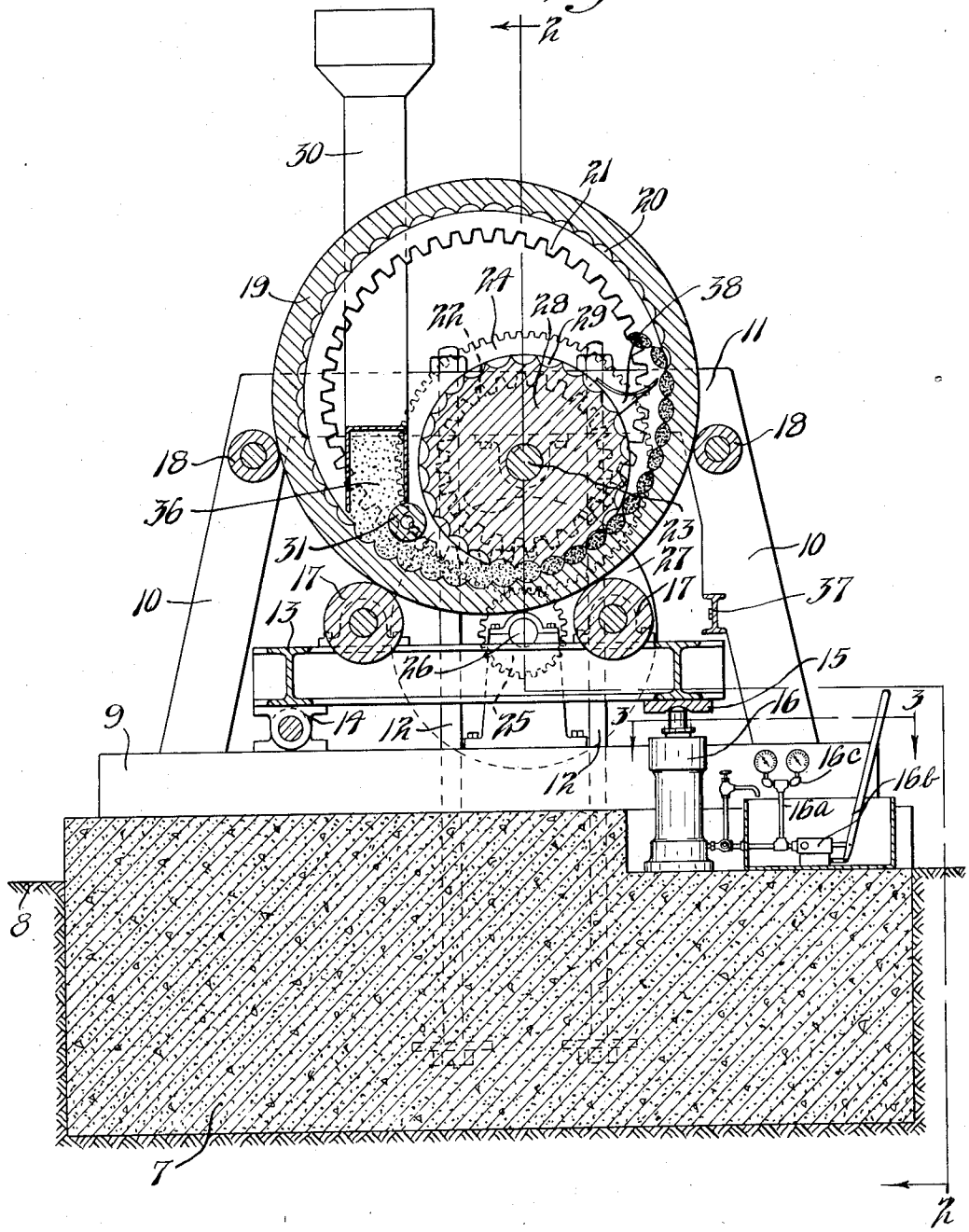
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BRIQUETTING MACHINE

