July 7, 1959 R. B. BRITNER ET AL 2,893,101

BRICK PRESS BATCH DISTRIBUTOR

Filed July 26, 1956 2 Sheets-Sheet 1

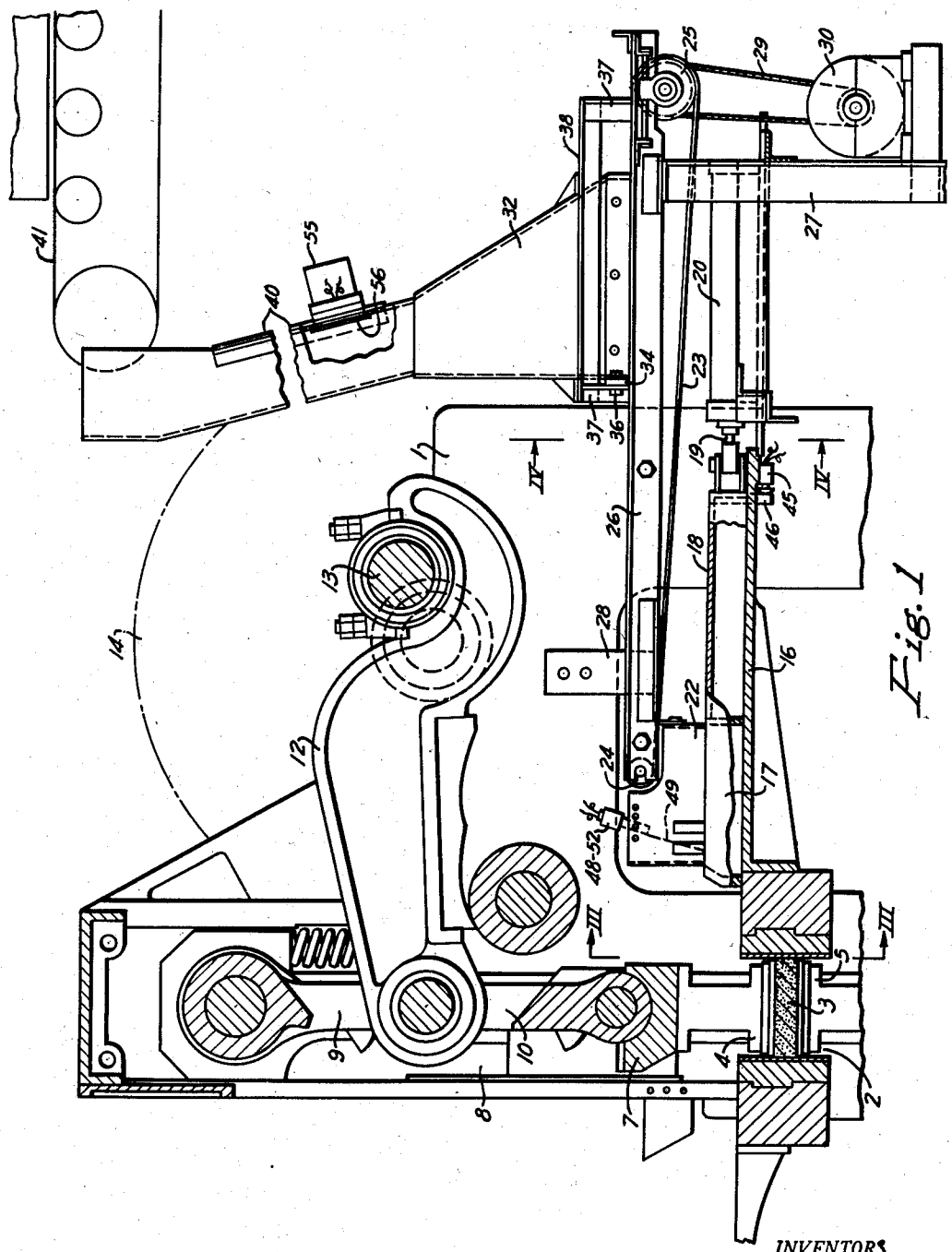


Fig. 1

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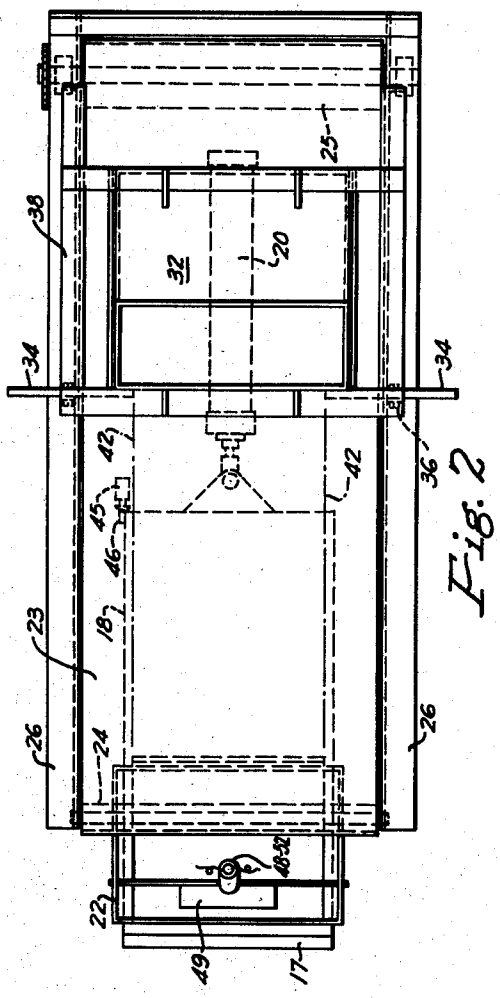


Fig. 2

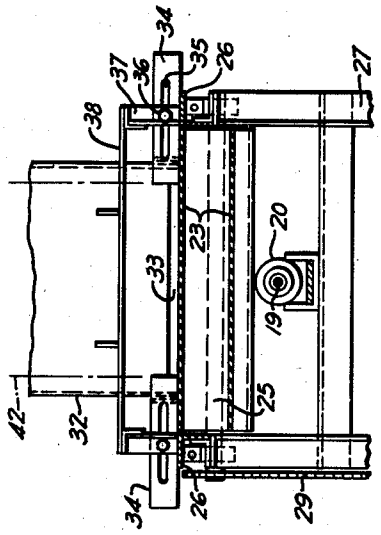


Fig. 4

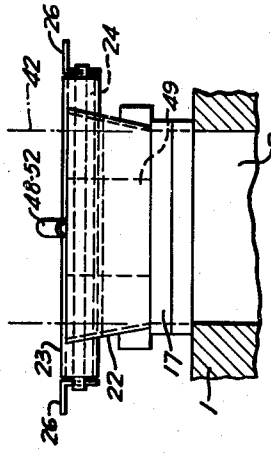


Fig. 3

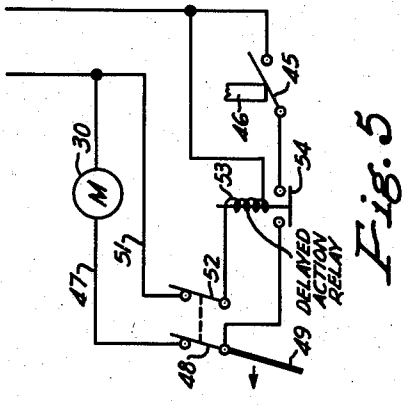


Fig. 5

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BRICK PRESS BATCH DISTRIBUTOR

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Application July 26, 1956, Serial No. 600,240

5 Claims. (Cl. 25—103)

This invention relates to brick presses for manufacturing refractory bricks, and more particularly to the feeding of batch material to the presses.

The well-known Boyd toggle press is an example of the kind of press to which this invention applies, but the invention is not limited thereto but is applicable also to other presses which form bricks from a granular batch. Many of the important properties of bricks made in such presses are governed by their bulk density, the control of which will depend on the success in feeding the same weight of uniformly mixed material to each mold box at each pressing. Refractory bricks are made of refractory grains of graded sizes, together with water for tempering or lubrication. No other bond may be needed in order to give the bricks enough strength to be handled through drying and firing. In other cases, such bonds as starch, lime, or sulphite waste liquor may be used. In any case, however, the batch is difficult to handle in ordinary equipment, because it is moist enough to be resistant to easy flowing.

