W. McQ. GENTLE.

COMPRESSING MACHINE.

APPLICATION FILED MAR. 6, 1912.

1,161,305.

Patented Nov. 23, 1915.

3 SHEETS—SHEET 1.

Fig. 1.

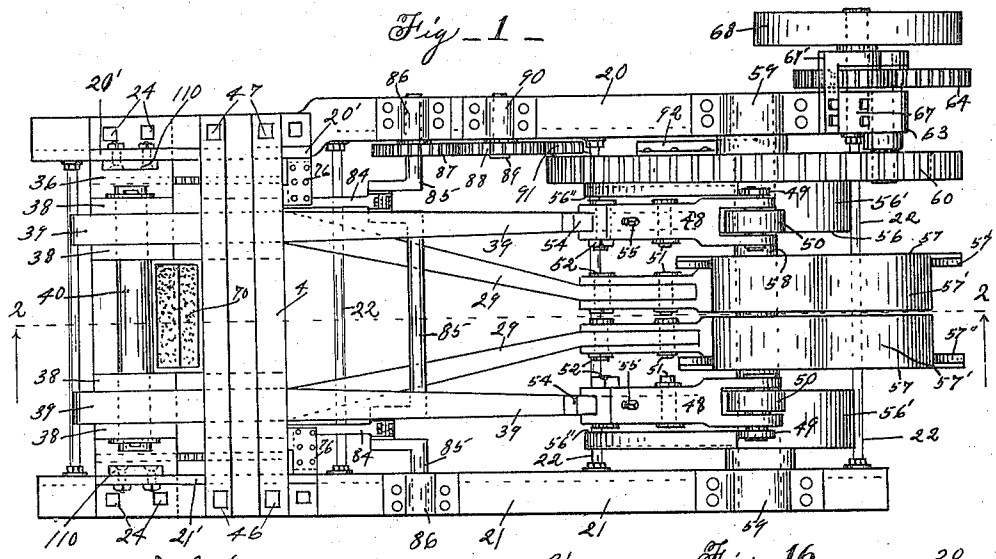

Fig. 2.