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Fig. 1



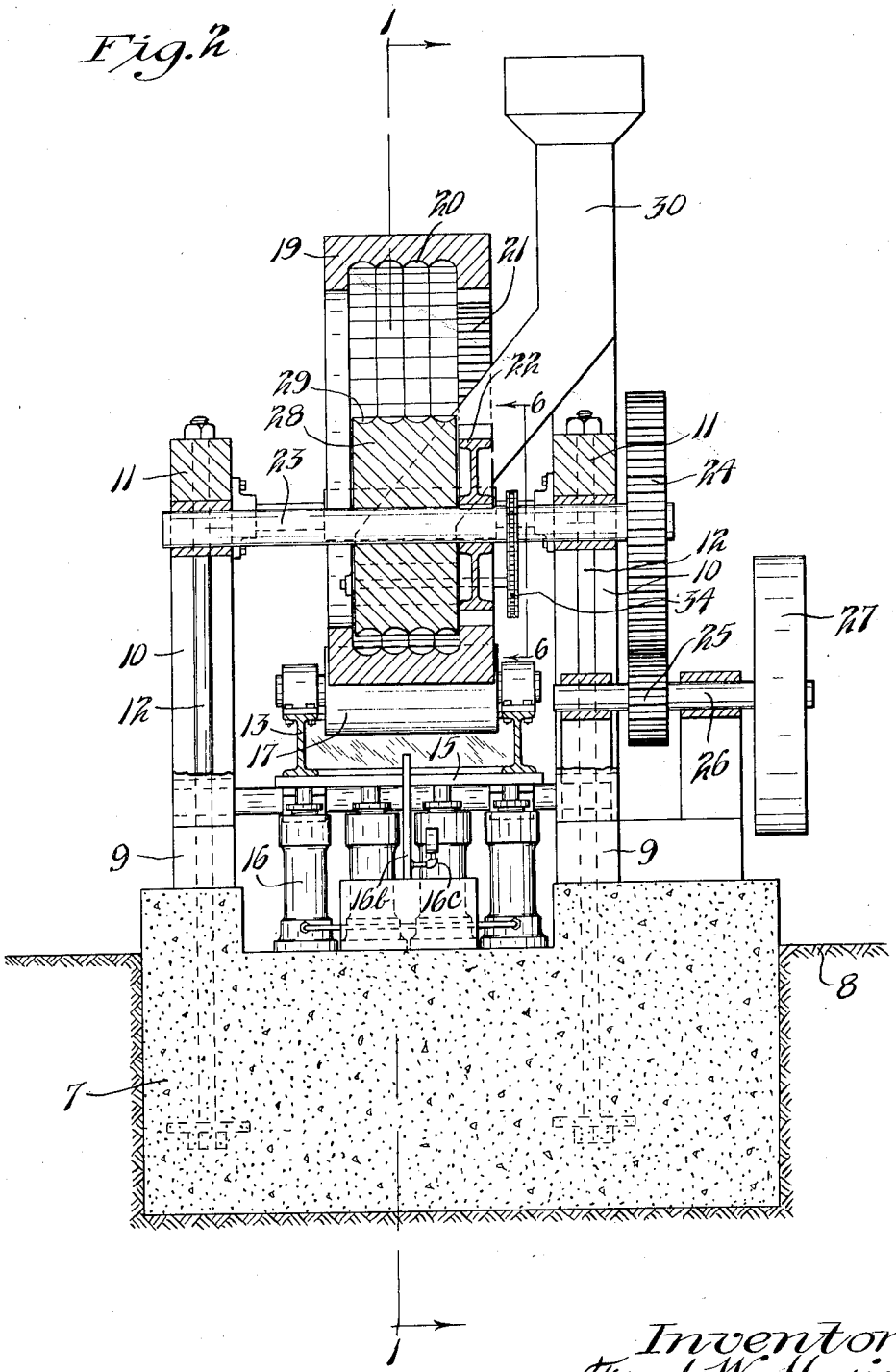
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Fig. 2



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Fig. 3.

