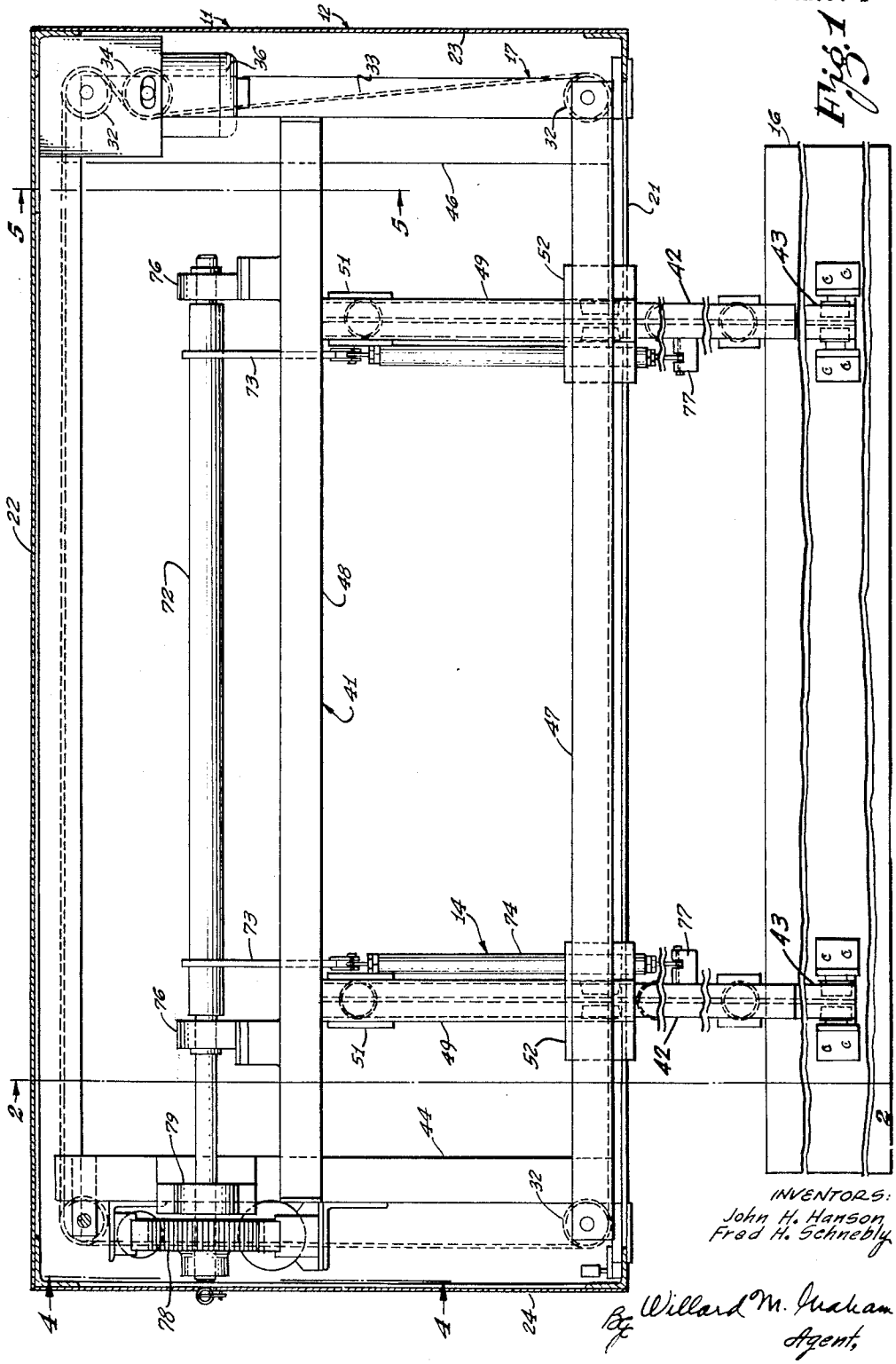
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PORTABLE RADIANT HEATER

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Fig. 1



INVENTORS:
John H. Hanson
Fred H. Schnebly

By Willard M. Graham
Agent.

