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ADJUSTABLE SUPPORT ASSEMBLY FOR KILN LINING APPARATUS

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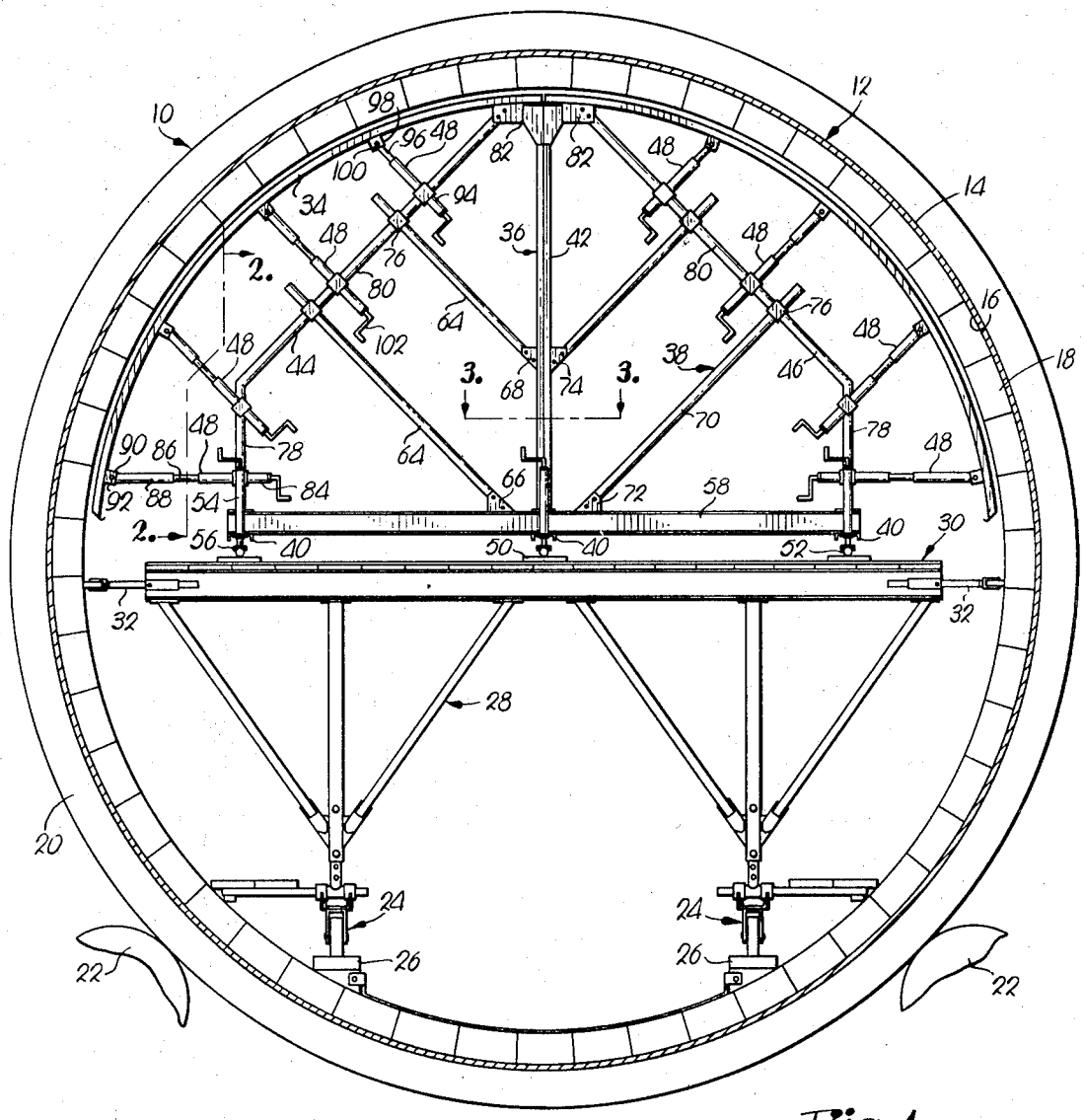



Fig. 1.

