

June 25, 1940.

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BRIQUETTING MACHINE TAMPING DEVICE

Filed March 12, 1938

2 Sheets-Sheet 1

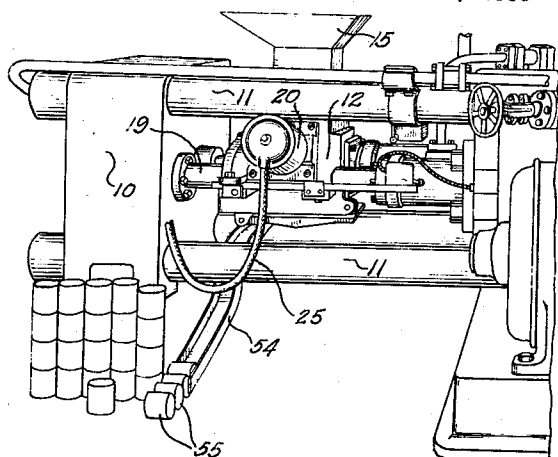


Fig. 1.

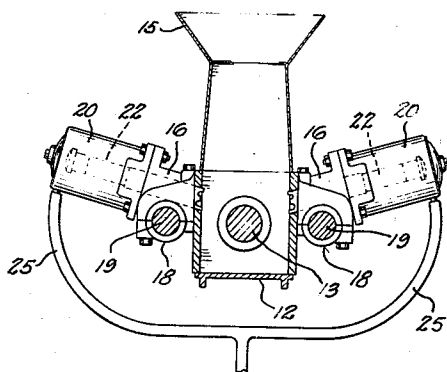


Fig. 5.

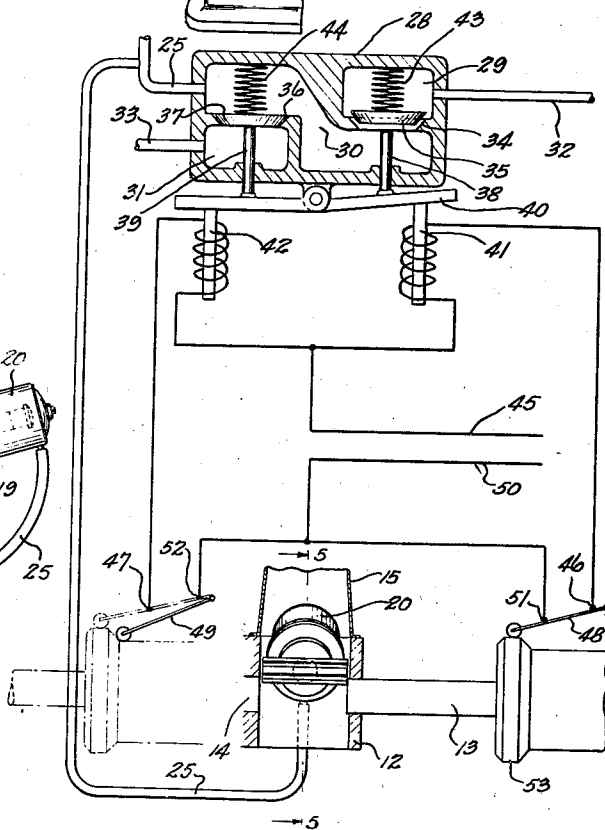


Fig. 4.