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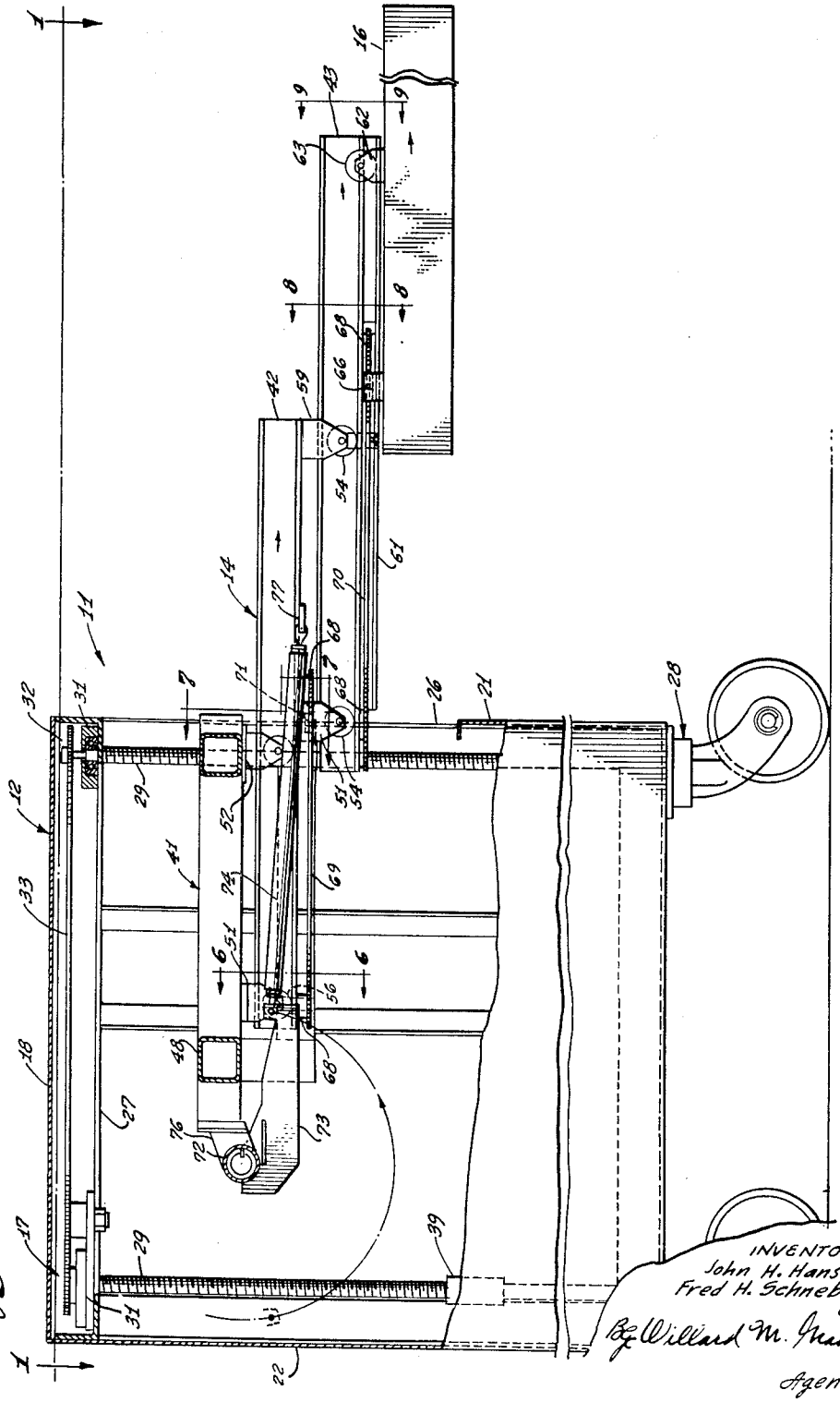


