May 19, 1931. J. C. LEMMING 1,806,300

BRIQUETTING MACHINE

Filed Feb. 1, 1930 3 Sheets-Sheet 1

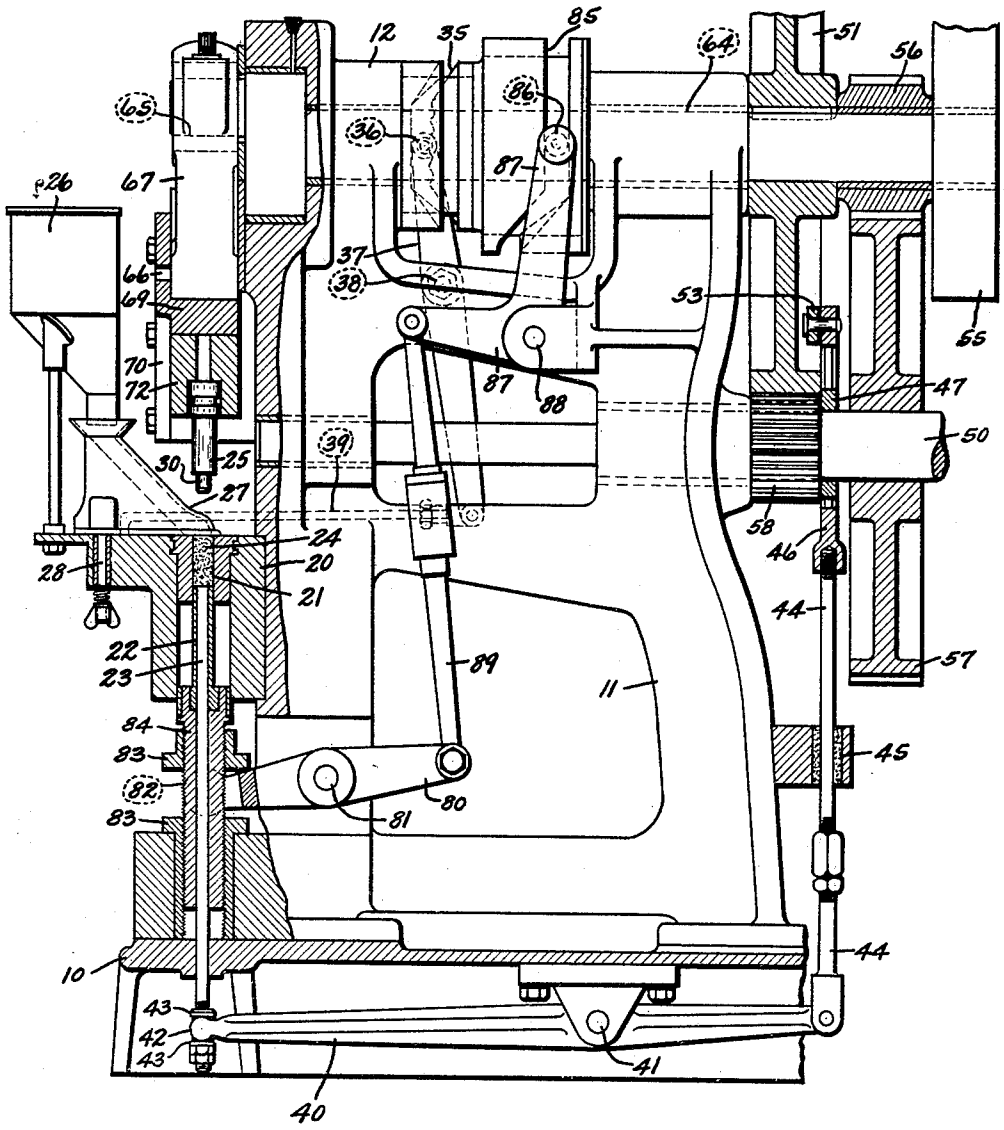


Fig. 1

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Filed Feb. 1, 1930 3 Sheets-Sheet 2