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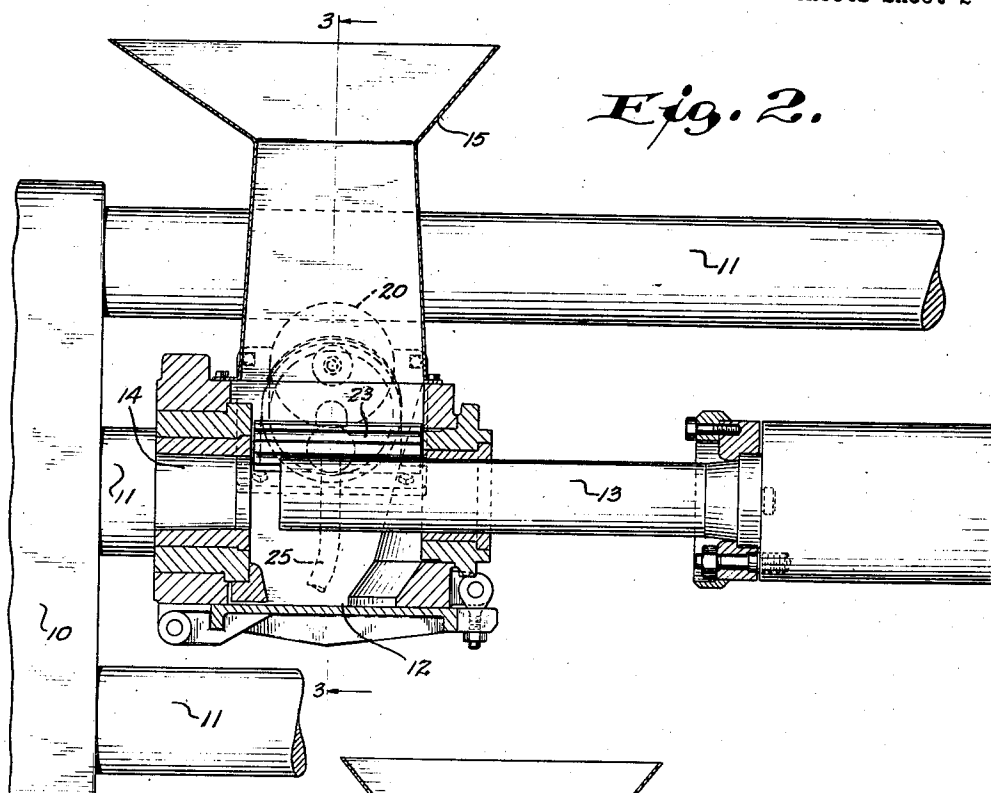


Fig. 2.

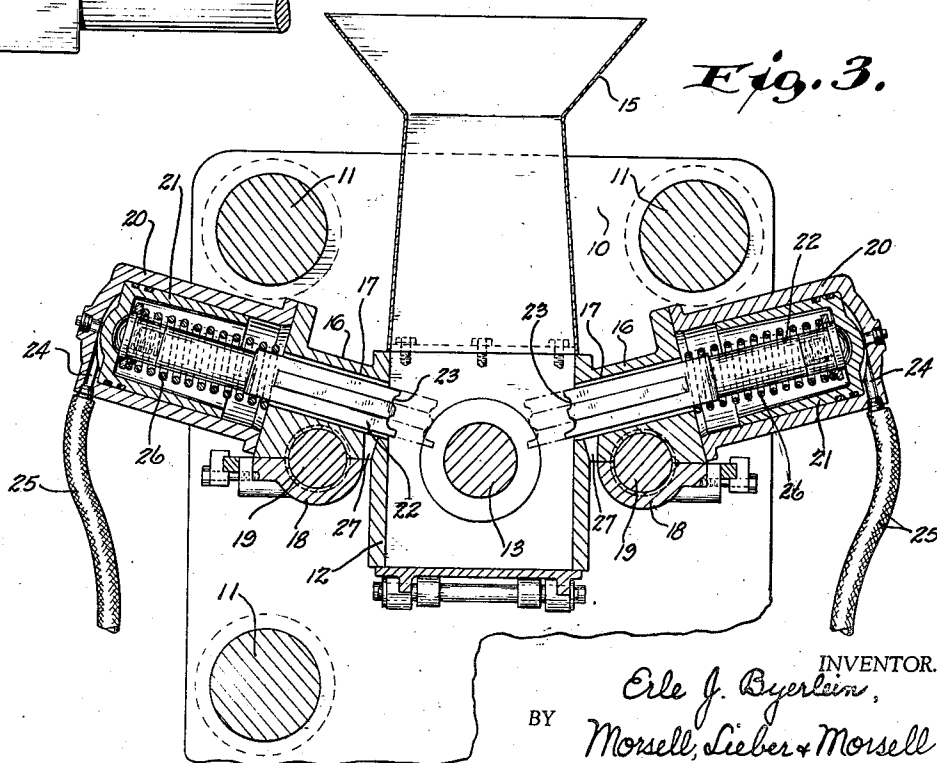


Fig. 3.

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UNITED STATES PATENT OFFICE

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BRIQUETTING MACHINE TAMPING DEVICE

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6 Claims. (Cl. 29—1)

This invention relates to improvements in briquetting machine tamping devices.

