Jan. 2, 1945. H. D. STUCK 2,366,367

JORDAN ENGINE LINING

Original Filed Jan. 16, 1941 2 Sheets-Sheet 1

FIG. 1.

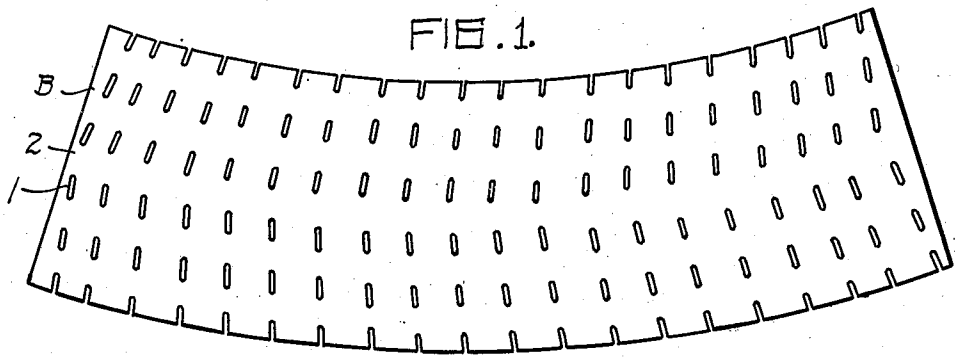


FIG. 2.

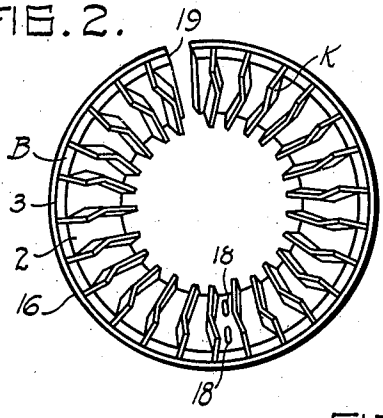


FIG. 3.

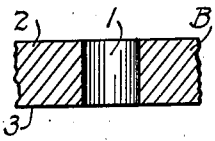
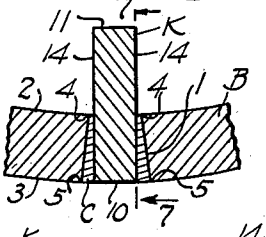


FIG. 4.



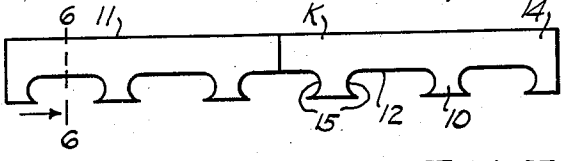


FIG. 5.

FIG. 6.

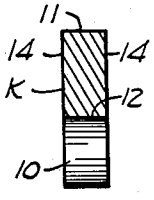


FIG. 7.

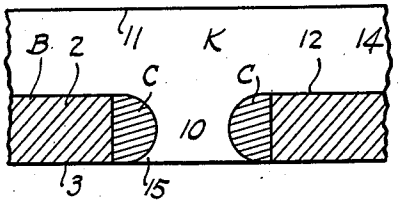
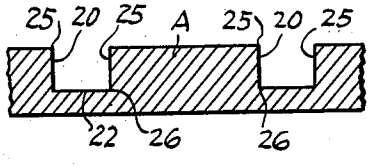


FIG. 8.



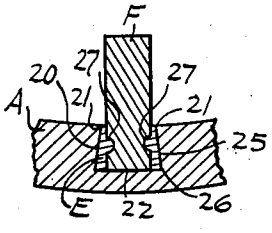


FIG. 9.

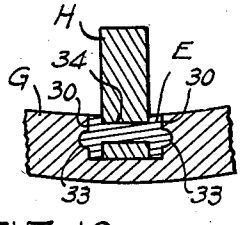


FIG. 10.

INVENTOR.

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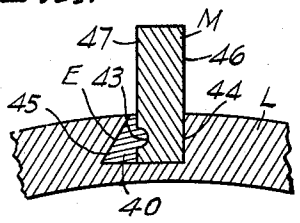
BY Gardner D. Deacon Attorney

Jan. 2, 1945. H. D. STUCK 2,366,367

JORDAN ENGINE LINING

Original Filed Jan. 16, 1941 2 Sheets-Sheet 2

FIG. 11.