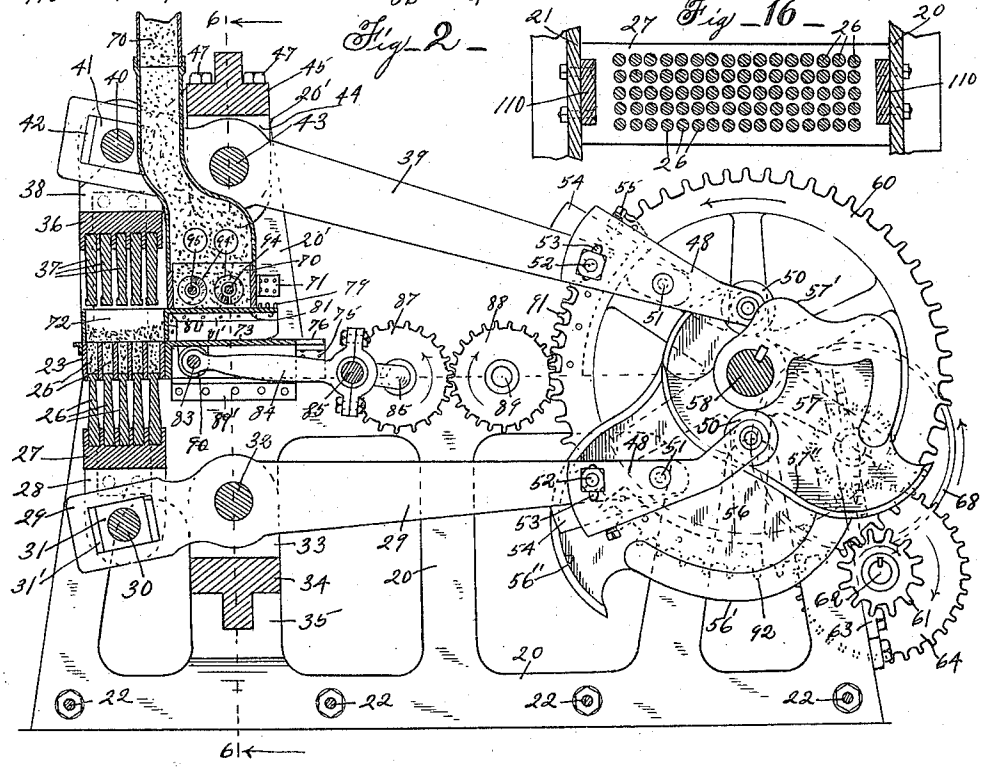

Fig. 16.

WITNESSES

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3 SHEETS—SHEET 2.

Fig. 3.

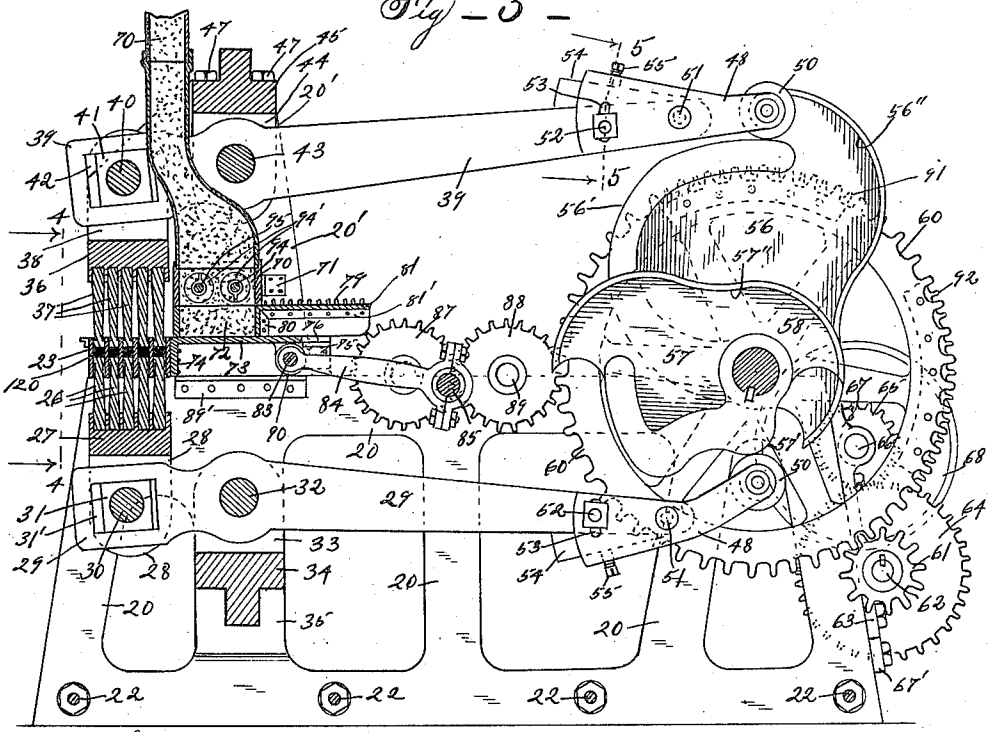


Fig. 4.