In U. S. Patent #1,860,075 there is disclosed a briquetting machine particularly adapted for compressing metal borings and cuttings into briquettes. With particular reference to the chip box in the disclosure of said patent it appears that the material to be compressed is deposited therein and a longitudinally operating ram becomes effective to compact and force batches of the metal material into a die where compressed, compact briquettes are formed which are subsequently ejected from the machine.

While the machine of said Patent #1,860,075 is in general very effective and efficient in its operation, particularly with powdery cast iron borings, it has been found that if the chip box thereof be equipped with the improved tamping device, the subject of the present invention, the efficiency of the machine will be increased, particularly when the machine is operating on metallic materials which form voids within the chip box such as steel turnings, brass cuttings and other steel particles such as broachings, or other coarser particles which are crushed to suitable size preparatory to briquetting.

It is, therefore, a primary object of the present invention, to provide a tamping device applicable to the chip box of a briquetting machine of the type under consideration, to enhance the efficiency of the briquetting machine by operating on the material within the chip box to preliminarily tamp, compress, and confine the material with the result that regardless of the type of material being used, the machine can handle more material and the resulting briquettes will be more dense and compact.

A further object of the invention is to provide a tamping device for the chip box of a briquetting machine, which tamping device tends to bridge the chip box to prevent undesired displacement of the material in the chip box during operation of the machine ram.

A further object of the invention is to provide a briquetting machine tamping device which makes it possible to increase the amount of material taken into the machine die per stroke of the ram, the tamping device operating to confine the pulverulent material within the chip box so that it will not be displaced and so that an adequate amount thereof will be maintained in the path of the ram as the latter moves toward the die.

A further object of the invention is to provide

a briquetting machine tamping device wherein the tamper plungers operate in synchrony with the briquetting machine ram, novel means being employed for automatically controlling the operation of the tampers or plungers in relation to the operation of the ram.

A further object of the invention is to provide a tamping device for briquetting machines which can be incorporated with a briquetting machine with a minimum of modification thereof and which is operated and controlled by the general operating and control means for the briquetting machine proper.

A further object of the invention is to provide a briquetting machine tamping device which is of very simple construction, is strong and durable, is efficient and automatic in its operation, and which is well adapted for the purposes described.

With the above and other objects in view the invention consists of the improved briquetting machine tamping device, and its parts and combinations, as set forth in the claims, and all equivalents thereof.

In the accompanying drawings in which the same reference characters indicate the same parts in all of the views:

Fig. 1 is a fragmentary perspective view of that portion of a briquetting machine with which the improved tamping device is associated;

Fig. 2 is a longitudinal vertical sectional view, on a larger scale, through the chip box end of a briquetting machine with the tamping device incorporated therein;

Fig. 3 is a transverse sectional view taken on line 3—3 of Fig. 2;

Fig. 4 is a diagrammatic and schematic view of the ram and tamper portions of a briquetting machine together with a showing of the electrical controlling means for the compressed air valves which control air flow to and from the tamper plungers; and

Fig. 5 is a further schematic showing indicated on line 5—5 of Fig. 4.

Referring now more particularly to the drawings, it will appear that the numeral 10 designates the fixed end frame member of a briquetting machine into which are extended the outer ends of strain rods 11. Mounted within the space enclosed by said strain rods is a chip box 12 into which a longitudinally moving, reciprocable ram 13 is adapted to be projected. At the forward end of the chip box, aligned with the ram 12, is a briquette forming die 14. The ram is operated in the manner disclosed in U. S. Patent #1,860,075.

Extending upwardly from the upper open end of the chip box is a chip box hopper 15. During operation of the briquetting machine it is intended that the chip box 12 and hopper 15 be kept constantly filled with pulverulent or granular metallic material such as cast iron borings, steel trimmings, brass cuttings, broachings, and other like classes of metallic particles, in some instances crushed and screened preparatory to briquetting. This material is introduced into the chip box through the hopper 15.