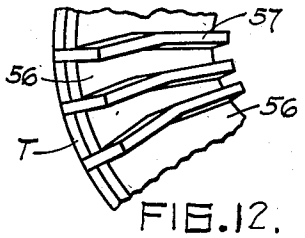


FIG. 12.

FIG. 13.

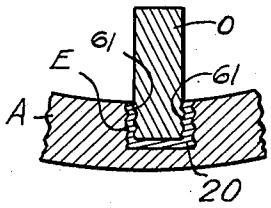


FIG. 14.

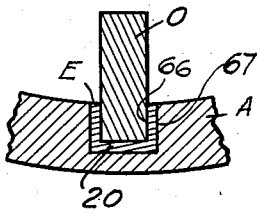
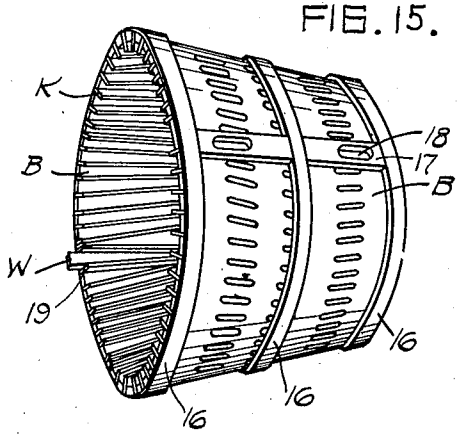


FIG. 15.



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Patented Jan. 2, 1945 2,366,367

UNITED STATES PATENT OFFICE

2,366,367

JORDAN ENGINE LINING

Harold D. Stuck, Andover, Mass., assignor to John W. Bolton & Sons, Inc., Lawrence, Mass., a corporation of Massachusetts

Substituted for abandoned application Serial No. 374,718, January 16, 1941. This application July 26, 1944, Serial No. 546,602

4 Claims. (Cl. 92—27)

This invention relates to the Jordan engine members known as shells and plugs. A Jordan shell and plug are of truncated conical form and are provided with knives or bars positioned lengthwise or axially so that when the plug revolves, their faces are very close together. I will call both bent and straight knives for the shell and all kinds of bars for the plug by the generic term bars, meaning thereby stock treating members of a relatively hard metal which resists frictional wear.

I use a holding member which is a lining of the bodily transportable type adapted to be assembled in the machine shop and slipped in the shell or on the plug of a Jordan engine in a paper mill.

It is preferably of the type in which the usual wooden separators or separators of other material between the knives or bars are omitted. It is fundamentally an all metal structure comprising three different metals. Separators may be used with it.

These metals are the holding member, the bars, and a fusible metal which holds the bars in place in the holding member and which is preferably of much lower fusibility than the other metals so that if the knives or bars are injured or worn they can be removed by melting the fusible metal and replaced by new knives or bars.

This application is a substitute for my abandoned application Serial No. 374,718 filed January 16, 1941.

I can use knives or bars which are much narrower than those generally used for the same assembly because each knife or bar is very firmly held. In fact, in the same sized openings in a holding member knives or bars of different thicknesses can easily be installed.

In the preferred form of the device which is a bodily transportable Jordan shell lining, the main feature is the provision of a sheet of relatively thick, tough metal forming a holding plate which is a holding member. This holding plate is made with rows of axially positioned openings which may be slots or holes extending entirely through the plate, or the openings may be grooves which extend part way through the plate. These openings are preferably formed while the plate is flat after which the plate is rolled up.

This rolling process brings the inside edges of the openings closer together or a shorter distance from each other than the outside parts so that when knives or bars with suitable holding parts at or near their outer edges are extended into such openings, and melted metal is poured into the opening and allowed to harden, this hardened metal rigidly locks each knife or bar in place in and across the opening into which one or more of its holding parts project.

The locking metal is preferably an alloy of lower fusibility than that of the bars or of the holding plate, and preferably so low that it will not affect the temper of either when it is melted and poured or pressed in to its place between them. Preferably it should not shrink but should expand or remain of the same volume after it has cooled and hardened.