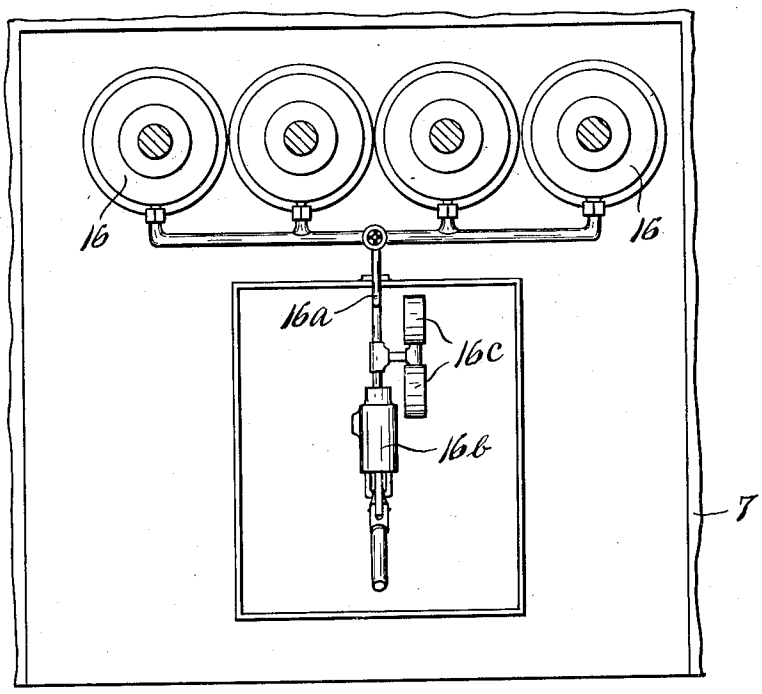


Fig. 4.

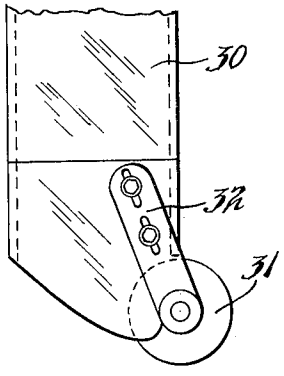


Fig. 5.

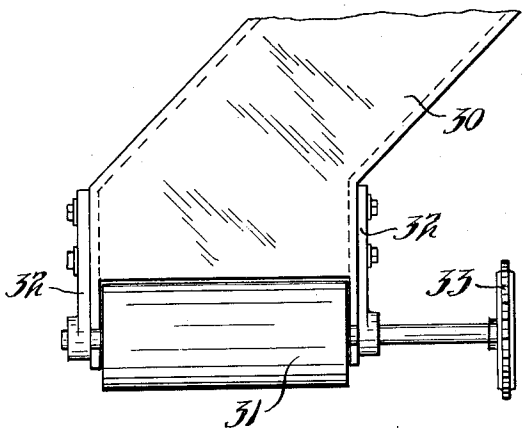
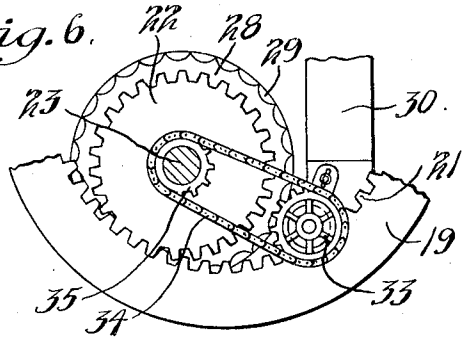


Fig. 6.



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UNITED STATES PATENT OFFICE

1,931,759

BRIQUETTING MACHINE

Fred W. Hasing, Minneapolis, Minn.

Application August 8, 1932. Serial No. 627,831

6 Claims. (Cl. 25—21)

My invention relates to briquetting machines, and while the machine embodying my invention is capable of general application for briquetting various kinds of moldable materials, it was especially designed for use in briquetting lignite or what is sometimes called lignite coal.

To this end, my invention consists of the novel devices and novel combinations of devices hereinafter described and pointed out in the claims.