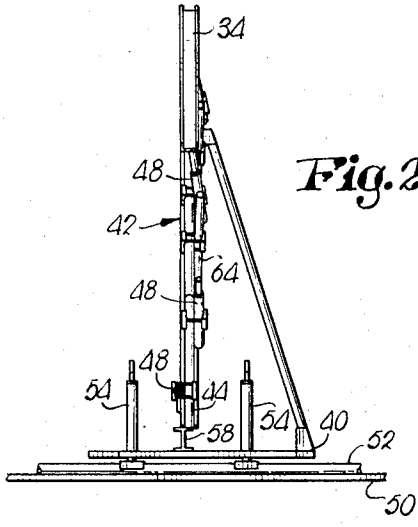



Fig. 2.

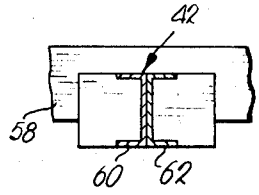



Fig. 3.

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3,550,344

# ADJUSTABLE SUPPORT ASSEMBLY FOR KILN LINING APPARATUS

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Int. Cl. E04g 11/20; E01g 5/14
U.S. Cl. 52—749 1 Claim

## ABSTRACT OF THE DISCLOSURE

A supporting assembly including a framework to be positioned substantially vertically interiorly of a rotary kiln for adjustably supporting a rigid member in spaced relationship to the interior face of the kiln shell, the framework carrying a plurality of screws which are connected to the rigid member whereby, upon independent operation of the screws, the desired configuration of the rigid member with respect to the interior face of the shell may be maitnained.

This is a continuation of application 654,811, filed July 20, 1967, and now abandoned.

This invention relates to a support assembly for kiln lining apparatus of the type shown in Pat. No. 3,298,155, issued Jan. 17, 1967.

It is the primary object of this invention to provide a support assembly for such kiln lining apparatus, which assembly includes a framework, the framework being substantially vertically disposed within the kiln, there being a plurality of screws carried by said framework, the other ends of the screws being fixedly clamped to the framework, the other ends of the screws being pivotally connected to a rigid member which is spaced from the interior face of the kiln shell and normally supports the liner brick during the kiln lining operation.

It is a yet further object of this invention to provide a support assembly for kiln lining apparatus which is adjustable in all respects in that the same has a framework including a center post and a pair of stringers, the stringers diverging downwardly from said center post and supporting the screws, the lower ends of the center post and the stringers being carried by a baseplate, which baseplate is shiftable in a vertical path whereby said support assembly is yet further adjustable with respect to the rigid member carried thereby.

Other objects of this invention will become apparent from the following specification and accompanying drawing, wherein:

FIG. 1 is a front elevational view of a rotary kiln looking thereinto and showing the support assembly therewithin in connection with kiln lining apparatus;

FIG. 2 is a fragmentary sections view taken on line 2—2 of FIG. 1 and looking in the direction of the arrows; and

FIG. 3 is an enlarged, fragmentary, sectional view taken on line 3—3 of FIG. 1 and looking in the direction of the arrows.

The support assembly hereinafter described is particularly intended for use with apparatus for lining the interior face of the shell of a rotary kiln such as that disclosed in U.S. Pat. No. 3,298,155, issued Jan. 17, 1967. Such apparatus is adapted to be positioned within a rotary kiln **10**, the kiln having an outer shell **12**, normally of metal of suitable strength and of an elongated, cylindrical configuration, the shell having an exterior face **14** and an interior face **16**, there being liner brick **18** which are positioned against the interior face **16** of the shell **12** in



lining the same. Kiln **10** is normally provided with a plurality of ribs **20** spaced along the length thereof, which ribs each ride on a set of opposed trunnions **22** whereby the kiln **10** may be rotated.

The kiln lining apparatus in conjunction with which this support assembly is to be utilized, includes wheeled carriage assemblies **24** which ride upon trackways **26** positioned interiorly and longitudinally of kiln **10**, said assemblies **24** supporting a scaffolding rig **28** normally positioned in the lower portion of the interior of the kiln, the rig **28**, in turn, supporting a platform **30**, which platform **30** has casters **32** carried at the outer ends thereof to facilitate rotary movement of the kiln with the lining apparatus therewithin.

The kiln lining apparatus further includes a normally arcuate, rigid member **34** which spans the upper half of the interior of the kiln shell, said rigid member in turn, carrying a flexible expandable member (not shown) which, in turn, carries an articulated frame, the liner brick **18** resting upon the frame, which is not shown, whereby, upon shifting of the articulated frame, as by expansion of the flexible member, the liner brick **18** are moved into engagement with the interior face **16** of the shell **12** in the manner more fully described in the above-mentioned Pat. No. 3,298,155.