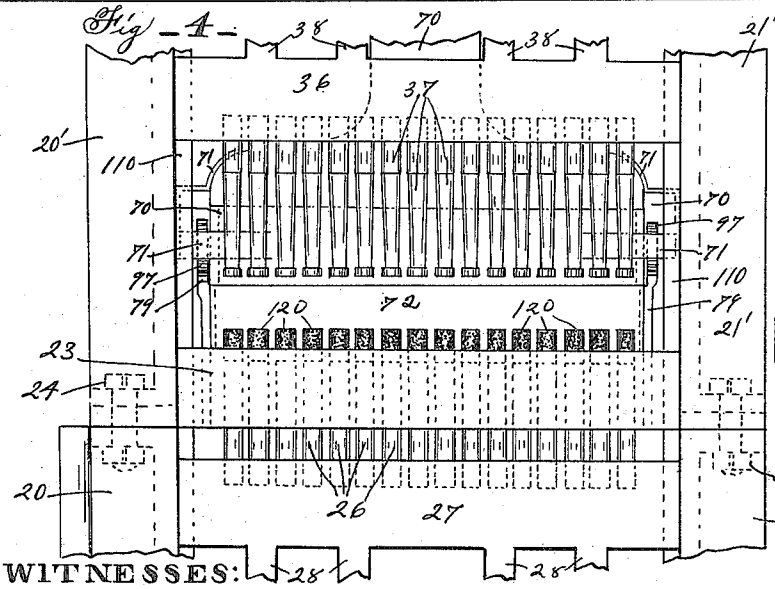
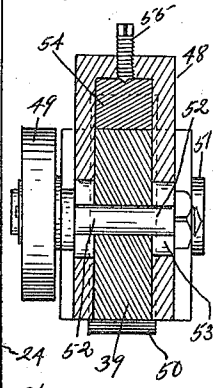


Fig. 5.



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3 SHEETS—SHEET 3.

Fig. 6.

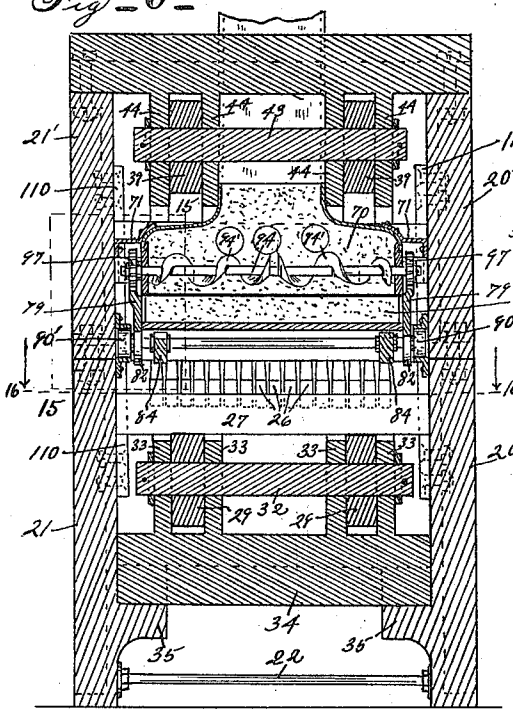


Fig. 7.

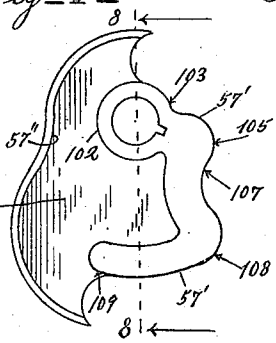


Fig. 8.

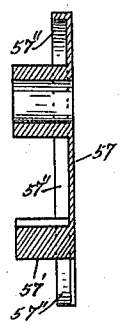


Fig. 9.

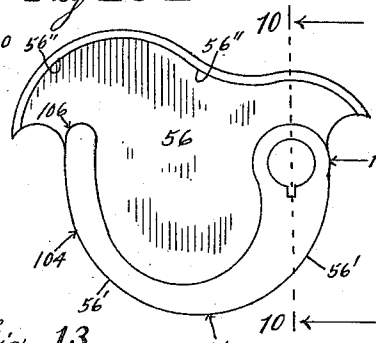


Fig. 10.

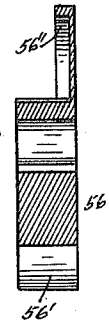


Fig. 11.

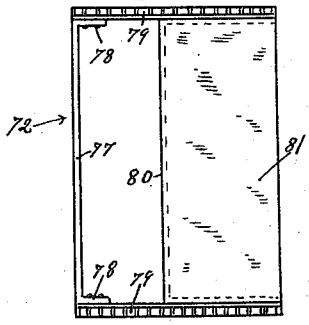


Fig. 13.