Fig. 2

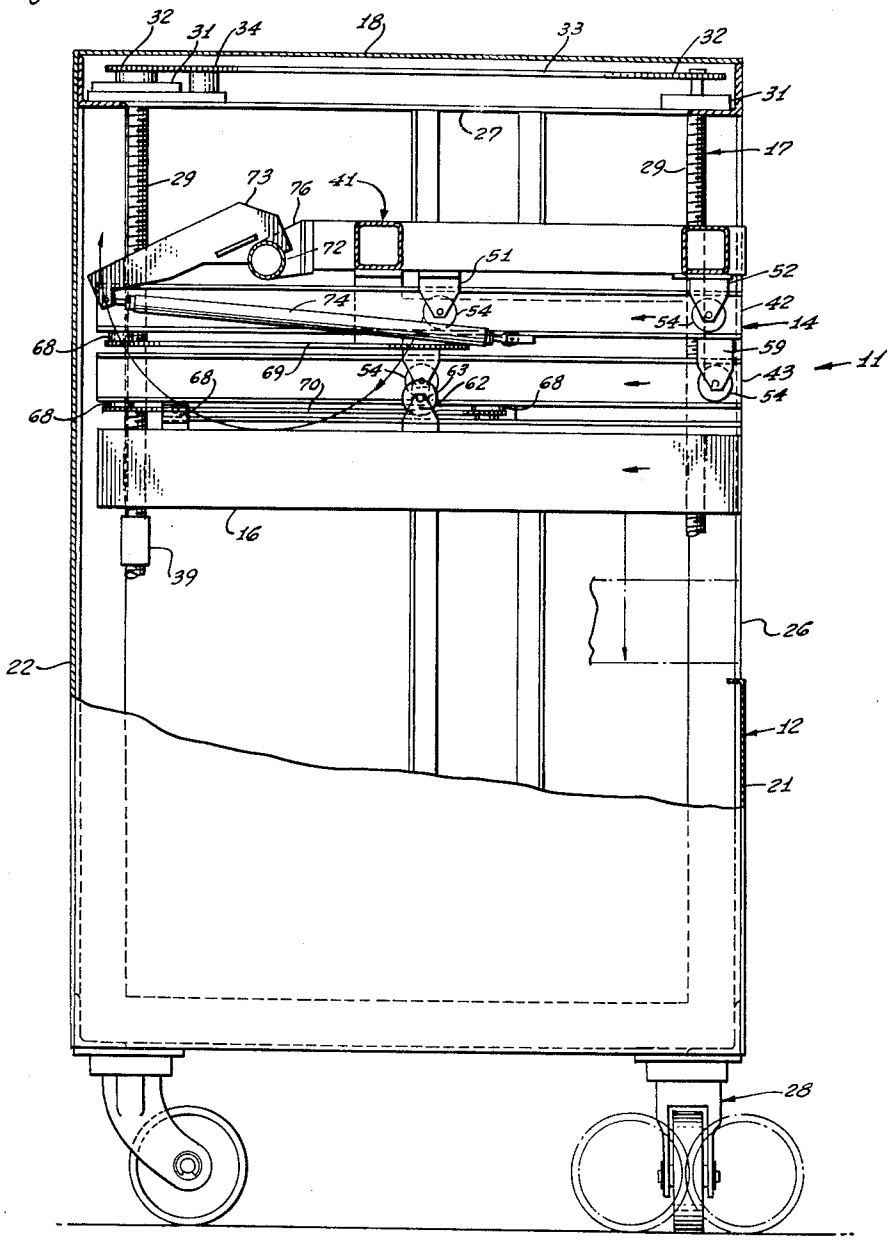
INVENTORS:
John H. Hanson
Fred H. Schnebly
By Willard M. Graham
Agent