The support assembly **36** for use in connection with the above-described kiln lining apparatus, includes a framework **38** carried upon platform **30** and, more particularly, by vertically shiftable baseplates **40**, the framework including, in the form chosen for illustration, a center post **42** supported in a substantially vertical position by a guy bar connected thereto and to one of the baseplates **40**, a pair of stringers **44** and **46** diverging downwardly from the upper end of center post **42**, and a plurality of screws **48** interconnecting the rigid member **34** and the stringers **44** and **46** of the framework **38**.

Support assembly **36** is carried upon platform **30** by means of beams **50** in the nature of flat boards or the like, the beams **50** being positioned longitudinally of the platform **30**. Each beam **50** has a length of pipe **52** corresponding thereto and in overlying, centrally disposed relationship to its respective beam **50**. The pipes **52** each support a pair of jacks **54**, it being noted that jacks **54** each have a saddle **56** at the lower end thereof so that the support assembly may be shifted longitudinally of the kiln by moving said saddles **56** along their corresponding pipes **52**.

Each pair of jacks **54**, as best shown in FIG. 2 of the drawing, is coupled with a corresponding baseplate **40**, said baseplates **40** being vertically shiftable upon actuation of their corresponding pair of jacks **54**. Baseplates **40**, in turn, collectively support a transversely disposed jack beam **58** which is in substantially parallel relationship to the platform **30**, the jack beam, in turn, being in engagement with the normally lowermost ends of center post **42** and stringers **44** and **46**, each of the latter having a foot on the lower end thereof which is in engagement with the upper face of jack beam **58**.

The center post **42** is of the configuration shown in FIG. 3 of the drawing and consists of a pair of channel members **60** and **62**, the same being in back-to-back relationship as illustrated in said FIG. 3. The channel members **60** and **62** may be coupled together as by passing suitable fastening means through their opposed web portions, it being noted however, that said members can be readily separated as by removing said fastening means, whereby the entire support assembly **36** may be broken into two halves, being a right-hand half and a left-hand half, viewing FIG. 1 of the drawing, for purposes of transportation, storage and erection. In the embodiment chosen for illustration, the center post **42** is provided inasmuch

as the diameter of the kiln is such that central support of the framework is necessary and desirable. On the other hand, in the case of kilns having a smaller diameter, the center post **42** may be eliminated and, if necessary, replaced by other suitable bracing.

Stringer **44** is supported by a pair of braces **64**, the lowermost of said braces being connected to jack beam **58** as by a connector plate **66**, the uppermost of said braces **64**, in the form shown, being connected to center post **42** and particularly, channel **60** thereof as by a connector plate **68**. Likewise, stringer **46** is supported by a pair of braces **70**, the lowermost of said braces being carried by jack beam **50** and connected thereto as by connector plate **72**, the uppermost of said braces being carried by center post **42** and connected to channel **62** thereof as by connector plate **74** in the form of invention illustrated. The outer ends of the braces **64** and **70** are attached to their corresponding stringers **44** and **46** as by conventional clamp members **76**. It will be noted that each of the stringers **44** and **46** has a substantially vertical stretch **78**, each of said stringers also having an inclined stretch **80**, the inclined stretches extending upwardly and inwardly from the upper ends of the vertical stretches to a point of connection with rigid member **34** and center post **42**, as by gusset members **82**.

As noted above, in kilns of a smaller diameter than that illustrated in the drawing, the center post **42** may be eliminated and if such is done, the upper ends of the stringers **44** and **46** would be suitably coupled to the central portion of rigid member **34**, as by gusset members similar to those shown at **82**. In the form of invention where no center post **42** is provided, the braces **64** and **70** may also be eliminated, the stringers **44** and **46** being supported by resting upon jack beam **58** and connected, at their upper ends, to rigid member **34**.