A machine embodying my invention in its preferred form is illustrated in the accompanying drawings, wherein like notations refer to like parts,

Fig. 1 is a view chiefly in central cross section through the machine with some parts shown in elevation and some parts removed, the section being on the line 1—1 of Fig. 2;

Fig. 2 is a view chiefly in vertical section taken on the line 2—2 of Fig. 1, with some parts shown in elevation;

Fig. 3 is a view partly in horizontal section and partly in plan showing the multiple cylinder hydraulic press used in the operation of my machine, the section being on the line 3—3 of Fig. 1;

Fig. 4 is a view in elevation showing the lower portion of the feed chute and feed roller carried thereby;

Fig. 5 is a rear elevation of the parts shown in Fig. 4 with the shaft of the feed roller extended and shown with a sprocket wheel thereon; and

Fig. 6 is a view in end elevation with some parts broken away and showing the driving connections for said feed roller in section on the line 6—6 of Fig. 2.

The numeral 7 represents a large body of cement embedded in the ground 8 and adapted to afford a foundation for my briquetting machine. The numerals 9, 10 and 11 represent the interconnected members of a strong frame adapted to support the resistance roller and some other parts of my machine, and of these frame members 9 to 11 inclusive, the members 9 rest on the cement foundation 7, the members 10 extend upward from the members 9 slightly convergent towards each other and the members 11 are horizontally disposed and connect the upper ends of the members 10. All the parts of this frame must be very strong and hence all these frame members 9 to 11 inclusive are preferably made from iron or steel and are strongly interconnected.

The numerals 12 represent headed and nutted rods having their upper ends secured to the cross members 11 of said frame and their lower ends deeply embedded in the cement foundation 7 and serving to anchor the said frame to the said foundation. The numeral 13 represents a strong platform pivotally connected by a strong hinge joint 14 with the underlying frame members 9 at what might be called the rear end of said platform. The front or free end of said pivoted platform 13 is provided with a cross bar 15 on its under side which directly overlies and rests upon the upper ends of the pistons of the cylinders of a hydraulic press 16 which is supported from the cement foundation 7, as clearly shown in Figs. 1 and 2 of the drawings.

On the face of said pivoted platform 13 are journaled a pair of anti-friction rollers 17; and on the main frame in the frame members 10 are journaled another pair of anti-friction rollers 18.

The numeral 19 represents a short hollow cylinder which rests upon the rollers 17 of the platform 13 and is held from lateral displacement by the anti-friction rollers 18, contacting with the periphery thereof, as clearly shown in Fig. 1 of the drawings. This cylinder 19 is provided on the interior of its peripheral wall with a series of half-mold cells 20 arranged in parallel rows with all the half cells contiguous and separated by the sharp edged portions of the half-mold cells. The said cylinder 19 has formed on one of its side walls an internal gear 21, which engages with the spur gear 22 fixed to a horizontal shaft 23 strongly journaled on the main frame of the machine and provided at one end with a large spur gear 24 that engages a pinion 25 on a short horizontal shaft 26 suitably journaled in the main frame and provided with a pulley 27 for the application of power from any suitable source. It is of course obvious that with these driving connections 21 to 27 inclusive, the cylinder 20 may be rotated on its supporting rollers 17.

The numeral 28 represents a solid resistance roller having formed on its periphery a series of half-mold cells 29 of the same size and shape as the half-mold cells 20 formed on the inner wall of the periphery of the cylinder 19, and adapted to cooperate therewith. This resistance roller 28 is of considerably less diameter than the diameter of the cylinder 19 and is mounted within the said cylinder eccentric to the axis thereof, and with the shaft 23 which supports the resistance roller 28 located below the axis of the cylinder, as clearly shown in Fig. 1 of the drawings. Inasmuch as this resistance roller 28 is fixed to the shaft 23, it is obvious that, with the driving connections for the cylinder hitherto noted, the roller 28 will be turned in the same direction as the cylinder 19 and because of its location the