In the drawings, Fig. 1 is a plan view of a sheet of metal as it is cut to form a pattern or blank and after openings have been punched or cut in it, but before it is rolled up into a truncated cone, such as shown in Fig. 2.

Fig. 2 is an elevation from the large end of the same sheet of metal after it has been rolled up and knives or bars have been installed in the openings.

Fig. 3 is a cross sectional view of an opening before rolling up and Fig. 4 is a view of the same opening after rolling up and after a bar has been installed and fixed in position by hardened molten metal.

Fig. 5 is a side elevation of a bar before installation and Fig. 6 is an enlarged sectional view on line 6—6 of Fig. 5. Fig. 7 is an enlarged sectional view on line 7—7 of Fig. 4.

Fig. 8 is a view similar to Fig. 3 of another type of backing plate with slots or grooves instead of holes.

Fig. 9 is a view similar to Fig. 4 showing a bar in place in a backing such as shown in Fig. 8.

Fig. 10 is a view similar to Fig. 9 of another modification of the backing plate, bar and holding means.

Fig. 11 is a sectional view similar to Figs. 9 and 10 but of a plug jacket instead of a shell lining and with grooves and other holding means of somewhat different types.

Fig. 12 is an isometric view of the inside of a Jordan shell in which cement is used in place of wooden separators.

Figs. 13 and 14 are views similar to Figs. 8 and 9, showing other modified forms of the assembly.

Fig. 15 is an isometric view of a shell like Fig. 2.

In the drawings, in Fig. 1, B represents a flat sheet of relatively thick metal which may be a suitable kind of tough steel cut in such a pattern that it can be rolled up in a truncated cone such as shown in Fig. 2.

2 represents the inside and 3 the outside of this plate B. As shown in Fig. 3, plate B while flat

is punched or formed with openings, preferably in rows shown as holes or slots 1 which extend completely through it and as shown having parallel side walls so that the openings extend radially outward and the rows run axially.

As shown in Fig. 4, this plate B is now rolled up and this causes the inner edges 4, 4, of each opening, hole or slot 1 to come closer together than the outer edges 5, 5. This rolling process thus produces dove tailed openings or holes or slots extending entirely through the backing plate B. Each knife or bar K has an inner edge 11 and an outer edge 12 from which there is a holding part 10 with projecting portion or portions 15. These are shown forming a dove tail shaped member the dove tailing extending in an axial direction while the dove tailing of the slots is in a circumferential direction.

The side walls 14, 14 of each knife or bar K are shown as parallel with each other but the knives can be of many other shapes particularly where they extend inward from the inner face 2 of the plate B as in a shell lining.

As shown, the outside edge 12 of the body of each knife K rests on the inside edge 2 of the plate B.

C represents the third metal which is preferably of the type known in the trade as Cero-matrix being an alloy of tin, antimony, bismuth and lead.

In Figs. 2 and 15, 16, 16 represent outside reinforcing bands, 17 an anchor bar, 18, 18 fastening slots and 19 a split for a wedge W.

After punching or cutting openings in a backing member or flat plate such as B and rolling it up, each knife or bar such as K can be put in place and held while the melted metal C is poured into the opening.

I find a better way is to use an alloy such as indicated which will melt at about 250° (two-hundred and fifty degrees) Fahrenheit and, preferably, after warming the backing plate pouring the melted metal into an opening to partly or wholly fill it and to then allow it to cool and harden.

A bar or its holding part only is then heated to perhaps 900° (nine hundred degrees) Fahrenheit and the holding part is pressed steadily on to the fusible metal. Its heat melts a path into the fusible metal until it is fully seated, when the metal is allowed to cool and harden.

Another form of the device is shown in Figs. 8 and 9. While flat, as shown in Fig. 8, openings 20, 20 in the form of grooves with parallel side walls 25, 25, are cut on what will be the inside of a plate A.

As shown in Fig. 9, plate A is then rolled up into a truncated cone which causes the inner edges 21, 21 of these openings or grooves 20, 20, to come together so that they are a shorter distance from each other than the edges 26, 26, of bottom face 22.

Each knife F is shown as being provided with slots or grooves 27, 27, which serve as holding parts, the sides 25, 25, and edges 26, 26, of each slot 20 serving as the holding parts of the backing plate member A so that when melted metal E is poured in and hardens, each knife F is locked in place in the plate.