The invention resides particularly in the association with the briquetting machine mechanism just described of a pair of oppositely disposed tamping devices. As shown most clearly in Fig. 3, one of said tamping devices is mounted on each upper side portion of the chip box. A tamping device includes an inner base casting 16 preferably cast integral with an upper portion of the chip box and provided with an opening 17 therethrough, which at its inner end opens into the upper portion of the chip box. Each casting 16 has in its lower face a semicircular recess to cooperate with a complementary casting 18 for embracing a supporting rod 19 to which the chip box is clamped. Mounted on each casting 16 is a cylinder casing 20 enclosing a piston 21. The upper end of a plunger 22 is extended axially into a cylinder 20 and piston 21 and its extremity is engaged by the latter. Said plunger or tamper also extends through the opening in the casting 16 and in inoperative position it is approximately flush with the interior of the chip box. The lower end of the plunger or tamper is serrated as at 23. The upper end of each cylinder 20 is provided with a compressed air port 24 to which is connected a flexible air tube 25. By means later to be explained compressed air is admitted into the upper end of each cylinder 20 so as to react against the adjacent end of the pistons 21 and thereby force inwardly the pistons and plungers. This movement is against the tension of the confined coiled springs 26, within the pistons, and upon a shut-off of the air supply and opening of the valves to exhaust the air, the springs 26 will expand to return the pistons to normal positions within the cylinders, thereby retracting the plunger tamper 22.

It is important that the tamping devices be disposed so that the plungers operate in lines at substantial angles to horizontal. In some instances it may be desirable to have the angular disposition of said plungers substantially greater than that shown in the drawings. The disposition of the plungers on opposite sides of the ram 13, also should be such that they may project into the chip box adjacent the top surface of the ram 13 to substantially bridge the top thereof. In Fig. 3 the full line showing indicates the retracted position of the plungers while their projected position is shown in broken lines. The plungers 22 fit relatively loosely and sloppily within the openings in the castings 16. With this arrangement it is possible for the forward ends of the tamper plungers to rock or oscillate somewhat during projection thereof, and this affords freedom from binding or sticking. Each of the castings 16 furthermore is provided with a cored opening 27 and said openings permit material to fall out of the guide casting 16, if material is brought therein with inward movements of the plungers.

As previously suggested the tampers are operated by compressed air means. The complete mode of operation and control of said tampers is shown

clearly in Figs. 4 and 5 of the drawings. For this purpose there is provided a valve casing 28 divided by suitable interior walls and partitions into an inlet chamber 29, an intermediate chamber 30 and an exhaust or outlet chamber 31. Compressed air from the source (not shown) is led into chamber 29 of the valve casing through an air supply tube 32. An exhaust air tube 33 extends outwardly of the valve chamber 31. Also, the air supply tubular connection 25 extends outwardly of the valve chamber 30 and this latter connection is branched so that it may extend to both of the tamper cylinders 20. A port 34 between the inlet chamber 29 and the intermediate chamber 30 is controlled by a valve 35, and a port 36 between the intermediate chamber 30 and the exhaust chamber 31 of the valve casing is controlled by a valve 37. Each of the valves 35 and 37 is provided with a valve stem 38 and 39 respectively, projecting outwardly of the casing 28 and contacting an intermediately pivoted toggle or snap lever 40. Said lever 40 is actuated in one direction by the energization of an intake solenoid 41 and upon de-energization of the intake solenoid 41 and energization of an exhaust solenoid 42 the lever 40 is kicked in the opposite direction. Obviously actuation of the solenoid 41 operates to open the valve 34 and close the valve 37, and actuation of the solenoid 42 operates to open the valve 37 and close the valve 34. The valves 34 and 37 are urged to closing positions by springs 43 and 44 respectively.

A circuit wire 45 which is connected with the main power line or the source has branches extending to the solenoids 41 and 42 respectively and also to terminals 46 and 47 of control switches 48 and 49 respectively. The other main circuit wire 50, extending from the main power line or the source, is branched so that the respective branches extend to the other terminals 51 and 52 of the switches 48 and 49 respectively. The plunger of the main ram 13 carries a contact collar 53 adapted, upon actuation of the ram 13 to engage and operate the switches 48 and 49. The operation of the improved tamping device, in relation to the operation of the main ram 13, is as follows: Before the ram 13 commences its forward or ramming movement the contact ring 53 engages and closes the switch 48. This closes the electrical circuit to the solenoid 41 and causes energization of the same with the result that the valve 35 will open and the valve 37 will close. Compressed air from the source will then flow from connection 32 into the valve casing chamber 29, through port 34 to the intermediate chamber 30, and out of the casing through the connection 25, from which it flows through the several branches thereof into the outer ends of the piston cylinders 20 and thereby operates to project the tamping plungers 22. It will therefore be observed that prior to compacting action by the ram the tampers become effective to compress a quantity of the material within the chip box toward the line of movement of the ram. The tampers stay in this projected position while the ram is moving forwardly a predetermined distance and due to this positioning of the tampers, upward displacement and bulging of the material in the chip box is prevented, whereby the ram will engage and move forwardly a substantial and adequate amount of compacted material and will force said material into the die 14 for the formation of a briquette.