said roller 28 will rotate in proximity to but out of contact with the interior of the cylinder 19, thus bringing its half-mold cells into position to cooperate with the half-mold cells of said cylinder. Said roller 28 is held against any radial movement. The numeral 30 represents a feed hopper for supplying the pulverized lignite 36 to the bite of said cylinder 19 and resistance roller 28. This feed hopper 30 is strongly supported from the main frame of the machine with its lower end projecting into the cylinder 19 and is provided, with a feed roller 31 at its delivery mount or lower end. Said feed hopper 30 is made of strong material such as steel and has adjustably secured to its opposite sides short brackets 32 in the lower end of which the feed roller 31 is journaled, as best shown in Fig. 4 of the drawings. The shaft of the roller 31 projects at one end beyond one of the bearing brackets 32 and is provided with a sprocket wheel 33, as shown in Fig. 5, which is connected by chain 34 with a smaller sprocket 35 on the main shaft 23, as best shown in Fig. 6 of the drawings. With these connections it is obvious that the feed roller 31 will receive rotary motion in the proper direction to act on the pulverized lignite 36 supplied from the feed hopper 30, so as to spread it out and even it up, to some extent, and help to forward it into the bite of the cylinder 19 and resistance roller 28, as best shown in Fig. 1 of the drawings.

The multiple cylinder hydraulic press 16, as conventionally shown in the drawings, may be of standard or any suitable construction for the purpose intended and is provided with suitable supply piping 16*a* and hand pump 16*b* and double disk manometers 16*c*.

The numeral 37 represents a strong stop rigidly secured to the frame members 10 directly over and a short distance above the free end of the pivoted platform 13; and which stop 37 is for the purpose of limiting the upward pivotal movement of said pivoted platform 13, anti-friction roller 17 and the cylinder 19 supported thereby.

Operation

Lignite, in its natural state, is very hard and brittle and it has to be crushed or broken up and pulverized and the pulverized material thoroughly sifted so as to elminate all foreign materials therefrom and get the pulverized lignite finely enough divided for briquetting purposes. The coefficient of heat present in lignite, in its natural state, is low, but after the lignite has been treated as above described, the pulverized lignite used for briquetting will have a higher coefficient of heat than the lignite as it comes from the mine. The pulverized and sifted lignite is treated to a steam heated drier before it is supplied to the briquetting machine. This prepared lignite contains more or less paraffin and rosin which, in the compressing action on the lignite, becomes heated and melted and, if the pressure is sufficient, may be utilized as a natural binder for holding together the parts of the briquette. To secure this result, the available pressure in the briquetting action must be very great. My machine was designed to meet these conditions and will afford any pressure needed for briquetting such prepared lignite without the addition of any artificial binder.

In the usage of the machine, the prepared lignite 36 is supplied, in any suitable way, to the feed hopper 30 whence it drops by gravity into the cylinder 19 and becomes subject to the feed roller 31 which spreads it out and levels it off to some extent and helps to forward it into the bite of the said cylinder 19 and resistance roller 28, at which place the said lignite 36 will begin to be compressed within the cooperative sections of the mold cells on the cylinder and roller respectively, and be subject to pressure therefrom until the briquette is completely formed and then the briquettes will be carried up in the half-mold cells of the cylinder until gravity causes the most advanced briquettes on the cylinder to break off from the briquettes lower down on the cylinder and drop from the cylinder to be carried off by the off leading spout 38 to any point desired. In this compressing or briquetting action, it has been assumed that the hydraulic press has been applied to the free end of the pivoted platform 13 which, through the anti-friction rollers 17, support the cylinder 19 to move the cylinder 19 radially toward the resistance roller 28 and there hold the same while the cylinder and roller revolve and compress the prepared lignite 36 within the mold cells into briquettes; and, hence, it is obvious that the pressure will be an increasing one from the start to the finish of the briquetting action.

This multiple cylinder hydraulic press therefore affords one form of ancillary power device adapted to be applied to radially move the cylinder 19 toward the resistance roller 28 for increasing the pressure on the material in the mold cells gradually from start to finish of the briquetting action, and so far as I know, this combination is broadly new over the prior art. Each of the cylinders of the multiple cylinder hydraulic press is expected to have a power of, at least, 600 atmospheres, making 2400 atmospheres in all, and this press is under such control that either the whole or any part of this available pressure can be brought into action.

