

Feb. 19, 1963

G. KOMAREK ET AL

3,077,634

BRIQUETTING ROLL STRUCTURE WITH MOLD INSERTS

Filed Jan. 28, 1959

3 Sheets-Sheet 1

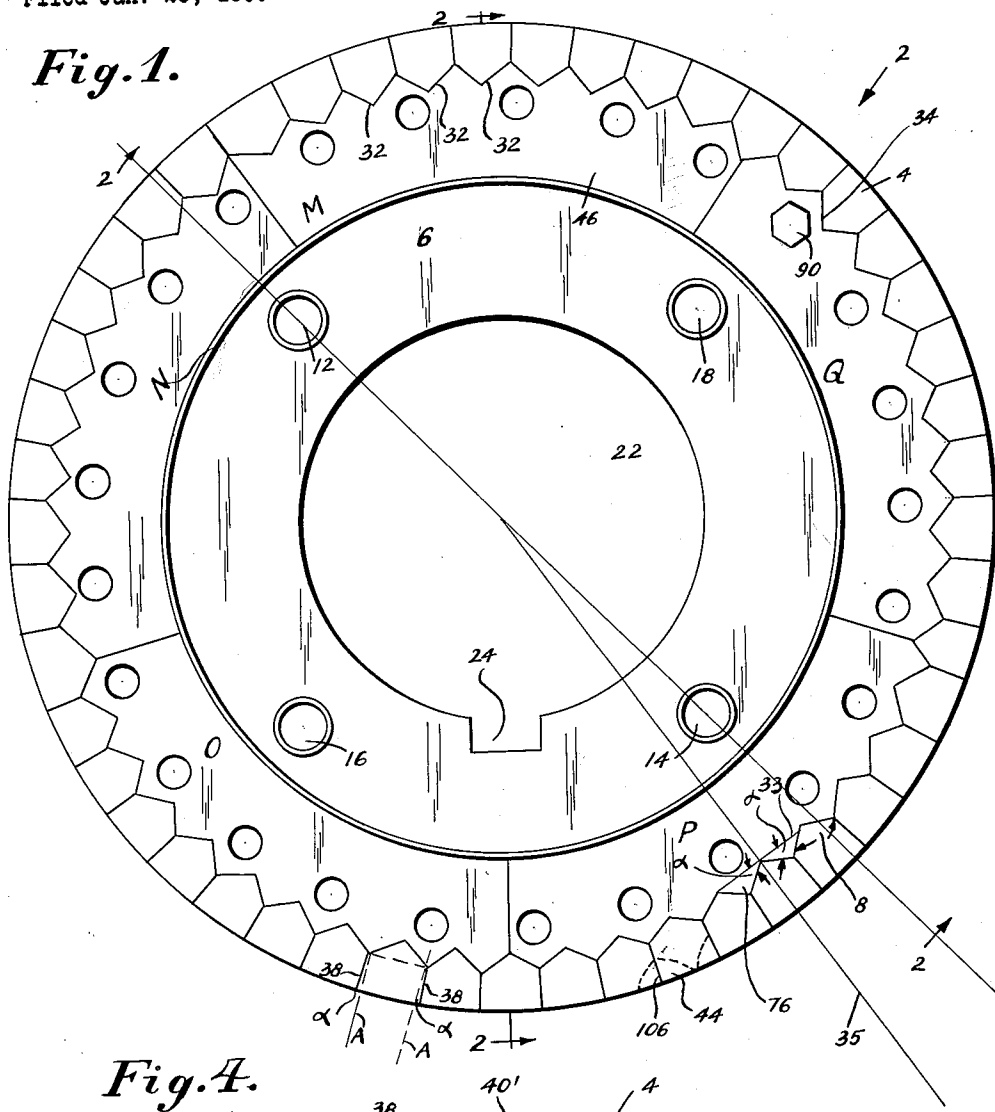
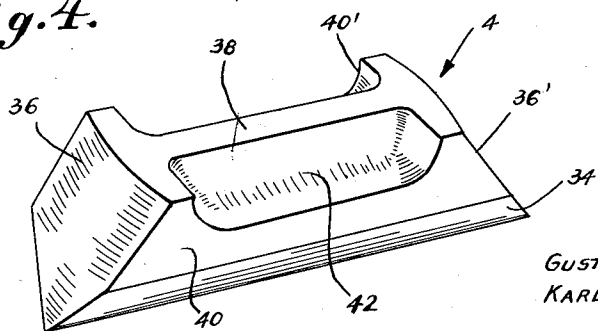


Fig. 4.