Nov. 22, 1960 J. H. HANSON ET AL 2,961,523

PORTABLE RADIANT HEATER

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Fig. 3



INVENTORS:
John H. Hanson
Fred H. Schneby

By Willard M. Graham
Agent

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Fig. 4

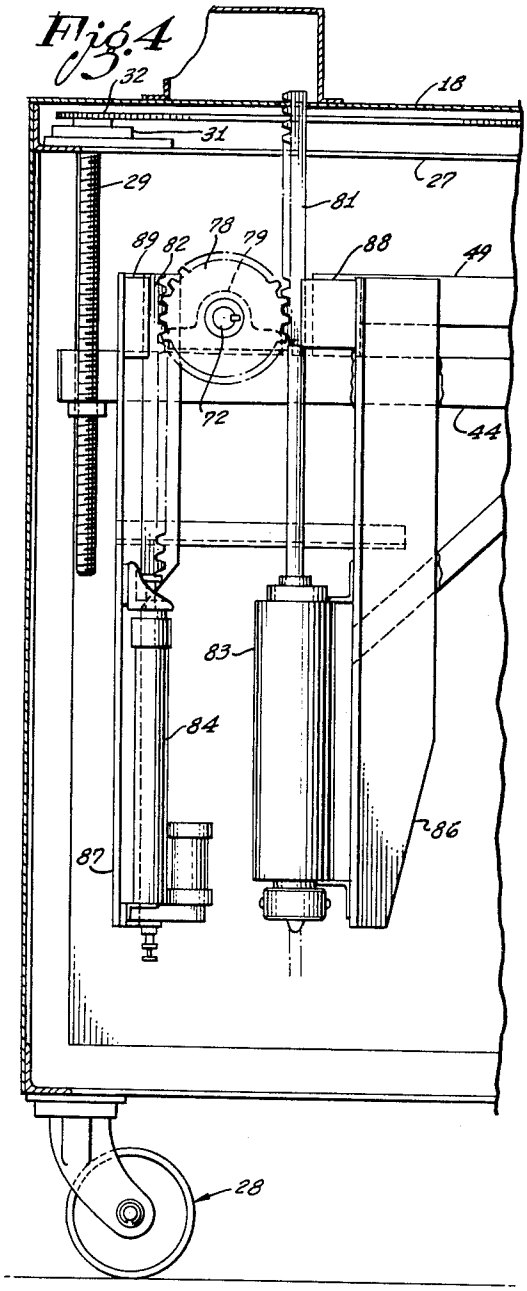
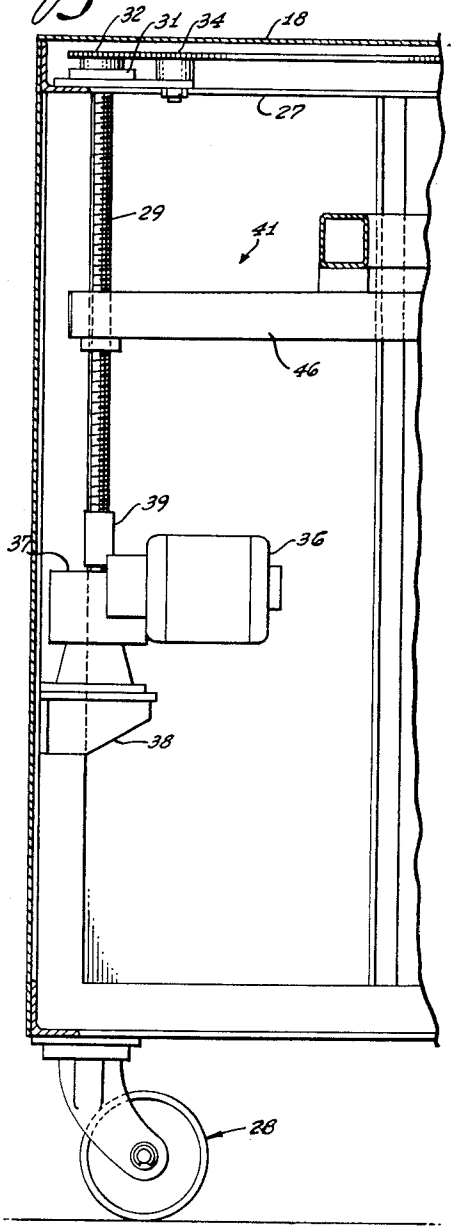


Fig. 5



INVENTORS.
John H. Hanson
Fred H. Schnebly

By Willard M. Graham
Agent.