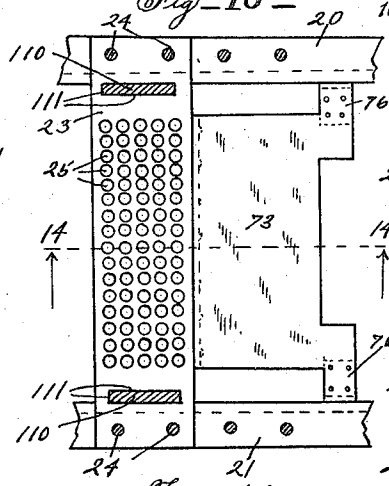


Fig. 15.

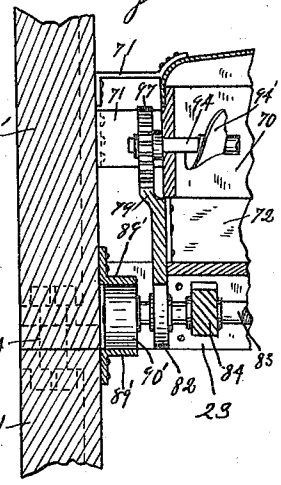


Fig. 12.

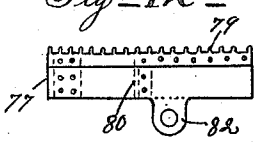
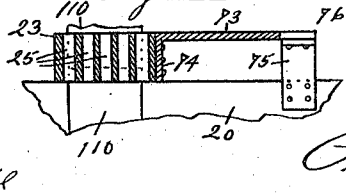


Fig. 14.



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UNITED STATES PATENT OFFICE.

WILLIAM McQUIT GENTLE, OF GREENWOOD, INDIANA.

COMPRESSING-MACHINE.

1,161,305. Specification of Letters Patent. Patented Nov. 23, 1915.

Application filed March 6, 1912. Serial No. 682,074.

To all whom it may concern:

Be it known that I, WILLIAM McQUIT GENTLE, a citizen of the United States of America, residing at Greenwood, in the county of Johnson, State of Indiana, have invented a certain new and useful Compressing-Machine; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a fuel briqueting machine, and it may be said to consist in the provision of the novel features, and in the novel and improved construction, arrangement and combination of parts and devices therein as will be apparent from the description and claims which follow hereinafter.

The chief feature of the invention consists of the facilities for applying great pressure to the material to be compressed. To this end a plurality of levers of great length and strength are fulcrumed on the frame and have one end of each adapted to cooperate to drive a plurality of plungers toward one another in mold boxes of substantially the same diameters as the plungers and with compressible material therein so that a very great pressure will be exerted simultaneously from two sides of the compressible material and the other end of said levers having rollers thereon adapted to pass over the cam surfaces of the cams on the cam shaft and said rollers are positioned relative to said shaft so that the upper ones are directly above said shaft and the lower ones directly below it, whereby said rollers are in vertical alinement with said shaft and whereby the power necessary to move said rollers away from said shaft will be equally distributed above and below it.

Another feature is that the mechanism is so constructed that this great pressure will be maintained for a fixed period, so that the compressed material will fully cohere before the pressure is released and the material is ejected from the molds, and during the period of this maintained pressure the machine continues in action to bring the cooperating parts into position for a repetition of compressing another charge of compressible material.

Another feature is that the heat in the compressible material is conserved by forming the stationary hopper to keep the material *en masse* until it is distributed and fed to the movable hopper.

Another feature is the novel and improved automatic means for conveying a charge of compressible material from the stationary hopper to the mold table where the molds are charged mechanically, and the combination of this movement to also eject from the face of the mold table the material that has previously been compressed in the molds and ejected from the molds to the surface of the mold table.

Other features and objects and advantages of the invention will be understood by those skilled in the art from the accompanying drawings and the following description and claims.