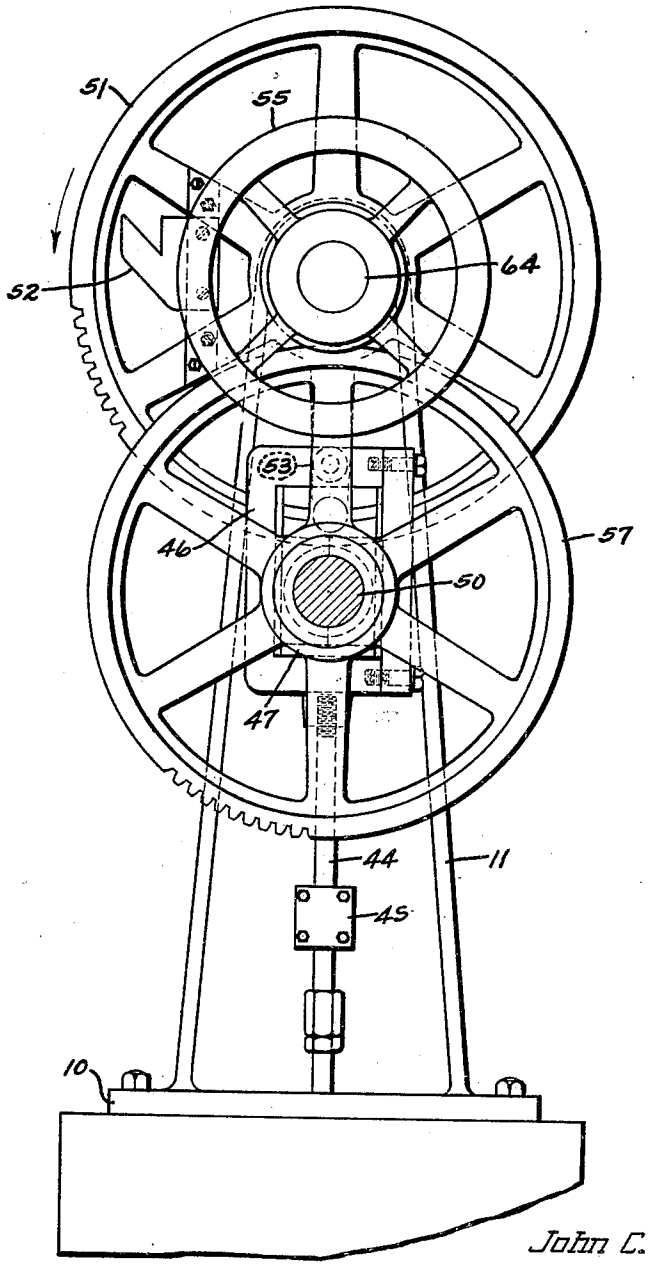


Fig. 2

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BRIQUETTING MACHINE

Filed Feb. 1, 1930 3 Sheets-Sheet 3

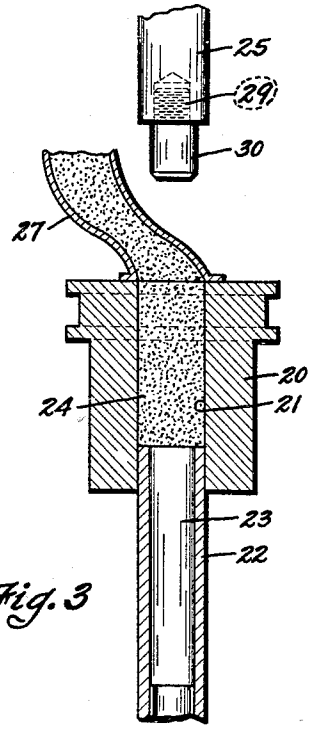


Fig. 3

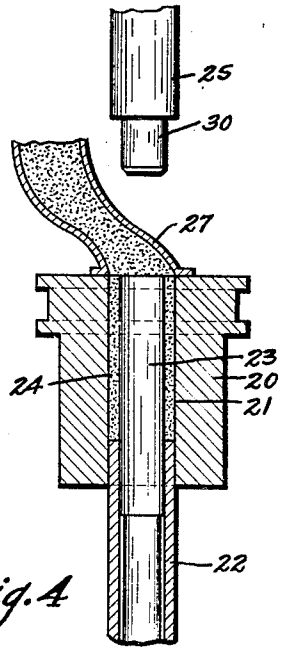


Fig. 4

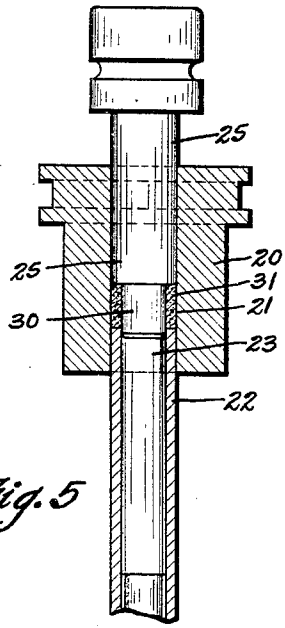


Fig. 5

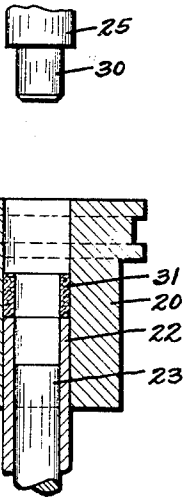


Fig. 6

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UNITED STATES PATENT OFFICE

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BRIQUETTING MACHINE

Application filed February 1, 1930. Serial No. 425,290.

This invention relates to an improved means and method of briquetting bushings or other similar apertured articles from powdered, semi-plastic, or other materials capable of being briquetted by pressure.

An object of this invention is to provide an improved briquetting press and method of operation including the following features:

(1.) The briquetting punch has a renewable core forming projection thereon which is withdrawn from the briquetted article prior to its ejection from the mold cavity. The abrasive action or wear upon the core is thus concentrated upon a relatively small easily renewable part and hence the cost of renewing the part serving as a core is greatly reduced.

(2.) The wear upon the die cavity walls is also greatly reduced and the ejection of the formed bushing is greatly facilitated by the prior withdrawal of the core forming projection from the formed bushing. Hence the cost of die renewals will be greatly decreased due to the longer life of the dies.

(3.) A reciprocatable temporary core is provided which is caused to move upwardly through the die cavity after it is filled with the loose charge of material to be briquetted. This action more evenly distributes the loose powder in the annular cavity and causes a more uniform filling of same and hence the briquetted bushing will have walls of more uniform density. This temporary core is displaced by the core forming projection on the punch during the compacting stroke without substantial wear thereon since the material does not undergo its highest compression until the temporary core is withdrawn therefrom.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of one form of the present invention is clearly shown.