Present brick press charging devices require the semi-dry granular batch to flow laterally from the feed pipes into the charging box because the pipes have to be placed near the opposite sides of the charger, due to the central location of the pitman arm that operates the toggle. During this lateral flow of the batch, segregation of the various particles occurs and causes trouble. Thus, frequently the largest particles flow toward the side walls of the charging box, so that the finished brick will be different in composition or structure from one end or side to the other. Such brick often have to be scrapped. Furthermore, this dependence on material flow of gravity often results in bricks which are poorly filled out. In a multiple mold set up, the several bricks may have different weights, due to unequal charging. The lighter bricks will be unsatisfactory because high density is almost universally sought for in such products. Moreover, in refractory batches of certain types; for example, a fire clay batch made of flint clay and plastic clay, the rolling of particles leads to unwanted segregation. The plastic clay fines tend to roll up into small balls that are objectionable in the product and that prevent uniform distribution of the plastic clay which is relied upon for developing strong bonding.

It is among the objects of this invention to provide brick press feeding apparatus which prevents objectionable segregation of the batch from occurring, which is automatically controlled, which is variable for different operations, and which can be used with a conventional brick press.

In accordance with this invention, a charging box having an open top and bottom is movable forward from a rear batch-receiving position to a discharge position over the molding cavity of a brick press. A transfer hopper directly above the charging box empties into it in its rear position. The batch is delivered to this hopper by a conveyor belt, the rear end of which receives the batch from a feed hopper. The lower end of the front of the feed hopper is provided with an outlet slot, through which the

batch is drawn in a layer of predetermined size by the belt. For best results, the widths of the charging box, transfer hopper and slot are substantially the same in order to minimize agitation of the batch material after it leaves the feed hopper. The conveyor is driven only while the charging box is in batch-receiving position and means may be provided for automatically stopping the conveyor before the transfer hopper is overfilled at any time. The automatic stopping of the conveyor also assures an almost identical weight of batch for every charge.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which

Fig. 1 is a fragmentary vertical section through the upper part of a brick press;

Fig. 2 is an enlarged plan view of my feeding apparatus alone;

Figs. 3 and 4 are vertical sections taken on the lines III—III and IV—IV, respectively, of Fig. 1; and

Fig. 5 is an electric wiring diagram.

Referring to Fig. 1 of the drawings, a brick press frame **1** is provided near its front with a molding cavity **2** in which bricks **3** are pressed between upper and lower dies **4** and **5**. The upper die is reciprocated vertically by a cross head **7** slidably mounted in guides **8** at opposite sides of the frame. The cross head is moved up and down by toggle links **9** and **10** pivotally connected to the front end of a pitman arm **12** that extends back through the center of the machine to a crank pin **13** carried by a large gear **14**. Synchronized with the movements of the dies is a charger that is slidably mounted on a table **16** directly behind the mold cavity. The front half of the charger is in the form of a box **17** that has an open top and bottom. The rear half of the charger includes a horizontal plate **18** on a level with the top of the box. Secured to the rear end of this plate is the front end of a piston rod **19** which extends back into a fluid pressure cylinder **20**.

The charging box **17** receives a charge of brick-making material or batch in its rear position, and then it is moved forward when the upper die **7** is raised. In its forward position the box registers with the mold cavity, and the material in the charger drops into the cavity. When a plurality of bricks are being made at the same time, the charging box and molding cavity are provided with partitions as is well known.

It is a feature of this invention that every time the charging box is retracted from its forward mold-filling position, it is filled with the same weight of a uniform mixture of granular material in which there is no objectionable segregation of coarse and fine particles. Accordingly, a small transfer hopper **22** is rigidly supported by the press frame in any suitable manner in a location directly above the charging box **17** when the latter is in its rear or retracted position. The hopper has an open bottom the same size as the top of the box and engages it lightly, but the bottom of the hopper is closed by the charger plate **18** when the charger is moved forward. The hopper preferably has upwardly flaring side walls, as shown in Fig. 3, and they and the rear wall of the hopper may be cut down for receiving the front end of a conveyor.