INVENTORS

GUSTAV KOMAREK
KARL R. KOMAREK

BY *Cushman, Parley & Cushman*
ATTORNEYS

Feb. 19, 1963

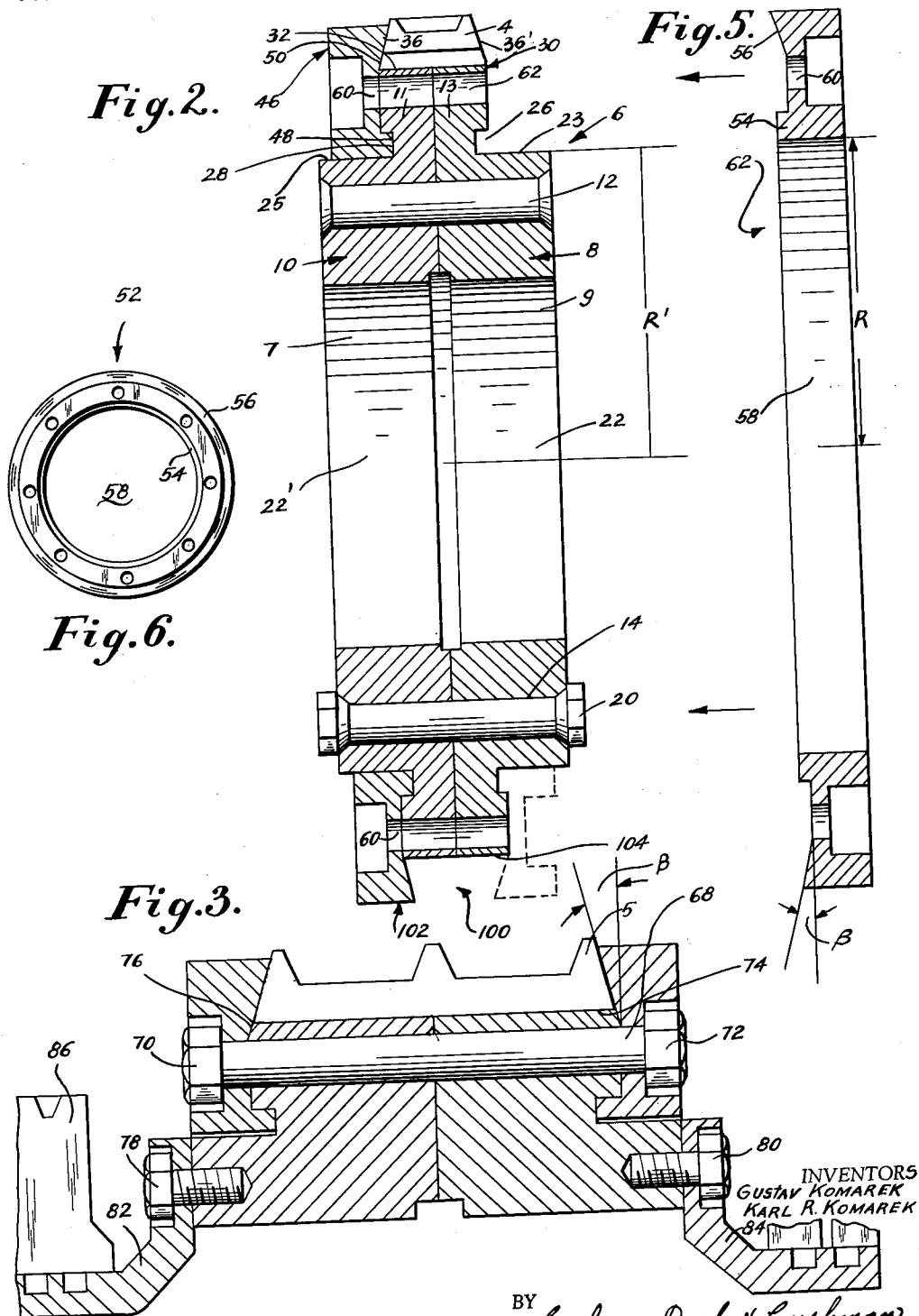
G. KOMAREK ET AL

3,077,634

BRIQUETTING ROLL STRUCTURE WITH MOLD INSERTS

Filed Jan. 28, 1959

3 Sheets-Sheet 2



Feb. 19, 1963

G. KOMAREK ETAL

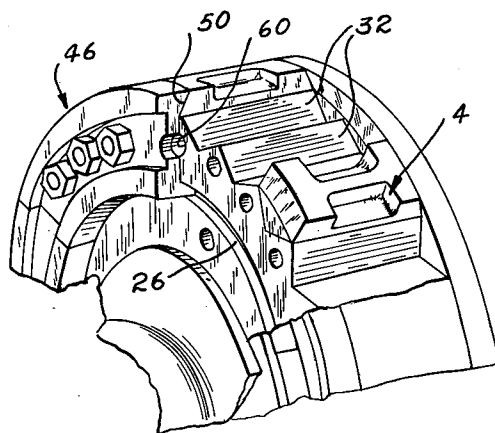
3,077,634

BRIQUETTING ROLL STRUCTURE WITH MOLD INSERTS

Filed Jan. 28, 1959

3 Sheets-Sheet 3

Fig. 7.



INVENTORS

GUSTAV KOMAREK

KARL R. KOMAREK

BY *Lushman, Darby + Lushman*

ATTORNEYS

1

3,077,634 BRIQUETTING ROLL STRUCTURE WITH MOLD INSERTS

Gustav Komarek and Karl R. Komarek, Chicago, Ill., assignors to Komarek-Greaves and Company, Chicago, Ill., a corporation of Illinois
Filed Jan. 28, 1959, Ser. No. 789,695
3 Claims. (Cl. 18-21)

This invention relates to briquetting rolls for briquetting presses.

Briquetting of various types of materials such as charcoal and the like, has been done for many years. Recently, however, briquetting procedures have been extended to high temperature operations such as are involved in the briquetting of iron ore. As appreciated by those in the art, it is necessary in order to briquet iron ore and like materials, to use high pressure as well as high temperature briquetting techniques. High pressure between briquetting rolls and the maintenance of such pressure at elevated temperatures causes increased wear on the briquetting rolls and results in a serious problem with respect to the replacement of worn-out parts. Presently there does not exist a completely satisfactory commercial method, or apparatus, which provides for renewal of a worn-out part of a briquetting roll without removal of a complete or substantially complete roll assembly. Because of this, when briquetting rolls or parts thereof become worn, it is necessary to leave a particular briquetting machine idle for an extended period of time while the worn-out parts are being replaced.