In the drawings:

Fig. 1 is in part an elevation and in part a vertical section through a briquetting press made according to this invention.

Fig. 2 is an end elevation of Fig. 1.

Figs. 3, 4, and 5 illustrate various positions of the essential parts of the press.

Fig. 3 shows the parts in initial position while the die cavity is being filled with the loose charge.

Fig. 4 shows the temporary core moved to its top position through the loose charge while the filling shoe remains in registration with the die cavity.

Fig. 5 shows the briquetting punch in its down position, having fully compressed the loose charge into the formed bushing.

Fig. 6 shows the formed bushing being easily ejected from the die cavity since it is not held compressed outwardly by any part within its central apertures.

Similar reference characters refer to similar parts throughout the several views.

The essential operations as disclosed in Figs. 3 to 6 will first be described.

Numeral 20 designates the stationary die having the open end cylindical die cavity 21 therein. A lower tubular ejecting ram 22 is received within the lower open end of cavity 21, shown in its bottom position in Fig. 3. Within ram 22 the vertically reciprocable temporary core 23 is also shown in its bottom position, thus leaving the cavity 21 unobstructed for easy automatic filling with the loose powder charge 24. This powder material is conducted from a suitable hopper 26 through the swinging and vibrating filling shoe 27, to be later described herein. After cavity 21 is filled with the loose powder as shown in Fig. 3, the temporary core 23 is raised through the loose material 24 to the position shown in Fig. 4 while the shoe 27 is yet positioned over the top of cavity 21. Thus the material displaced by the up movement of core 23 reenters the filling shoe 27.

This movement of core 23 through the loose powder aids in more evenly distributing this powder around the now annular cavity and shakes or agitates the powder sufficiently to prevent any unfilled spaces therein. The filling shoe 27 is then swung laterally out of the way across the top face of die 20, leaving the cavity 21 filled with powder flush with its top.