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Fig. 6

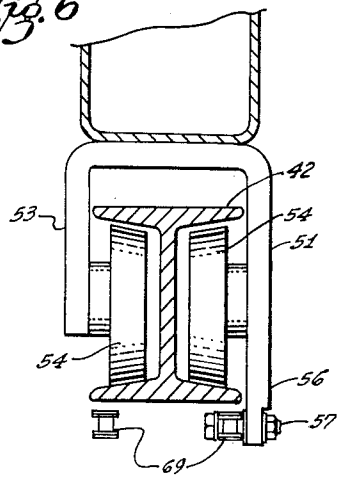


Fig. 7

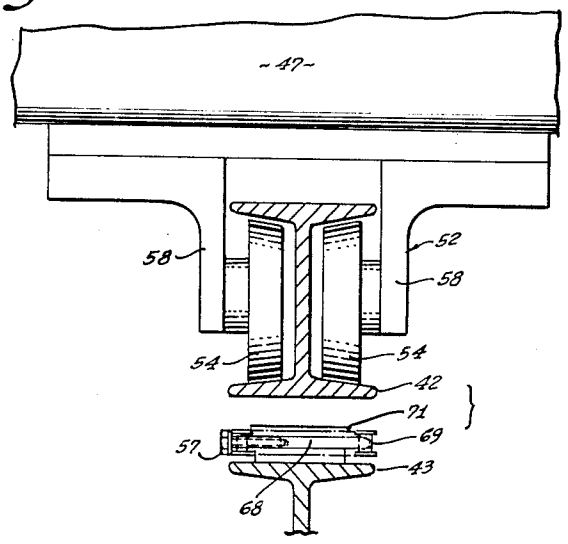


Fig. 8

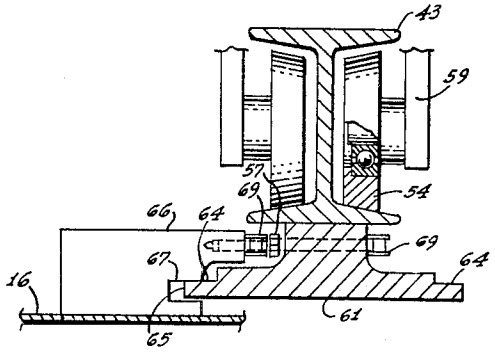
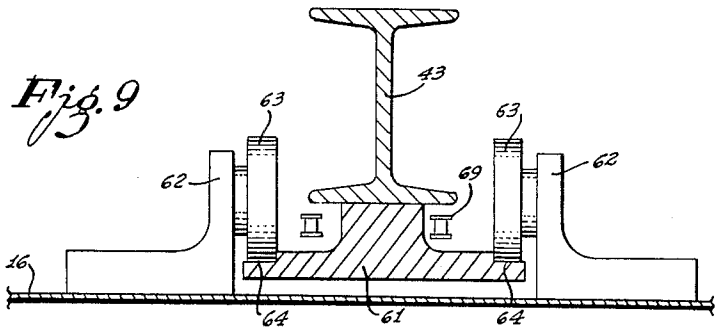


Fig. 9



INVENTORS:
John H. Hanson
Fred H. Schneble

By Willard M. Graham
Agent.

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PORTABLE RADIANT HEATER

John H. Hanson, Los Angeles, and Fred H. Schnebly, Redondo Beach, Calif., assignors to Northrop Corporation, Beverly Hills, Calif., a corporation of California

Filed Apr. 27, 1959, Ser. No. 809,300

4 Claims. (Cl. 219—19)

This invention relates to a facility useful in carrying out a heating operation and more particularly to a facility incorporating mechanical means for facilitating the movement of a heating or like unit between extended and retracted positions.

It is well known in the metal working art that certain metals and alloys thereof must be heated to a predetermined temperature in order that they may be fabricated satisfactorily. This is particularly true of titanium, molybdenum, and magnesium sheets and alloys thereof if they are to be fabricated without the occurrence of fractures, cracks, tears, etc. In addition to the above conditions other unusual conditions are encountered in the fabrication of titanium, molybdenum, magnesium and like sheets. For example, if sheets of the above type are heated to maximum allowable temperatures and subsequently allowed to cool to lower temperatures prior to their fabrication, an elongation loss in working the metal will be experienced which is proportional to the temperature drop of the metal.

It is, therefore, recognized that certain types of sheet metal material must be heated to a maximum allowable temperature and subsequently fabricated at or as near this temperature as possible. The most satisfactory method known to date for carrying out the above operation is by a radiant heating operation of the type disclosed in copending application, U.S. Serial Number 779,243 filed December 9, 1958.

To carry out the above heating operation it is necessary to shift a heating unit quickly between an extended position in which the heating unit is positioned directly above a blank to be heated and a retracted position in which the heating unit is removed from the blank to a retracted position. In the present disclosure this is accomplished by a positioning facility which includes a housing in which primary and secondary assemblies are mounted. The primary assembly includes a plurality of members which are mounted in the housing for relative movement with respect to the housing and with respect to each other. The members provide means on which a radiant heating unit may be mounted and facilitates the movement thereof between the aforementioned extended and retracted positions.

An object of this invention is to provide a positioning facility adapted to facilitate the movement of a heating unit between an extended position in which a sheet metal blank may be readily heated and a retracted position in which the heating unit is removed from the blank to be heated.

Another object is to provide a partially enclosed positioning facility adapted to move a heating unit between extended and retracted positions and which presents a clean appearance free of any protruding structure at such times as said heating unit is in its retracted position.

Another object is to provide a positioning facility usable in carrying out a radiant heating operation which is simple in design yet rugged in construction, which is

mobile and, therefore, easily movable from place to place and is economical to manufacture.

Although the characteristic features of the present invention are particularly pointed out in the appended claims, the invention itself, also the manner in which it may be carried out, will be better understood by referring to the following description taken in connection with the accompanying drawings forming a part of this specification and in which:

Figure 1 is a sectional view of the positioning facility as disclosed herein taken along the line 1—1 of Figure 2.

Figures 2 and 3 are similar views of the positioning facility as indicated by the line 2—2 in Figure 1; Figure 2 shows certain operating components of the facility in their extended position while Figure 3 shows the same components in their retracted position.

Figures 4 and 5 are fragmentary sectional views of the positioning facility as indicated by the lines 4—4 and 5—5, respectively, in Figure 1.

Figures 6, 7, 8 and 9 are sectional views on an enlarged scale of the positioning facility as indicated by the lines 6—6, 7—7, 8—8, and 9—9, respectively, in Figure 2.

Referring now to the drawings, a preferred embodiment of the positioning facility 11 as disclosed herein is shown in Figures 1, 2 and 3. The facility 11 includes a housing 12 in which a primary assembly 14, adapted to impart horizontal movement to a heating unit 16, is mounted. Also mounted in the facility 11 is a secondary assembly 17 adapted to impart vertical movement to the heating unit 16.