It is an object of this invention to overcome the above disadvantage of present commercial briquetting machines and to eliminate the costly and time consuming replacement techniques of the prior art. It is a further object of this invention to provide an improved briquetting roll structure which allows for replacement of a worn-out part or parts by merely removing a section of a restraining ring which holds the wearing parts of the briquetting roll in place during operation.

More particularly, it is an object of this invention to provide a briquetting roll having a plurality of half briquet pockets in the periphery thereof, which briquetting roll comprises (1) a cylindrical body adapted to receive a plurality of mold inserts, (2) at least two keeper rings, and (3) a plurality of mold inserts which cooperate with the cylindrical body and keeper rings for maintaining the inserts fixed to the cylindrical body, wherein at least one of which keeper rings is split into a plurality of sections whereby any mold insert may be replaced easily without dismantling the whole roll structure.

It is a further object of this invention to provide a briquetting roll in accordance with the above objects which roll has no limits as to size, which roll is constructed so that points of jointure of the various inserts are made at positions of minimum wear, and which roll utilizes certain conical shaped cooperating surfaces and the expansion caused by high temperature to achieve tight and proper securing of the inserts in position with relation to other components of the roll structure.

Other and more specific objects of this invention are to provide a briquetting roll structure (1) which affords convenient access to detaching devices for replacing parts; (2) which may be made as small as desired; (3) which eliminates the necessity for providing screws, dove-tail joints or similar means for holding inserts in place; (4) which is easy to fabricate and manufacture at a relative minimum of cost; and (5) which allows for utilizing renewable mold inserts which have multiple briquet forming pockets transversely positioned.