The briquetting punch 25 has a renewable core forming projection 30 fixed thereto, preferably by a threaded shank 29 (see Fig. 3). This projection 30 preferably exactly conforms in section to the temporary core 23 and is directly aligned therewith. Now after shoe 27 is swung out of the way, punch 25 is caused to descend upon its compacting stroke. The bottom end of core projection 30 abuts directly upon the top end of temporary core 23, which is yieldably supported in this position, and forces it downwardly as punch 25 descends. When punch 25 enters the cavity 21 it begins compacting the loose charge 24. Since this powder material usually does not flow freely in a narrow space the down motion of the core 23 will aid in reducing the friction of flow of the material while it is being compacted downwardly upon the upper end of the now stationary ejecting ram 22. Fig. 5 shows the parts at the end of the compacting stroke of punch 25, the powder now having been highly compacted into a quite hard rigid bushing 31. It will be seen from Fig. 5 that the temporary core 23 has been entirely displaced from the die cavity 21 by the core projection 30, which at this time serves as the core for the bushing 31. Punch 25 is now caused to rise and in so doing will withdraw its projection 30 from the formed bushing 31 since the friction hold of the bushing is greater upon the outer cavity walls than upon the smaller inner core 30, the bushing 31 hence remaining stationary in the die. After such withdrawal of projection 30 the frictional hold of bushing 31 upon the outer cavity walls is greatly reduced due to the fact that the bushing walls can then yield inwardly to some extent. The bushing 31 can then be quite easily pushed upwardly from the cavity 21 by ejecting ram 22 without great friction or substantial wear upon the die cavity walls. Fig. 6 shows the bushing 31 being ejected by ram 22 while the temporary core 23 remains in its bottom position.

It will thus be clear that substantially all wear upon the die parts will be concentrated upon the relatively small easily renewable core projection 30, since it is the only die part which experiences high friction upon the formed bushing of powdered materials which may have considerable abrasive action.

One form of machine for supporting and actuating the parts above described will now be described.

This machine (see Fig. 1) includes a base 10 which supports a main frame 11 providing bearings 12 for a main power driven shaft 64. Shaft 64 has an overhanging crank pin 65 which is connected by connecting rod 67 and crosshead pin 66 to crosshead 69. Crosshead 69 is thus caused to reciprocate vertically between the stationary guides 70 fixed to the main frame 11. Crosshead 69 has fixed thereto a socket member 72 within which the briquetting punch 25 is rigidly fixed. The reciprocating movement of punch 25 will now be clear. The other moving parts of the press are driven from the main drive shaft 64 and hence may be suitably timed in relation to the movement of punch 25.

The filling shoe 27 is pivoted at pivot pin 28 and its plane bottom surface swings across the plane top surface of die 20. It is actuated by cam 35 on main shaft 64. A lever 37, pivoted at fixed pivot 38, has at its upper end a cam follower 36 riding in cam groove 35, and at its lower end a link 39 connected to filling shoe 27, whereby said shoe is swung into registration with die cavity 21 at the proper time for filling same and then given several rapid shakes or small oscillations in order to discharge the loose material and fill cavity 21.

While shoe 27 is still in registration with cavity 21 the core 23 is raised from the bottom position shown in Figs. 1 and 3 through the loose powder by means of a lever 40 pivoted at fixed pivot 41. Lever 40 has a forked end 42 cooperating with the spaced flanges 43 at lower end of core 23 to actuate said core. Lever 40 is actuated by a vertically reciprocable link 44, extending through a suitable friction guide 45, and having at its upper end a guide frame 46 which is vertically reciprocable upon the guide blocks 47 which are supported by the shaft 50 which rotates within said blocks 47. Shaft 64 is driven by a belt pulley 55 which together with the small gear 56 fixed thereto runs loosely on shaft 64. Gear 56 drives large gear 57 keyed to shaft 50. Gear 58 fixed to shaft 50 thus drives large gear 51 and hence main shaft 64 at a greatly reduced speed. The large gear wheel 51, keyed to main shaft 64, has a cam 52 fixed to two spokes thereof (see Fig. 2) in such position as to engage the cam roller 53 mounted on guide frame 46 and thus depress link 44 at each revolution of shaft 64. The friction guide 45 yieldably retains link 44 in its depressed position after cam 52 rides over cam roller 53 and passes on, hence the temporary core 23 will be moved up to its top position in the die cavity 21 and be yieldably retained thereat. After core 23 is moved to its top position, the filling shoe 27 is swung out of the way by cam 35 and mechanism above described, whereupon the punch 25 descends and compacts the loose material into a rigid self-sustaining bushing 31 and at the same time moves the temporary core 23 back to its