The conveyor, which extends under pitman arm **12** of the press, includes an endless belt **23** that is supported at its front end by a small roller **24** and at its rear end by a large roller **25**. The two rollers are journaled in the opposite ends of a pair of horizontal angle bars **26**. Near their rear ends the bars are supported by legs **27**. Near their front ends they are supported by brackets **28** secured to the press frame. The rear roller is driven by a chain and sprocket drive **29** from an electric motor **30** beneath it.

Directly above the conveyor belt, behind the press frame, there is a feed hopper **32** which has an open bottom engaged by the belt traveling forward beneath it. The belt thus forms the bottom of the hopper. The lower end of the front wall of the feed hopper does not touch the belt, but is spaced from it a predetermined distance, for example about one inch. As shown in Fig. 4, this forms a slot **33**, the width of which is controlled by vertical plates **34** that overlap the front of the hopper and extend laterally in opposite directions away from it. Each plate is provided with a horizontal slot **35**, through which a bolt **36** extends which connects the plate to a leg **37** of a frame **38** that surrounds and supports the hopper. The frame is supported by the angle bars **26** of the conveyor. By loosening bolts **36**, plates **34** can be moved toward and away from each other to adjust the width of the slot.

The semi-dry brick making material may be delivered to feed hopper **32** in different ways. A preferred manner of doing this is to extend a conduit **40** upward from the top of the feed hopper to a point where it can receive the material from another conveyor **41** of any suitable construction. This material, which is delivered to the upper end of the conduit well mixed, will stay mixed as it falls down through the conduit and into the feed hopper below. There is no chance for segregation of fine and coarse particles at this point.

Assuming that the feed hopper, transfer hopper and charging box are all full of the desired batch, the charger is moved forward to fill the mold cavity and then is retracted. As soon as the empty charging box is pulled back beneath the transfer hopper, the batch in that hopper refills the box, and the conveyor belt moves ahead to carry forward a layer of batch material corresponding in width and thickness to the size of the outlet slot in feed hopper **32**. The width of such a layer is indicated by broken lines **42** in Fig. 2. Segregation of the material does not occur on the belt because there is no agitation of the material by the conveyor. The layer of material pours off the front end of the belt in a wide stream into the transfer hopper. The fall is not great, so there is not much chance of segregation occurring at this point, especially since the charging box will already be full of material that it just received from the transfer hopper when the charger moved back under it. The conveyor merely has to replenish the material in the shallow transfer hopper.

It is highly desirable, however, in order to even further minimize the chance of segregation, to make the charging box substantially as wide as the mold cavity **2**, to make the transfer hopper substantially as wide as the charging box and to adjust the width of the feed hopper slot to the width of the bottom of the transfer hopper. With this arrangement, the stream of material pouring off the front end of the conveyor belt will be substantially as wide as the transfer hopper and therefore will build up a mound of material in that hopper having the same thickness from end to end instead of forming a conical pile of material in the center of the hopper. There will therefore be no occasion for the particles of material to segregate by rolling toward the opposite sides of the transfer hopper. Although there will be some movement of the material toward the front and back of the hopper, this movement will be small and unobjectionable. After the charging box has discharged a load of material into the mold and has moved back under the transfer hopper for a refill, the material in the hopper will pour straight down into the box and will have no occasion to move laterally in any direction therein. It will thus be seen that once the well-mixed batch of material leaves the feed hopper **32**, it is agitated but very little before it reaches the mold, so segregation will not occur.

It is desirable that the batch conveyor **23** should operate only while the charging box is in batch-receiving position. Therefore, a normally open electric switch **45** is secured to the rear end of table **16** and is closed only when it is struck by a lug **46**, extending down from charger plate **18**, when the charging box is retracted. This switch is in the electric circuit **47** to the conveyor motor **30**, as shown in the wiring diagram in Fig. 5. The moment the box starts to move forward, the switch opens and the motor is shut off, thereby stopping the conveyor.