Basically, the invention provides a briquetting roll struc-

2

ture having a plurality of half briquet pockets in the periphery thereof, the briquetting roll structure comprising a cylindrical body with a plurality of adjacent V-shaped channels extending across the periphery of the cylindrical body and with aligned recesses in the end walls of the cylindrical body, a keeper ring on each side of the cylindrical body extending outwardly from the periphery of the cylindrical body, one of the keeper rings being split into a plurality of sections, the two keeper rings and the cylindrical body forming a briquetting roll frame with a circular recess in the periphery thereof, and a plurality of inserts adapted to fit within the recess. It is an important feature of this invention to provide certain conically bevelled cooperating surfaces between the keeper rings and the inserts and the roll frame, since such configuration of the parts allows for tight fits and eliminates the possibility of having loose inserts.

The invention will be better understood, and objects other than those specifically set forth above, will become apparent when consideration is given to the following detailed description of the invention. The description refers to the annexed drawings presenting illustrative embodiments of the invention.

In the drawings:

FIGURE 1 is a side view of an improved briquetting roll structure constructed in accordance with the teachings of this invention;

FIGURE 2 is a cross-sectional view of the improved roll structure shown in FIGURE 1, FIGURE 2 being taken on the line 2-2 of FIGURE 1;

FIGURE 3 is a cross-sectional view of a part of the improved roll structure, FIGURE 3 showing in detail the manner in which various components are coupled together, and a multiple pocket mold insert which may be utilized;

FIGURE 4 is a perspective view of a mold insert constructed in accordance with the teachings of this invention;

FIGURE 5 is a cross-sectional view of a keeper ring provided by this invention for maintaining the mold inserts in proper position;

FIGURE 6 is a front perspective view of the inside of the keeper ring shown in FIGURE 5; and

FIGURE 7 is a perspective view of a portion of a partially assembled briquetting roll constructed in accordance with this invention.

Referring more particularly to FIGURE 1, the numeral 2 designates the briquetting roll provided by this invention, and the numeral 4 designates briquetting inserts adapted to cooperate with the briquetting roll frame designated by the numeral 6.

By reference to FIGURE 2, it will be seen that the briquetting roll frame comprises two substantially cylindrical bodies 8 and 10 provided with bores 12, 14, 16 and 18 that allow for passage of a bolt therethrough to secure the bodies together. The bolt 20 shown in FIGURE 2 extends through the bore 14, and similar bolts are provided to extend through bores 12, 16 and 18 for the stated purpose. The bodies 8 and 10 include cylindrical central bodies 7 and 9 with circular extensions 11 and 13 centrally disposed therearound. The extensions 11 and 13 are of less width than the cylindrical central bodies 7 and 9 so that shoulders 23 and 25 are provided. Each of the central bodies is provided with a central bore, 22, 22' respectively, having a key-way 24 therein. With this construction, the two portions 8 and 10 of the briquetting roll frame, when coupled together, may be affixed via the key-way to a shaft which is suitably driven.

It should be apparent from the above that the briquet-

ting roll frame may be described as including a cylindrical central body consisting of the components designated by members 7 and 9 with a circular extension at least substantially centrally disposed therearound whereby shoulders are provided on the frame on either side of the extension. The extension obviously consists of the components designated by the numerals 11 and 13. Although the above described construction of the briquetting roll frame is preferred, it should be understood that various modifications may be made thereto without departing from the scope of the invention. For this reason, details of construction of the frame have not specifically been referred to hereinafter. Instead the frame has been referred to generally as having certain features.

The briquetting roll frame 6 has, as shown in FIGURE 2, circular recesses 26 and 28 on either side thereof. The outer periphery 30 of the frame 6 has a plurality of V-shaped channels extending thereacross as shown in FIGURE 1. These V-shaped channels are designated by the numerals 32, as shown in FIGURE 1. Cooperating with each V-shaped channel 32 is a mold insert 4 which has a V-shaped bottom wall 34 of a corresponding configuration to the channels 32. The inserts 4, as best seen in FIGURE 4 have conical end walls 36, 36' which diverge outwardly from the top 38 of the mold inserts. The inserts also have side walls 40, 40' which diverge outwardly from the top 38. By referring to FIGURE 1 it will be noted that the side walls 38 are not parallel. Instead, they make an angle ϕ with imaginary parallel sides A shown in phantom. For reasons set forth hereinafter, this divergence of the side walls 38, 38' is an important feature of the invention, as is the divergence of the end walls 36, 36'.