The housing 12 on the most part is fabricated from structural members and sheet material, the sheet material provides protection for operating components mounted in the facility 11 and impart a cabinet-like appearance to the facility. As mounted on the structural members the aforementioned sheet material provide top and side walls 18 and 21—24, respectively, for the facility 11. The sheet material completely incloses the structural members to provide a closed housing with the exception of its forward side; here the sheet 21 terminates a predetermined distance above the bottom of the facility 11 to provide an opening 26 as best seen in Figures 2 and 3. The housing 12 is further characterized by including angle members 27, located adjacent the top 18, adapted to provide support for the primary and secondary assemblies 14 and 17 in a manner to be described later. The facility 11 is rendered mobile by caster assemblies 28.

The secondary assembly 17 includes a threaded member 29 mounted at each corner of the housing 12 in depending relation from the angle members 27. The members 29 are rotatably mounted at their upper ends by means of thrust bearings 31 and each carries a sprocket 32 at a location directly above the bearings. A continuous roller chain 33 encircles the sprockets 32 in meshing relation and functions to transmit rotary movement therebetween. An adjustable idler sprocket 34 is provided adjacent one of the sprockets 32 and functions to remove slack from the chain 33.

Rotary movement is imparted to the right-rear member 29, as viewed in Figure 1, by a bidirectional electric motor 36 acting through a reduction gear 37 as shown in Figure 5. The motor 36 and reduction gear 37 are mounted on a bracket 38 which in turn is secured to structural members of the housing 12. Rotary movement which is imparted to the right-rear member 29 through a coupling 39 functions to raise and lower the primary assembly 14 in a manner which will be described presently.

The primary assembly 14 includes a supporting frame 41 and also upper and lower extension members 42 and 43, respectively. On the most part the frame 41 is constructed of tubular members which are square in cross-

section. A pair of side members 44 and 46 are spaced apart a distance slightly less than the width of the housing 12 and are held in spaced relation by fore and aft cross members 47 and 48, respectively. Intermediate members 49—49 are spaced with respect to each other and are secured to the cross members 47 and 48 at positions between the side members 44 and 46. The members 49—49 have a parallel relation with respect to the side members 44 and 46, they impart rigidity to the frame 41 and provide means on which the extension members 42 and 43 are mounted. It should be noted that side members 44 and 46 depend from the cross members 47 and 48 as shown in Figure 4.

The frame 41 is supported in the housing 12 by the members 29 which pass through threaded bores provided in the ends of the forward member 47 and through blocks attached to the aft ends of the side members 44 and 46. It will now be apparent that the frame 41 may be raised or lowered by energizing the motor 36 to provide rotation in a clockwise or counterclockwise direction. The relative position of the frame 41 in the housing 12, as the frame 41 is raised or lowered and may be subject to horizontal forces, is maintained in its relative position by grooves provided in each end of the cross member 47 or extensions thereof. The grooves formed in the member 47 receive and have a sliding relation on exposed vertically extending flanges of structural members of the housing 12 as best seen in Figure 1.

The upper and lower extension members 42 and 43 are characterized in that they are channel members of equal length of slightly less extent than the distance between the fore and aft walls of the housing 12. The size of the heating unit 16 is such that it may be passed through the opening 26 and positioned in the housing 12 in a horizontal attitude. The size of the unit 16 is further characterized in that its fore and aft measurement as viewed in Figure 2 is equal to or slightly less than the respective length of the members 42 and 43. The members 42 and 43 and unit 16 are mounted on the frame 41 in a manner presently described allowing them to be moved between their retracted and extended positions as shown in Figures 3 and 2, respectively.

The upper members 42 are movably suspended from the frame 41 by means of two pairs of roller assemblies 51—51 and 52—52. The assemblies 51 and 52 are located at the aft and forward ends, respectively, of the intermediate members 49.

Each of the roller assemblies 51 includes a yoke member 53 and a pair of rollers 54—54 of frustro-conical configuration rotatably mounted in opposing relation on the yoke member as shown in Figure 6. By referring to Figures 2 and 6 it will be seen that the webs of the members 42 are received between the rollers 54 and the rollers in turn bear on the upper or lower flanges of the members 42 according to the position of the members 42 with respect to the frame 41. One leg of the yoke members 53 is longer than the other as indicated by the numeral 56 and carries a clip 57.

Each of the roller assemblies 52—52 includes a pair of bracket members 58—58 on which a pair of rollers 54—54 are rotatably mounted as shown in Figure 7. By referring to Figure 7 it will be seen that the members 42 are received between the rollers 54—54 in the same manner that they are received in the assemblies 51.