Of course, it will be understood that the primary power available to rotate the cylinder 19 and the resistance roller 28 in the briquetting action, must be sufficient to effect this rotation of said parts against the pressure applied from the ancillary power device applied to the cylinder 19 through the pivoted platform 13 and the anti-friction rollers 17.

It must be obvious that, under the great pressure available, a large amount of heat will be produced which becomes effective on the paraffin and rosin within the pulverized lignite. This heat is so great that the paraffin and rosin are melted and, under the pressure, are disseminated throughout the material in the mold cells and thereby effective to serve as a binder when the material is properly compressed.

It is thought that this machine will have a capacity of not less than ten and possibly as much as fifteen tons of briquettes per hour.

It will of course be understood that the ancillary power device might take other forms and possibly be applied to effect the radial movement of the cylinder 19 towards the resistance roller 28 by other means than those shown and described and that more or less of the other details of the mechanism illustrated and described could be varied without departing from the principle of my invention.

What is claimed is:—

1. In a briquetting machine, the combination with a radially movable rotary cylinder having half-mold cells on the interior of its peripheral wall, of a resistance roller of smaller diameter than said cylinder eccentrically mounted within said cylinder and having half-mold cells on its periphery and normally held against any ra-

dial movement, power means for rotating said cylinder and roller in the same direction, and ancillary power means for radially moving said cylinder towards said resistance roller arranged to apply a gradually increasing pressure to the material within the mold cells from the start to the finish of the compressing or briquetting action.

2. In a briquetting machine, the combination with a radially movable rotary cylinder having half-mold cells on the interior of its peripheral wall, of a resistance roller of smaller diameter than said cylinder eccentrically mounted within said cylinder and having half-mold cells on its periphery and normally held against any radial movement, power means for rotating said cylinder and roller in the same direction, a pivoted platform underlying and supporting said cylinder and a power device applied to the free end of said platform for moving said cylinder radially towards said resistance roller with a gradually increasing pressure from start to finish of the compressing action.

3. In a briquetting machine, the combination with a radially movable rotary cylinder having half-mold cells on the interior of its peripheral wall, of a resistance roller of smaller diameter than said cylinder eccentrically mounted within said cylinder and having half-mold cells on its periphery and normally held against any radial movement, power means for rotating said cylinder and roller in the same direction, a pivoted platform underlying and supporting said cylinder and a hydraulic press applied to the free end of said platform for moving said platform and cylinder toward the resistance roller with a gradually increasing pressure from start to finish of the compressing action on the material in the mold cells.

4. In a briquetting machine, the combination with a radially movable rotary cylinder having half-mold cells on the interior of its peripheral wall, of a resistance roller of smaller diameter than said cylinder eccentrically mounted within the cylinder and having half-mold cells on its periphery and normally held against any radial movement, power means for rotating said cylinder and roller in the same direction, means for supplying moldable material to the bite of said cylinder and roller, a pivoted platform underlying and supporting said cylinder and a multiple cylinder hydraulic press applied to the free end of said platform for moving said platform and cylinder toward said resistance roller with a gradually increasing pressure from start to finish of the compressing action on the material within the mold cells, substantially as described.

5. A briquetting machine having in combination, a hollow cylinder mounted for limited lateral movement and having a multiplicity of concave, closed, half-mold cells on its interior peripheral wall, a resistance roller of smaller diameter than said cylinder revolubly mounted on a fixed axis within said cylinder and disposed eccentrically of said cylinder and having a multiplicity of concave, closed, half-mold cells on its periphery adapted to cooperate with said first mentioned half-mold cells, power means for rotating said cylinder and roller in the same direction, means for synchronizing the rotation of said cylinder and roller and hydraulic means for bodily moving said cylinder toward said resistance roller for increasing the available pressure applied to the material within the mold cells.

6. The method of making lignite briquettes which consists in simultaneously compressing and molding a mass of lignite particles with sufficient pressure to produce such heat upon the lignite that the paraffin, rosin and other natural binding constituents of the lignite will be heated and melted and will serve to bind the other elements of the lignite into a hard, homogeneous mass.

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