The screws **48** are carried by said stringers **44** and **46** and are spaced apart thereupon, the screws **48** lying in a common, substantially vertical plane. In this regard, it will be noted from FIG. 2 of the drawing that the lower ends of the stringers **44** and **46** are positioned slightly off-center on jack beam **58**, whereby to cause said framework **38** to assume a position slightly inclined with respect to true vertical, this resulting from the fact that, while the lower ends of the framework are offset with respect to the center of beam **58**, the upper ends thereof are on the center line of rigid member **34**. The provision of a slightly inclined-from-vertical position for the framework **38** permits the screws **48** to be actuated without binding or hanging up as the same are rotated to obtain the desired configuration for rigid member **34**.

As seen in FIG. 1 of the drawing, the screws **48** are preferably substantially equidistantly spaced along their supporting stringers, whereby the right and left halves of the support assembly **36** are essentially identical in construction. Thus, it will be noted that each of the vertical stretches **78** carries a pair of screws **48**. On each side of the support assembly, the lowermost of said screws carried by the vertical stretch **78** is substantially horizontally disposed and consists of a cylinder **84**, a threaded rod **86**, and an interiorly threaded sleeve **88**, the sleeve **88** being coupled to the rigid member **34** by a bracket **90** having a pivot pin **92** extending therethrough and through sleeve **88**.

The construction of the uppermost screws carried by each of the vertical stretches **78** is the same as that of the lowermost screws, it being noted however, that said uppermost screws are inclined relative to the vertical stretch **78**.

In the embodiment chosen for illustration, the inclined stretches **80** of stringers **44** and **46** each carry two screws, the lowermost screws on each side being of the same construction as the screws carried by vertical stretches **78**, the uppermost screw carried by each of the inclined stretches **80** consisting solely of a cylinder **94** having a threaded rod **96**, which rod is connected to rigid member **34** by means of a bracket **98** and pivot pin **100**. Each of the screws **48** carried by support assembly **36** is provided with a suitable operating handle **102** whereby the screws may be actuated by a user positioned on platform **30** or on framework **38** whereby to rotate said handles **102**.



It will be appreciated that when support assembly **36**, as illustrated, is to be positioned within kiln **10**, the same may be broken along its vertical center line as by separating the channels **60** and **62** constituting center post **42**. The support assembly may then be erected upon jack beam **50** which is, in turn, carried by baseplates **40** and the screws each connected to the rigid member **34**, which member is made of a distortable material and is normally arcuate in configuration whereby to conform as closely as possible to the configuration of the interior face of the kiln shell **12**. However, in order to accommodate the rigid member **34** to the exact configuration of the interior face **16**, it is normally necessary to operate one or more of the screws **48** to conform the configuration of the rigid member **34** to that of the interior face **16** of the kiln shell **12**. As is readily apparent from the foregoing, this can be accomplished by either independent or collective operation of the screws **48**, and when this is done, the configuration of rigid member **34** can be longitudinally distorted into conformity with that of the interior face **16**, whereupon liner brick may then be positioned upon rigid member **34** and said brick spaced equidistantly from the interior face **16**. Additionally, the support assembly **36** and its adjusting screws **48** may be utilized to insure that rigid member **34** is maintained in an arcuate configuration corresponding to that of the interior of the kiln shell being lined. Thus, by providing a support assembly which permits adjustment of the rigid member **34**, said member can be drawn inwardly whereby to accommodate for a kiln which is out-of-round, or to compensate for brick which is of different size or dams formed along the interior of the kiln shell by the liner brick. Likewise, support assembly **36**, by its adjustability, permits rigid member **34** to be expanded outwardly whereby to likewise accommodate for an out-of-round condition in the kiln shell or brick which is smaller.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

**1.** A support assembly for apparatus for lining the interior face of the generally cylindrical shell of a rotary kiln comprising:

an arcuate, rigid member of distortable material adapted to conform to the configuration of the interior face of the shell;

an upright framework;

a plurality of circumferentially positioned power devices carried by said framework, said devices lying in a common, substantially vertical plane;

means coupling the plurality of power devices with the framework;

means pivotally coupling each of the plurality of power devices to said distortable member at corresponding substantially equidistantly spaced points intermediate the ends of said member; and

separate operating means for each of said power devices to permit selective operation thereof, in either direction, to thereby exert independent, radially directed distorting forces on a portion of said member adjacent said corresponding point, said forces being collectively exertable to distort the longitudinal configuration of said member and thereby conform the member to the configuration of the interior face of the shell.

**References Cited**

UNITED STATES PATENTS

3,298,155 1/1967 Byfield et al. ---------- 61—84

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