The lower extension members 43 are movably mounted below the upper extension members 42 in the same manner that the latter members are mounted on the frame 41. This mounting is accomplished by roller assemblies 51 mounted on the members 42 in depending relation midway between the ends of the members 42 and assemblies 59, similar in construction to the assemblies 51 except that the depending portion 56 is omitted, mounted in depending relation on the forward ends of the members 42.

The heating unit 16 is of substantially the same construction as the heating unit disclosed in the aforementioned copending U.S. application. The heating unit 16 is movably mounted in depending relation on the members 43. This mounting is accomplished by guide strips 61 which are substantially T-shaped in cross section and are attached to and extend lengthwise along the bottom flanges of the members 43 in an inverted position as best seen in Figure 8. Roller assemblies 62, similar to the roller assemblies 52, are mounted on the top of the unit 16 in an upstanding attitude at a position midway between the fore and aft sides of the unit 16. The assemblies 62 include a pair of cylindrical rollers 63—63 which ride on guideways 64—64 formed in the member 61 as shown in Figure 9. As mounted rocking tendencies of the unit 16 is precluded by guide blocks 66 mounted on the top of the unit 16 aft of its vertical center line. The blocks 66 define grooves 67 which receive flanges 65 of the guide strip 61 in sliding relation and also carry clips 57.

Sprockets 68, as best seen in Figure 2, adapted to receive roller chains 69 and 70, are rotatably mounted in depending relation on the aft and mid-section portions of the members 42 and 43. The inside runs of the chains 69 are secured to the clips 57 carried by the roller assemblies 51 which are mounted on the members 42. The outside runs of the chains 69, also carried by the sprockets mounted on the members 42, are secured to clips 57 which are mounted on blocks 71 which in turn are mounted on the upper flanges of the members 43 at the aft ends thereof as shown in Figure 7. The inside runs of the chain 70, carried by the sprockets mounted on the members 43, are secured to the clips 57 carried by the assemblies 51 mounted on the members 43 while their outside runs are secured to the guide blocks 66 as best seen in Figure 8.

With the members 42 and 43 and unit 16 assembled as described above it will be seen that as fore and aft movements are imparted to the members 42 like movements will also be imparted to the members 43 and unit 16 by the chains 69 and 70. This movement, hereinafter referred to as initial movement of the members 42, 43 and unit 16, results from the fact that the chains 69 are fixedly secured to the roller assemblies 51 (mounted on the members 49) and the blocks 71 while the chains 70 are fixedly secured to the roller assemblies 51 (mounted on the members 42) and the guide blocks 66.

Simultaneously with the initial movement described above additional movement is also imparted to the members 43 and unit 16 by the chains 69 and 70. For example, as initial movement is imparted to the members 42 the chains 69, due to the fact that their inboard runs are secured to fixed structure, viz., the assemblies mounted on the members 49, are caused to rotate about the sprockets 68. The outboard runs of the chains 69 being secured to the blocks 71 they impart an additional movement to the members 43, hereinafter referred to as auxiliary movement, equal to the initial movement imparted to the members 42. In other words, for a given travel of the members 42 the members 43 are caused to travel through a distance twice the distance traveled by the members 42. Further, as rigged it will be apparent that the auxiliary travel of the members 43 will be in the same direction as the initial travel of the members 42.

In view of the above explanation it will now be apparent that auxiliary travel will also be imparted to the unit 16. This auxiliary travel will be equal to the original travel imparted to the members 42 and, therefore, the unit 16 is caused to travel twice as far as the members 43 and three times as far as the members 42 as a result of original movement of the members 42.

For purposes of illustration, it may be assumed that the members 42, 43 and unit 16 are in their retracted position as shown in Figure 3. Now if an initial movement to the right, approximately equal or slightly less than one half the depth of the housing 12, is imparted to the mem-

bers 42 it will be seen that the members 42, 43 and unit 16 will be caused to assume their extended position as shown in Figure 2.

Initial movements are imparted to the members 42 by means of a torque tube 72, throw arms 73 and connecting rods 74. The torque tube 72 is rotatably mounted in bearing blocks 76—76 which are secured to the aft cross-member 48. The hub portions of the arms 73 are secured to and rotate with the tube 72 while their outer ends are pivotally attached to ends of the connecting rods 74. The other ends of the rods 74 are pivotally attached to the members 42 by means of bearing members 77. The throw of arms 73 is slightly less than one half the depth of the housing 12.