Even when the charging box is in its rear position, it is desirable to stop the conveyor after a predetermined amount of batch material has been carried forward to the transfer hopper, so that the same amount will be delivered every time and also to prevent overfilling of the transfer hopper. This can be done automatically by connecting a normally closed switch **48** in the motor circuit and mounting the switch in transfer hopper **22**, where it is adjustable from front to back of the hopper. The switch may be a tilting one, such as a mercury switch, provided with a sail or vane **49** that extends down into the front part of the hopper for opening the switch when the vane is pushed forward by the pressure of a predetermined quantity of batch material piling up against it. When the switch is opened in this manner, the conveyor is shut off. To insure that the charging box will be in its fully retracted position and that switch **48** will have to come to rest in closed position before motor **30** starts to operate, a delayed action relay is incorporated in the motor circuit. Thus, a wire **51** is shunted across the motor circuit as shown in Fig. 5, and contains a normally open switch **52** which is operated by vane **49** and which may be included in the housing of switch **48**. The delayed action relay of any well-known construction has a solenoid coil **53** connected in wire **51** and a normally open switch **54** in circuit **47**, so that the circuit is not closed until the relay has been closed. Delay in the closing of the relay after switch **52** has closed is such that the relay switch **54** will be the last switch in the circuit to close. Fig. 5 shows the system just after switch **48** has closed but before switch **45** and the relay have been closed.

To keep feed hopper **32** full of batch material, it likewise may be fed automatically. Thus, a normally closed diaphragm type switch **55** is mounted in the wall of feed chute **40** near the upper end of the hopper. When the hopper is full and the material starts to pile up in the lower part of the conduit, its pressure against the switch diaphragm **56** will open the switch which is connected in the motor circuit that drives the upper conveyor **41** delivering material to the upper end of the chute. When the material falls away from the diaphragm, the switch will close again and additional material will be delivered to the upper end of the conduit to replenish the supply to the feed hopper.

According to the provisions of the patent statutes, we have explained the principle of our invention and have illustrated and described what we now consider to represent its best embodiment. However, we desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

We claim:

1. Feeding apparatus for use with a brick press provided with a molding cavity, said apparatus comprising a horizontally reciprocable charging box having an open top and bottom and being movable forward from a rear batch-receiving position to a discharging position over said cavity, a transfer hopper directly above the charging box and emptying into it in its rear position, a conveyor belt having one end delivering to said hopper, and an open-bottom feed hopper above the opposite end of the belt and substantially engaging it, the lower end of the front of the feed hopper being provided with an outlet slot, whereby the belt will convey from the feed hopper to the transfer hopper a layer of batch material, the widths of the charging box, transfer hopper and said slot transversely of the belt being substantially the same

to minimize agitation of the batch material after it leaves the feed hopper.

2. Feeding apparatus according to claim 1, including means for adjusting the width of said hopper slot when the width of the transfer hopper and charging box is changed.

3. Feeding apparatus according to claim 1, including an electric motor for driving the conveyor, an electric circuit for operating the motor, and a normally open switch in said circuit, the switch being in a position to be closed when the charging box is moved back into said batch-receiving position.

4. Feeding apparatus according to claim 1, including an electric motor for driving the conveyor, an electric circuit for operating the motor, a switch in said circuit that is closed only while the charging box is in said batch-receiving position, a normally closed switch in said circuit, and means actuated by the pressure of the batch material against it in the transfer hopper for opening said normally closed switch to stop the conveyor as soon as a quantity of said material has been delivered to the transfer hopper.

5. Feeding apparatus according to claim 1, including an electric motor for driving the conveyor, an electric circuit for operating the motor, a switch in said circuit

that is closed only while the charging box is in said batch-receiving position, a pair of normally closed switches, one of the switches being connected in said circuit, a second circuit containing the other switch, a delayed action relay energized by said second circuit and having a normally open switch in said motor circuit, and means actuated by the pressure of the batch material in the transfer hopper for opening said normally closed switches to stop the conveyor as soon as a quantity of said material has been delivered to the transfer hopper.

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