In the drawings Figure 1 is a plan view of the machine; Fig. 2 is a transverse section on the line 2—2 of Fig. 1; Fig. 3 is the same as Fig. 2 with the parts moved to the extreme compressing position. Fig. 4 is an end elevation of the machine looking along the line 4—4 of Fig. 3, with parts broken away and parts omitted, showing the compressed material discharged from the molds to the upper surface of the mold table. Fig. 5 is a section on the line 5—5 of Fig. 3, showing in detail the adjustable construction of the roller and of the compressing levers; Fig. 6 is a section on the line 6—6 of Fig. 2; Fig. 7 is a side elevation of one of the cams for controlling the movement of the lower compressing levers; Fig. 8 is a section on the line 8—8 of Fig. 7; Fig. 9 is a side elevation of one of the cams for controlling the movement of the upper compression levers; Fig. 10 is a section on the line 10—10 of Fig. 9; Fig. 11 is a plan view of the movable hopper and its associated parts; Fig. 12 is a side elevation of the same; Fig. 13 is a plan view of the mold table and its associated parts, showing the means for securing the mold table to the frame, and also the means for securing the false bottom of the movable hopper to the frame and the mold table; Fig. 14 is a section on the line 14—14 of Fig. 13; Fig. 15 is an enlarged view of the parts inclosed in the dotted square 15—15 of Fig. 6; and Fig. 16 is a section on the line 16—16 of Fig. 6, with parts omitted and parts broken away, showing a plan of the lower plunger plate and its associated parts.

There are shown in the drawings herein two frame plates 20 and 21 which are secured together at their base by cross rods 22, and above these plates are mounted the plates 20′ and 21′, which are secured to the frame plates 20 and 21. Upon these plates constituting the frame, are mounted all the parts of the machine mechanism. Mounted upon one end of the frame is a stationary mold table 23, which is secured to the plates 20 and 21 by bolts 24. The mold table contains a plurality of rows of vertically disposed cylindrical molds 25 equidistant apart, as shown in the drawings; but it is immaterial as to the shape, size or number of molds, for the mechanism herein shown will operate equally well with any sort of mold construction.

A plurality of plungers 26 are located beneath the mold table 23 in vertical alinement with the molds in said table, there being a plunger for each mold, and the top of said plungers normally close the lower ends of said molds, but said plungers have a movement entirely through said molds for the purpose of ejecting the compressed material from the mold after it has been compressed therein. The plungers 26 are shrunk in a plate 27, which has a reciprocating movement and which will be hereinafter explained.

Near each end of the plate 27 there are a pair of downwardly extending flanges 28 in which one end of each of the compression levers 29 is pivoted on a cross rod 30. Said rod 30 passes through a sliding block 31 which is slidably mounted in the slot 31 in the ends of the compressing levers 29, as shown in Figs. 2 and 3.

The levers 29 are fulcrumed on the rod 32, which passes through the upwardly extending flanges 33 of the T-shaped cross plate 34; said levers are positioned so that the pressure therefrom is evenly distributed to all the lower plungers. The ends of the cross plate 34 rest on and are partly embedded in the U-shaped flanges 35, which are integral with the side frames 20 and 21.

Above the mold table there is mounted a reciprocating plate 36, which has downwardly extending plungers 37, equal in number to and centered to pass into the molds of the mold table. The plate 36 has upwardly extending flanges 38 near each end thereof in which one end of the compressing levers 39 are pivoted on the cross rod 40. Said rod 40 passes through the blocks 41 which are slidably mounted in the slots 42 in the end of the compressing levers 39.