By again referring to FIGURE 4, it will be noted that each mold insert is provided with at least two quarter ($\frac{1}{4}$) briquetting pockets. Thus, when two mold inserts 4 are placed adjacent one another as shown in FIGURE 1 there is provided a half briquet pocket 44 (FIGURE 1, in phantom). Of course, when two rolls cooperate in the customary manner a briquet is formed between half briquet pockets on cooperating briquetting rolls. To understand the operation of a briquetting machine utilizing cooperating briquetting rolls having half briquet pockets in the periphery thereof reference should be made to U.S. Patent Nos. 1,293,475; 1,295,764; and 2,203,200.

The manner in which the inserts 4 are mounted on the briquetting roll frame is presented in FIGURE 2 wherein the mold 4 is disposed within a V-shaped channel 32. As shown, on the left side of the frame 6 there is provided a keeper ring 46 having a flange 48 which cooperates with recess 28. Keeper ring 46 has along the outer portion thereof a conical bevelled flange 50 which cooperates with one conical side 36 of the mold insert 4. The keeper ring 52 shown in FIGURES 5 and 6 cooperates with the right side of the frame 6 shown in FIGURE 2 in the same manner as keeper ring 46 cooperates with the left side of that frame. Similarly, keeper ring 52 has a flange 54 which cooperates with circular recess 26 on the right side of frame 6 and a conical bevelled flange 56 which cooperates with conical side 36' of mold insert 4. It will be noted that the keeper rings 46 and 52 have central openings 58 of a radius R corresponding to the radius R' of the side portions of the frame. Thus, the keeper rings 46 and 52 fit over part of the frame 6 on either side thereof to hold the mold inserts 4 in proper position. Each keeper ring is provided with a plurality of aligned apertures 60 which cooperate with apertures 62 provided in the frame whereby a bolt may be passed through both keeper rings and the frame to secure the keeper rings on either side of the frame. The keeper ring 58 as shown is a solid ring, however, the keeper ring 46, as shown in FIGURE 1, is split into a plurality of sections, namely sections M, N, O, P and Q. Each section of keeper ring 46 extends across an arc which allows for replacement of a number of inserts. The arc across which a

section extends is only limited by the fact that when the sections is removed the inserts should be held in place by gravity and not allowed to fall out on either side of the section. As is apparent, if each section covered a half-circle then the inserts on either side would be likely to fall away. Moreover, if one insert wore out it would be necessary to unlock half of the inserts to replace the worn-out one. According to this invention, however, if one insert wears out, it is only necessary to remove a portion of keeper ring covering relatively few inserts. As many sections may be provided as desired, but it is essential that at least five sections be used since if less than five sections are used, the inserts may fall away due to the action of gravity.

Now, if reference is made to FIGURE 3 it will be noted that the keeper rings are held together by a bolt 68 having a head 70 and a threaded nut 72. The mold insert 5 shown in FIGURE 3 is similar to the mold insert 4 shown in the other figures, however mold insert 5 has two quarter briquet pockets in either side thereof as opposed to the single quarter briquet pocket on either side of the mold insert 4. The pockets in the mold insert 5 are transversely positioned with respect to the roll frame 6. Thus, by this invention, there is provided a briquetting roll structure wherein inserts may be used, and at the same time more than one half briquet pocket may be provided between opposite sides of the roll structure.

It should also be noted by reference to FIGURE 3 that the outermost edges 74 and 76 of the briquetting roll frame are bevelled. Those edges are also conical to cooperate with the conical bevelled edges of the keeper rings 46 and 52. By reference to FIGURE 1 it will be seen that the conical bevel occurs between the bottom of the V-shaped channels 32 and the top thereof, and the keeper bars must press against the mold inserts; that is to say, the conical bevelled flanges 50 and 56 must abut a surface of the frame 6 and surfaces of the mold inserts of corresponding conical bevels.

As also shown in FIGURE 3 the cylindrical body may have attached thereto by means of bolts 78 and 80 rings 82 and 84 which carry lubricating means 86 of any conventional design.