The left hand end of the tube 72, as viewed in Figure 1, extends beyond the side member 44 and has a spur gear 78 fixdely secured thereto. The tube 72 is also provided with an additional bearing 79 which is mounted on the side member 44. As mounted the spur gear 78 meshes with driving and braking gear racks 81 and 82, respectively, as best seen in Figure 4 and which will be further described as the disclosure progresses.

The racks 81 and 82 are secured to the free ends of connecting rods comprising components of a hydraulic actuator 83 and braking cylinder 84. The actuator 83 and cylinder 84 are mounted on structural members 86 and 87 which are mounted on and depend from the left side member 44 as viewed in Figure 1. The racks 81 and 82 are maintained in meshing relation with the gear 78 by means of bearing blocks 88 and 89. The actuator 83 imparts rotary motion to the tube 72 and includes a cylinder and piston operation in a conventional manner, pressurized fluid flow from and to the actuator 83 is controlled by conventional valve means (not shown). The breaking cylinder 84 is also of conventional construction including a cylinder and piston functions to slow speed of the tube 72 and maintain the latter in fixed positions at such time as the actuator 83 is rendered inoperative by bypassing fluid from one end of the cylinder 84 to the other.

It will now be seen that the members 42, 43 and unit 16 may be actuated between their retracted and extended positions by directing pressurized fluid to the actuator 83. Inasmuch as the individual fore and aft dimensions of the members 42, 43 and unit 16 are slightly less than the depth of the housing 12, it will be seen that the members 42, 43 and unit 16 are located entirely within the housing 12 when they are in their retracted position as shown in Figure 3. Upon actuation of the arms 73 between aft positions (Figure 3) and forward positions (Figure 2) initial movement in a forward direction is imparted to the members 42. This initial movement is simultaneously imparted to the member 43 and unit 16 due to the fact that the members 42, 43 and unit 16 are tied together by the chains 69 and 70. Auxiliary movement is also simultaneously imparted to the members 43 and unit 16 due to the rotation of the chains 69 and 70 on the sprockets 68. Thus initial and auxiliary movements cause the members 42, 43 and unit 16 to assume their extended position as shown in Figure 2. If the facility 11 is properly positioned it will now be seen that the unit 16 may be actuated as desired between its retracted position and its extended position in which it may be used to heat a metal sheet of the type previously described.

In practice limit switches (not shown) are provided to limit the throw of the arms 73 and also to limit the vertical travel of the supporting frame 41. Thus it will be seen that a positioning facility adapted to carry out the various objects of the invention is provided.

While in order to comply with the statute, the invention has been described in language more or less specific as to

structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprise a preferred form of putting the invention into effect, and the invention is therefore claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

What is claimed is:

1. In a positioning facility for carrying out a heating operation the combination comprising: a supporting structure adapted to rest on a generally horizontal surface; a support assembly; screw means mounting said support assembly in said supporting structure for limited vertical movement therein; extension means mounted in depending relation on said support assembly for limited horizontal movement thereon; heating means mounted in depending relation on said extension means for limited horizontal movement thereon; actuating means mounted on said supporting structure including a torque tube and throw arms; the free ends of said throw arms being pivotally attached to said extension means and functioning to impart initial movement thereto in a horizontal direction when moved through a predeterminde angular range; and chain means mounted between and attached to said extension and heating means whereby said initial horizontal movement of said extension means is simultaneously imparted to said heating means.

2. In a positioning facility for carrying out a heating operation the combination set forth in claim 1: further characterized in that said chain means includes continuous chains and sprockets mounted on said extension means; said chains being operationally mounted on said sprockets to provide inside and outside runs; the inside and outside runs being respectively fixedly secured to said extension means and heating means in a manner functioning to impart secondary horizontal movement to said heating unit which is twice as great as the initial horizontal movement imparted to said extension means.

3. In a positioning facility for carrying out a heating operation the combination comprising: a supporting structure; a support assembly mounted in said supporting structure; extension means mounted on said support assembly for movement thereon through a predetermined linear distance with respect to said support assembly; heating means mounted on said extension means for linear movement thereon; actuating means mounted on said supporting structure adapted to impart said linear movement to said extension means; and chain means mounted on and attached to said extension and heating means whereby the latter is caused to move through a greater linear distance than said extension means in moving through said predetermined linear distance.

4. In a positioning facility for carrying out a heating operation as set forth in claim 3: further characterized in that said chain means includes continuous chains and sprockets mounted on said extension means; said chains being operationally mounted on said sprockets to provide inside and outside runs; the inside and outside runs being respectively fixedly secured to said extension means and heating means in a manner functioning to impart secondary horizontal movement to said heating unit which is twice as great as the initial horizontal movement imparted to said extension means.

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