The levers 39 are fulcrumed on the cross rods 43 which pass through the downwardly extending flanges 44, which are integral with the inverted T-shaped plate 45: and said levers 39 are also positioned relative to the upper plunger plate so that the pressure from said levers is evenly distributed to all the upper plungers. Said plate is secured to the frame plates 20′ and 21′ by bolts 46 and 47; see Figs. 1, 2 and 3. On the other end of the levers 29 and 39 are secured adjustable bearing sleeves 48 upon which are mounted two rollers 49 and 50. The bearing sleeves 48 are pivotally secured to the levers 29 and 39 by the pins 51 and by a bolt 52 which passes through the side walls of the sleeves 48 and the levers 29 and 39. There is a slot 53 in the side walls of the sleeves 48 which in combination with the wedge 54 and the set screw 55 permit of adjustment of the levers 29 and 39 to any desired position with relation to the cams 56 and 57, which control the movement of said levers. Changing the position of the wedges 54 to either a greater or less depth in the sleeves 48 will necessarily alter the position of the levers and consequently also alter the position of the plungers, and by this means the proper position of the plungers relative to the mold boxes is attained. These cams 56 and 57 are secured to a shaft 58 in proper position to perform all their functions in exact time and accord with the other machine mechanism. In order that maximum power may be efficiently transmitted from the cams 56 and 57 to the rollers 49 and 50, said rollers are adapted to have the axes thereof disposed in vertical alinement with the shaft 58. The shaft 58 is mounted in the bearings 59 on the frame plates 20 and 21, as shown in Figs. 1, 2 and 3. Secured to the shaft 58 is a spur gear 60, which is driven by a spur gear 61 on a shaft 62 mounted in the bearing plate 63, which is secured to one end of the frame plate 20. On the other end of the shaft 62 there is a spur gear 64 which meshes with a gear 65 on a shaft 66. This shaft is mounted in the bearing 67 and bracket 67′, both of which are secured to the end of plate 20, see Fig. 1. On the other end of the shaft 66 there is secured a pulley 68 which is driven from some suitable source of power. As seen by the drawings the levers 29 and 39 are continually controlled by the cams 56 and 57 by means of the rollers 49 and 50.

The cams 56 control the two upper levers 39 and the cams 57 control the two lower levers 29. The action of these cams will be described later.

A stationary open bottom hopper 70 is located between and secured to frame plates 20′ and 21′ by means of straps 71. The bottom part of this hopper is substantially the size and shape of the mold containing portion of the mold table 23; and it is located above and to one side of said table, as shown in the drawings. The upper part of the hopper 70 is narrowed and may be of any form, size or shape so that a sufficient amount of compressible material may pass through by

gravity to the lower part of said hopper. A movable open-bottomed hopper 72 is normally located directly below the stationary hopper 70 and in communication or registry therewith. The length and width of the two hoppers are substantially the same. The depth of the sliding hopper 72 is sufficient to carry enough of the compressible material from the stationary hopper to the upper surface of the mold table to fully fill the molds once during each single revolution of the gear wheel 60.

A false bottom 73 is located beneath the movable hopper 72 and is secured to the mold table 23 and to the frame plates 20 and 21, as shown in Figs. 2, 3, 13 and 14. A downwardly extending flange 74 of the false bottom 73 is riveted to the mold table 23 and the rearward portion of the false bottom 73 is supported by means of angle plates 75, which are riveted to the flanges 76 of the false bottom and to the frame plates 20 and 21.

The movable hopper 72 is constructed as best shown in Figs. 2, 3, 11 and 12. A plate 77 has flanges 78 turned at right angles to said plate and are riveted to the forward end of two rack bar plates 79. A second plate 80 is flanged and riveted to the rack bar plates at a distance from the front plate 77 equal to the width of the stationary hopper, and this plate has a portion 81 turned back at a right angle with the plate 80 to form a false bottom for the stationary hopper when the movable hopper is moved to a position over the mold table 23. The false bottom 81 has downwardly extending flanges 81′ that are riveted to the rack bar plates 79. There are two downwardly extending flanges 82 integral with the rack bar plates 79 which form a bearing for a cross rod 83 as shown in Figs. 2, 3, 6 and 12. The purpose of the rod 83 is to connect the movable hopper 72 with a pair of pitman rods 84 which give an intermittent action to said hopper by the following means: One end of the pitman rods 84 is pivoted to the rod 83 and the other end is pivoted on the crank shaft 85. The crank shaft 85 is mounted in the bearings 86 secured to the frame plates 20 and 21. This crank shaft 85 has secured to it a gear 87 which meshes with a pinion 88 on the spindle 89 in the bearing 90 secured to the side plate 20.