It has been found that particular angular relationships between certain parts is important to the most efficient design and operation of the roll structure provided by this invention. For example, each wall of the V-shaped channels 32 (FIGURE 1) preferably makes an angle α , equal to 30°, with a perpendicular, such as 33, to a radius, such as 35, passing through a vertex, such as 37, at the bottom of a channel 32. To express this another way, the angle α between adjacent walls of a channel is preferably equal to 120°. Similarly, the angle of the conical bevel β on the flanges 50 and 56 of keeper rings 46 and 52, and the angle of slope of conical sides 36, 36' on the mold inserts is preferably 15°. Of course, the edges 74 and 76 of frame 6 are correspondingly preferably conically bevelled at a 15° angle. In such construction, the angle of bevel on side walls 40 and 42 is preferably 3° 36'.

A briquetting roll constructed in accordance with the teachings of this invention has a plurality of half briquet pockets in the periphery thereof. The roll comprises the briquetting roll frame 6 having a plurality of V-shaped channels 32 extending across the periphery of the frame. The frame also has aligned recesses 26 and 28 in the end walls thereof, and the area of the end walls of the frame between the vertices of the V-shaped channels and the outer limits of the V-shaped channels is inwardly and conically bevelled (74, 76) as shown in FIGURE 3. A solid keeper ring 52 is provided, and this keeper ring has a flange 54 disposed adjacent the inner radius thereof and extending from one side to cooperate with the recess 26 in the right-hand end wall of the frame as shown in FIGURE 2. The keeper ring 52 also has a second and a conical bevelled flange 56 disposed adjacent the outer

radius of the keeper ring, and this conical bevelled flange cooperates with the conical bevel 74 on the right end wall of the frame 6. A second keeper ring 46 is provided and this keeper ring is split into a plurality of arcuate sections. The second keeper ring has an outer radius corresponding to the outer radius of the first keeper ring. Each of the arcuate sections M, N, O, P and Q of keeper ring 46 has a flange 48 disposed adjacent the inner radius of the section and extending from one side of the section to cooperate with the recess 28 in the left end wall of the frame 6 as shown in FIGURE 2. Each of the sections M, N, O, P and Q also has a second and conical inwardly bevelled flange 50 disposed adjacent the outer radius of the section to cooperate with the conical bevel 76 on the left end wall of the cylindrical body. Means, in the form of bolts 90 are provided to secure the keeper rings 46 and 52 to the briquetting roll frame 6 whereby the keeper rings and the frame form a drum with a circular recess in the periphery thereof. This recess as shown in FIGURE 2 is designated by the numeral 100. The recess has side walls diverging outwardly from the periphery 102 of the drum and a bottom wall 104 consisting of a plurality of adjacent V-shaped channels extending between the sides of the recess. Into this recess 100 fit a plurality of mold inserts, the end walls 36, 36' of the mold inserts engaging the conical bevelled flanges 50 of the keeper ring 52 and the flange 56 formed by sections M, N, O, P and Q of the keeper ring 46. The V-shaped bottom wall of the mold inserts engage the V-shaped channels 32 of the recess 100. Each of the mold inserts has at least two separate quarter briquet pockets 42, therein, and these pockets cooperate with quarter briquet pockets in adjacent inserts whereby the inserts define the periphery of the briquetting roll structure. Of course, the top 38 of each insert has a convex configuration, whereby when the inserts are in position, a circular roll is formed.

FIGURE 7 presents a perspective view of a portion of a partially assembled briquetting roll, and from the figure the configuration of the components, and their relation to one another as presented in FIGURES 1-6, will become readily apparent.

By again referring to FIGURE 1 it will be noted that the line of jointure 106 of any two inserts falls at the bottom of the half briquet pocket 44. This is an important feature of the invention since with the line of jointure so located the wear is reduced. If the line of jointure were at the top of a briquetting pocket 44 then there would be excess wear because that point continually is engaging a cooperating briquet roll, but with the line of jointure at the bottom, wear along that line is reduced to a minimum.

With the construction of the briquetting roll provided by this invention, as suggested above, the increase in temperature of the structure is used to advantage. First, the expansion causes the conically shaped bevelled end walls 36, 36' of the inserts to tightly engage the keeper rings as well as the V-shaped channels in the periphery of the frame 6. Secondly, the diverging side walls 38, 38' cause adjacent inserts, upon increase in temperature, to press against one another whereby the inserts tightly fit together around the periphery of the briquetting roll structure.

The provision of the conical bevelled flanges 50 and 56 on the keeper rings causes the inserts to be continually pressed into engagement with the V-shaped channels on the cylindrical body and prevents the possibility of having loose inserts.