bottom position, all as described above in connection with Figs. 3 to 6. Punch 25 then immediately rises withdrawing the core projection 30 from the formed bushing, whereupon ejecting ram 22 is actuated to eject the bushing 31 by lever 80, pivoted at 81, and having a forked end 82 engaging the two flanges 83 adjustably fixed to the large sleeve 84 to which ram 22 is rigidly fixed at its top. Lever 80 is actuated by cam groove 85 on main shaft 64 through the cam follower roller 86 on bell crank lever 87, pivoted at 88, and the link 89. The operation will be clear from Fig. 1. After ejection of the formed bushing, ram 22 is immediately returned to its bottom position shown in Figs. 1 and 3, and the cycle may then be repeated. When filling shoe 27 swings to its filling position it engages the previously ejected bushing and pushes it laterally across the top of die 20 into a suitably located chute.

Reference is made to my prior application Serial Number 342,230, filed Feb. 23, 1929, which shows a somewhat similar briquetting press for briquetting a cup-shaped or closed end article from powdered metals or other powdered materials.

The briquetting materials used with this invention may be such as are disclosed in Patent 1,642,348, Sept. 13, 1927, H. M. Williams et al. for making self-lubricating porous bearing bushings.

While the form of embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. In a briquetting press, a die mold having a die cavity and a reciprocatable core therein, means for filling said cavity with a loose charge of material to be briquetted, and a briquetting punch for compacting said material in said cavity, said punch having a core forming projection thereon which on its compacting stroke abuts the end of said core and displaces it from the briquetted article.

2. In a briquetting press, a die mold having a die cavity and a reciprocatable core therein, means for filling said cavity with a loose charge of material to be briquetted, and a briquetting punch for compacting said material in said cavity, said punch having a core forming projection thereon identical in transverse section to said core and aligned therewith, whereby said core forming projection abuts the end of said core and displaces it from the article being briquetted during the compacting stroke of said punch.

3. In a briquetting press, a die mold having a die cavity and a reciprocatable core therein, means for filling said cavity with a loose charge of material to be briquetted, means yieldably supporting said core within the loose charge within said cavity, and a briquetting punch for compacting said loose charge, said punch having a core forming projection thereon which abuts the end of said core and displaces it from the briquetted article during the compacting stroke of said punch.

4. In a briquetting press for briquetting hollow articles, a die mold having a die cavity and a yieldably supported core extending therethrough, means for filling said cavity with a loose charge of material, and a briquetting punch for compacting said material within said cavity, said punch having a core forming projection thereon aligned with said core and which abuts the end of said core and displaces same from the briquetted article during the compacting stroke of said punch.

5. In a briquetting press for briquetting hollow articles, a die mold having a die cavity and a yieldably supported core extending therethrough, means for filling said cavity with a loose charge of material, and a briquetting punch for compacting said material within said cavity, said punch having a core forming projection thereon aligned with said core, and conforming in section thereto, whereby said projection abuts said core and displaces same from the briquetted article during the compacting stroke of said punch.

6. In a briquetting press, a die mold having a die cavity, means for filling said cavity with a loose charge of material to be briquetted, a reciprocatable die core, means for moving said core through the loose charge in said cavity and then yieldably supporting said core, a briquetting punch for compacting said loose charge, said punch having a core forming projection thereon aligned with said core, whereby said projection abuts said core and displaces same from the briquetted article during the compacting stroke of said punch.

7. In a briquetting press, a die mold having a die cavity, means for filling said cavity with a loose charge of material to be briquetted, a reciprocatable die core, means for moving said core through the loose charge in said cavity and then yieldably supporting said core, a briquetting punch for compacting said loose charge, said punch having a core forming projection thereon aligned with and conforming in section to said core, said projection being thus adapted to abut the end of said core and force same from the die cavity during the compacting stroke of said punch and replace same as a core during the latter portion of the compacting stroke.

8. In a briquetting press, a die mold having a die cavity and a reciprocatable core therein, means for filling said cavity with a loose charge of material to be briquetted, and a briquetting punch for compacting said material in said cavity, said punch having a renewable core forming projection thereon

which is aligned with said core and abuts same and displaces it from the briquetted article during the compacting stroke of said punch, and an ejecting punch actuated after withdrawal of said briquetting punch and its core-forming projection to eject the formed article from said die cavity.

In testimony whereof I hereto affix my signature.

JOHN C. LEMMING.