms in the horizontal position, jack means suspended beneath the lift beam, rack means on the jack means extending axially of the hollow members, a guide tube reciprocable on the rack means, a pinion operably engaging the rack and held in position by a pawl and ratchet, adjustable base means on the guide tube selectively attachable to the interior of each hollow member and hoist means on the guide tube connected to the lift beam for lifting the adjustable base means and removable grating means on the arms forming a working platform.

3. A portable scaffold as claimed in claim 2 wherein the base means is held in removable brackets on the interior of each of the hollow members.

4. A portable scaffold as claimed in claim 2 wherein the hoist means is a winch on the guide tube having a cable passing over a sheave on the lift beam and anchored to the base means.

5. A portable scaffold as claimed in claim 2 wherein the support arms are spaced apart circumferentially of the largest member and are of two lengths, each having a removable stabilizer on the end thereof adapted to bear against the interior of the vessel being worked upon.

6. A portable scaffold as claimed in claim 2 wherein stabilizer means are attached to the base and adapted to bear against the interior sidewalls of the vessel being worked upon.

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