When the ram 13 has moved forwardly sufficiently and has entered the die its contact ring 53

will have moved away from the switch 48 and will engage the switch 49 and move it to position to close the circuit to the exhaust solenoid 42. Thereupon the valve 37 will be operated and moved to open position and valve 35 will be closed, whereby compressed air from the tamper cylinders 20 will exhaust through the branch connection 25 into the valve casing 30 and through the exhaust chamber 31 and out via the connection 33. It will be appreciated that due to the springs 43 and 44 and due to the fact that the lever 40 is a toggle or snap action lever the valves 35 and 37 will be maintained in closed positions except upon energization of their respective solenoids.

After the movement of the ram 13 into its die the ram 13 recedes in the usual manner and the cycle is repeated. Finished briquettes 55 are automatically ejected from the die 14 and leave the briquetting machine via a chute 54. Before the briquette is completed in the die the mechanism becomes effective to retract the tampers. In this manner wear on the ram surface is minimized and there is no movement of the tampers during the back stroke of the ram as the tampers are in their raised or retracted positions during the entire back stroke of the ram.

From the foregoing description it will be apparent that the improved tamping device is associated with a briquetting machine in a novel and effective manner and operates automatically in conjunction with the normal operation of the briquetting ram. The device is furthermore of simple and novel construction and is well adapted for the purposes described.

What is claimed as the invention is:

1. In a briquetting machine, in combination, a chip box, a reciprocable ram movable longitudinally therein in a horizontal plane, a pair of oppositely directed tampers reciprocally mounted adjacent opposite sides of the chip box, the axes of the tampers intersecting adjacent the vertical central plane of the ram, fluid means for reciprocating the tampers, valves controlling flow of fluid to and from the tampers, and electrical means for operating said valves.

2. In a briquetting machine, in combination, a chip box, a reciprocable ram movable longitudinally therein in a horizontal plane, a pair of oppositely directed tampers reciprocally mounted adjacent opposite sides of the chip box, the axes of the tampers intersecting adjacent the vertical central plane of the ram, fluid means for reciprocating the tampers, valves controlling flow of fluid to and from the tampers, and electrical

means controlled by movements of the ram for automatically operating said valves.

3. In a briquetting machine, in combination, a chip box, a reciprocable ram movable longitudinally therein in a horizontal plane, a pair of oppositely directed tampers reciprocally mounted adjacent opposite sides of the chip box, the axes of the tampers intersecting adjacent the vertical central plane of the ram, fluid means for reciprocating the tampers, valves selectively controlling flow of fluid to and from the tampers, electrical circuits including solenoids for individually and selectively opening said valves, said circuits also including switches, and means carried by said ram and affected by forward movements of the ram for operating said switches.

4. In a briquetting machine, in combination, a chip box, a reciprocable ram movable longitudinally therein in a horizontal plane, a pair of oppositely directed tampers reciprocally mounted adjacent opposite sides of the chip box, the axes of the tampers intersecting adjacent the vertical central plane of the ram, fluid means for reciprocating the tampers, valves controlling flow of fluid to and from the tampers, and electrical means controlled by movements of the ram for automatically operating said valves, initial forward movement of the ram being effective to project said tampers, and the ram, upon reaching its projected position, operating said means to retract the tampers, the tampers remaining retracted during retraction of the ram.

5. In a briquetting machine, in combination, a chip box, a reciprocable ram movable longitudinally therein, and tamping devices mounted on opposite sides of the chip box, each tamping device including a cylinder with a movable piston therein, and a casing with a reciprocable plunger therein connected to the piston, said casing having an opening receiving the plunger, the casing opening registering with the chip box and being substantially larger in size than the enclosed plunger, providing for relative free movement of the plunger during reciprocation thereof.

6. In a briquetting machine, in combination, a chip box, a reciprocable ram movable therein, a pair of oppositely directed tampers reciprocally mounted adjacent opposite sides of the chip box, fluid means for simultaneously reciprocating the tampers, valves controlling flow of fluid to and from the tampers, and means controlled by movements of the ram for automatically operating said valves.

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