As explained above, the provision of a sectioned keeper ring, which according to this invention must have at least five arcuate sections, is extremely desirable and advantageous in that it facilitates replacement of any worn-out insert with minimum dismantling and maximum speed. The provision of keeper ring segments M, N, O, P and Q on the side of the completed briquetting roll structure facilitates removal of any insert in that it affords con-

venient access to the detaching devices, namely, the bolts 90. Moreover, by providing the keeper rings and bolts on the sides the wall structure may be made as small as desired. The incorporation of keeper rings, as is apparent, eliminates the necessity for including screws, dovetail joints, or similar means, to hold the mold inserts in place, and thus manufacturing costs are reduced and fabrication is simplified.

It should be understood that the briquetting roll structure provided by this invention will operate with materials that have been heated to a temperature in excess of 2000° F., and accordingly the term "high temperature" as used herein refers to temperatures of such magnitude.

After considering the foregoing description of the illustrative embodiments of the invention presented in the annexed drawings, various modifications will become apparent to those of ordinary skill in the art. For this reason it is intended that the foregoing description be interpreted as illustrative and that the invention be limited only as defined in the following claims.

What is claimed:

1. A briquetting roll adapted for use at temperatures encountered in briquetting iron ore and like materials, said briquetting roll comprising the combination of a briquetting roll frame including a cylindrical central body with a circular extension at least substantially centrally disposed therearound, the surface of said extension consisting of adjacent V-shaped channels extending across the periphery thereof; a plurality of mold inserts, each comprising a body having a bottom portion adapted to be received by one of said channels whereby the number of mold inserts is equal to the number of channels, each of said mold inserts also having two end walls converging with respect to each other from said bottom portion, and two side walls diverging with respect to each other from said bottom portion; at least two keeper rings adapted to engage the sides of said extension and extending therebeyond, said keeper rings carrying inwardly beveled flanges adjacent the outer extremities thereof adapted to engage the ends of said mold inserts; and means to secure said keeper rings to said frame whereby said mold inserts are retained in said channels.

2. A briquetting roll adapted for use at temperatures encountered in briquetting iron ore and like materials, said briquetting roll comprising the combination of a briquetting roll frame including a cylindrical central body with a cylindrical ring extension at least substantially centrally disposed therearound whereby shoulders are provided on said frame on either side of said extension, said extension having a peripheral surface provided with adjacent V-shape channels extending thereacross, said extension also having circular recesses therein adjacent said central body; a plurality of mold inserts, each of said mold inserts comprising a body having a bottom portion adapted to be received by one of said channels whereby the number of mold inserts is equal to the number of channels, each of said mold inserts also having two end walls converging with respect to each other from said bottom portion, and two side walls diverging with respect to each other from said bottom portion; at least two keeper rings, said keeper rings having inner and outer radii, feet projecting outwardly from at least one side of said keeper rings at the inner radius, said feet abutting said shoulders and extending into said recesses, said keeper rings also having inwardly-beveled flanges disposed adjacent the outer radius of said keeper rings, said flanges having configurations adapted to engage the ends of said mold inserts, at least one of said keeper rings comprising a plurality of separable sections; and means to secure said keeper rings to said frame.

3. A briquetting roll adapted for use at temperatures encountered in briquetting iron ore and like materials, said briquetting roll comprising the combination of a briquetting roll frame having a peripheral surface pro-

7

vided with adjacent V-shape channels extending there-
 across; a plurality of mold inserts, each of said mold in-
 serts comprising a body having a bottom portion adapted
 to be received in one of said channels whereby the num-
 ber of mold inserts is equal to the number of channels,
 each of said mold inserts also having two end walls con-
 verging with respect to each other from said bottom por-
 tion, and two side walls diverging with respect to each
 other from said bottom portions; at least two keeper rings
 adapted to cooperate with said frame, said keeper rings
 having inwardly-beveled flanges disposed adjacent the

8

outer radius of said keeper rings, said flanges having
 configurations adapted to engage the ends of said mold
 inserts, at least one of said keeper rings comprising a
 plurality of separable sections; and means to secure said
 keeper rings to said frame.

References Cited in the file of this patent

UNITED STATES PATENTS

538,475	Albrecht	Apr. 30, 1895
1,232,764	Brundage	July 10, 1917
2,294,098	Stromer	Aug. 25, 1942

10