The pinion 88 is driven by the segmental gears 91 and 92 which are secured to the side of the main gear 60 as shown in the drawings, Figs. 1 to 3. The segmental gears 91 and 92 are of sufficient length to give the pinion 88 a half revolution and consequently rotate the crank shaft 85 the same distance, whereby the movable hopper 72 will be actuated. The continued intermittent action upon the pinion 88 by the segmental gears 91 and 92, through gear 87, crank shaft 85 and pitman rods 84, will operate to cause the movable hopper 72 to alternately move from its position under the stationary hopper to a position directly over the mold table and then back to its former position, and this action is continued as long as the driving mechanism is in operation. To avoid friction and also to prevent binding in this hopper movement, there is provided a pair of rollers 90′ which are loosely mounted on the ends of the rod 83. These rollers 90′ travel in guide-ways 89′. These guide-ways consist of angle irons riveted to the frame plates as shown in Figs. 2, 3, 6 and 15.

As seen in Figs. 4 and 6, the upper part of the stationary hopper 70 is much narrower than the lower part, which latter is formed with extended ends and as it is indispensable that the compressible material be well distributed in the lower part of said hopper, for, unless the material is evenly distributed throughout the movable hopper, so that each mold will receive therefrom substantially the same amount of material, there will not be a uniformity of pressure applied to all the molds and consequently the molds receiving the smallest amount of material will be compressed to a less density than the others and produce either worthless or inferior briquets, and consequently a means has been provided for so doing, so that the molds will be evenly filled and thereby enable the same amount of pressure to be applied to the material in each mold. Said means consists of two parallel shafts 94 and 95 which have bearings in the end plates of the stationary hopper 70. A pair of spur gears 96 and 97 are secured to the shafts 94 and 95 outside the stationary hopper and in a position to engage the teeth of the rack bar plates 79 of the movable hopper 72. Secured to the shafts 94 and 95 inside of the stationary hopper 70 are screw plates 94′, a right hand and a left hand screw plate for each shaft, as shown in Figs. 2, 3 and 6. The intermittent action of the movable hopper 72 will rotate the shafts first in one direction and then in the other and consequently level and distribute evenly the material to all parts of the base portion of the stationary hopper where it will fall by gravity into the movable hopper 72 when the hoppers 70 and 72 are in registry.

The action of the cams 56 and 57 will now be described. As will be seen by the drawings these cams are of peculiar construction and, as has been heretofore stated, they continually control the pressure levers 29 and 39 by means of the rollers 49 and 50, and, as seen in the drawings, these rollers 49 and 50 are positioned directly above and below the cam shaft so that when the upper plungers are in their highest position and the lower plungers are in their lowest position the center of said rollers

are in a line vertical to the center of said cam shaft whereby the power necessary to elevate the upper rollers and depress the lower ones and thereby operate the levers to give the plungers their compressing action will be equally distributed above and below the shaft. The cams 56 control the upper pressure levers 29 and they are constructed with a convexed surface 56′ over which the roller 50 travels to give the levers their compressing movement, and also a concave surface under which the rollers 49 pass to return the compressing levers to a neutral position.

The cams 57 are similar in general construction to the cams 56, but the convexed surface 57′ over which the rollers 50 pass to give the levers 29 their compressing movement, is broken by a concave surface which operates to momentarily retard the compressing action of the lower levers. This retarded action prevents the ejectment of the compressed material 120 from the mold by the lower plungers until the upper plungers have released their pressure and are being returned to a neutral position. The levers 29 are returned to a neutral position by the concave surface 57″, under which the rollers 49 pass.