As shown in Fig. 10, instead of being rolled up, each backing plate G can be first rolled up and then openings or grooves 30, 30, with parallel sides can be cut and formed with holding portions 33, 33, in the form of grooves on each side.

Each knife H is pierced with one or more holes 34 through which the melted metal E can run. This melted metal E therefore engages the holding parts 33 of the plate and 34 of the knife.

As shown in Fig. 11, I can build up a lining or jacket or a plug by taking the back plate L and cutting in its outside face openings such as 40 which as shown are slots extending lengthwise with one face 44 which may be in a radial plane with the axis and another face 45 which slopes in towards the face 44 from the inside toward the outside thus forming a holding part of substantially dove tail form.

Each knife, or what is known generally as a bar M as shown, has parallel sides 46 and 47, 46 resting flat against face 44 and 47 being provided with a holding part in the form of a groove 43.

The holding metal E is of a similar type to that used in the embodiments shown in the other views.

As shown in Fig. 12, cement 56 or other similar material can be introduced between the bent knives 57 of a shell lining T made like those shown in Figs. 1 to 10.

By hardened molded metal, I mean a single metallic element or an alloy of several metallic elements which has been melted, poured into a confined space and allowed to cool, and to become hard.

While I prefer to have some holding parts of each opening which are a shorter distance from each other near the inside than other parts nearer the outside and some parts of the holding portion of each bar which parts are a shorter distance from each other near the inside than other parts nearer the outside, I can, as shown in Fig. 13 use bars such as O, each with a holding portion 61 with a rough surface or even a smooth surface 66, Fig. 14 with a holding plate A having openings 20 each with side walls which are parallel and preferably rough, but which might be smooth, as 67, Fig. 16, because a metal alloy such as E which is melted and poured or forced in between each opening and a projection from a bar, and which alloy then expands, will hang on to the walls of the openings and the faces of the bars and prevent the bars from moving.

As shown, the bars need not rest on the bottom of a slot.

I claim:

1. In a bodily transportable Jordan engine shell lining; the combination of a frustro-conical plate of tough bendable metal through which are a plurality of rows of holes which extend through the plate, each hole having sides formed to serve as holding parts; with a plurality of bars each of a hard metal and each of which has a plurality of holding portions along one edge, each of which holding portions extends into a hole in the plate, the part of the bar between the holding portions resting on the plate between the holes; and hardened molded cast metal of a kind which melts at a temperature so low that it will not affect the temper of either the bars or of the plate, which metal substantially fills each hole in the plate and engages the holding portion of each bar and the holding part of the hole in which such holding part of the bar is positioned.

2. In a Jordan engine lining; the combination of a frustro-conical metal holding member with a plurality of radially positioned openings each opening having sides formed to serve as holding parts, some sections of two of such sides being a shorter distance from each other near the inside of the metal holding member than other

sections of the same side which are nearer the outside; with a plurality of bars each of which has a holding portion near its outer edge which extends into each opening in the metal holding member and is formed with holding parts each of which has two faces which are a shorter distance from each other at sections near the inside of the holding member than other sections nearer the outside; and hardened molded cast metal which engages the holding part of each bar in each opening.

3. In a bodily transportable Jordan engine shell lining; the combination of a frustro-conical metal holding plate with a plurality of radially positioned rows of openings each opening having sides formed to serve as holding parts, some sections of two of such sides being a shorter distance from each other near the inside of the plate than other sections of the same sides which are nearer the outside; with a plurality of bars each of which has a holding portion near its outer edge formed as a plurality of parts one of which extends into each opening in the plate and is formed with holding parts each of which has two faces which are a shorter distance from each other near the inside of the holding plate than nearer the outside; and hardened molded cast metal which engages the holding part of each bar in each opening.

4. In a bodily transportable Jordan engine shell lining; the combination of a frustro-conical thin metal holding plate with a plurality of rows of radially positioned holes which extend through the plate, each hole having sides which converge toward the axis of the holding plate; with a plurality of bars each of which has a holding portion at its outer edge which includes a plurality of holding parts each of dove-tail form and each of which enters into one of said holes; and hardened molded cast metal which fills each hole and engages the holding part of each bar in such hole.

HAROLD D. STUCK.