The movement of the cams 56 and 57 is in the direction of the arrow on gear 60. With the cam 56 moving as stated the roller 50 rides upon the surface 56′, whereby it is elevated and thereby causes the roller end of the lever to ascend. This movement depresses the plunger plate 36 and consequently the plungers 37, thereby giving said plungers their compressing action. During the travel of the rollers 50 over the surfaces 56′, from the point 100 to the point 101, the movement of the levers 39 is sufficient to depress the plungers 37 to a position of closing the upper ends of the molds and to enter therein far enough to drive the air out of and to settle the material therein and during this movement the rollers 50 and the lower levers 29 are traveling over the neutral surface 102 on the hub of cams 57. As has been stated heretofore, the lower plungers 26 always close the bottoms of the molds and it is now assumed that the molds are full of compressible material and both ends of the molds closed.

When the rollers 50 on the levers 39 reach the point 101 on the convexed surface 56′, and the rollers 50 on the levers 29 reach the point 103 on the convexed surface 57′, then the compression on the material in the mold begins from both ends, and said compression continues until the rollers 50 pass over the points 104 on convexed surface 56′ and 105 on convexed surface 57′. When compression is attained the pressure is maintained for a definite period while the rollers 50 pass over the surface from the points 104 to 106 on cam surface 56′, and from the points 105 to 107 on cam surface 57′ to cause the material to fully cohere before the pressure is released. Then the cam surface 56″ engages the outside rollers 49 and moves the levers 39 in an opposite direction, whereby the upper ends of the molds are opened and the plungers 39 moved up out of the way of the moving hopper 72.

As has been stated heretofore the rollers 50 on the lower levers 29 pass into the concave recess in the surface of the cam 57′ while the upper levers are releasing the pressure on the upper surface of the compressed material 120 in the mold. Then the continuation of the convexed surface from the points 107 to 108 on cam 57′ elevates the plungers 26 to eject the compressed material in the mold to the upper surface of the mold table. The plungers 26 are maintained in their elevated position by the rollers 50 on levers 29 passing over the surface of the cam 57′ from the points 108 to 109, and during this period the segmental gear 92 engages the pinion 88, and through the means heretofore described moves the movable hopper from its position under the stationary hopper to a position directly over the mold table, thereby ejecting the compressed material from the surface of said table and also conveying another charge of compressible material for refilling the molds. Then the concave cam surface 57″ engages the rollers 49 on the levers 29 and returns said levers and associated parts to a neutral position. This movement causes the plunger 26 to recede downward through the molds, thereby sucking a charge of compressible material out of the movable hopper into the molds. After the plungers 26 reach their lowest position the other segmental gear 91 engages the pinion 88 and through it and associated parts, returns the movable hopper 72 to its normal position under the stationary hopper 70. The return of the movable hopper 72 to this position causes the plate 77 of said hopper to sweep all excess material from the face of the mold table 23, thereby leaving all the molds exactly filled to a level with said table. This is a very essential feature, as it is necessary that all the molds be filled as nearly even as possible, so that a uniform pressure will be exerted in each and all molds alike. The compressed material 120, which is ejected from the molds and from the upper surface of the mold table, falls upon a traveling belt which is not here shown and upon which no claims are made, as the conveying mechanism is old and unpatentable.

There are two guide plates 110 which are bolted to the frame of the machine. These plates pass upward through slots 111 in each end of the mold table and the purpose of said plates is to keep the plunger plates

27 and 36 in exact alinement with the mold table. The reason for this construction is important, for it is indispensable that a positive means be provided for keeping the plungers and the molds in the mold table in exact alinement. As seen by the drawings this positive alinement is accomplished by passing the guide plates 110 through the slots 111 in each end of the mold table, whereby the guide plates are held so that the plunger plates in which the plungers are secured can move either upward or downward without getting out of exact alinement with the mold table; whereby the plungers can operate in said molds without binding therein or striking the edges thereof when entering the molds. The ends of the plunger plates 27 and 36 are grooved to fit the guide plates 110 and have a slidable movement along the surface of said plates.

Having described the different parts of the machine and the object of their construction, the general action and operation will now be described. Assuming that the parts are in the position shown in Fig. 2, with the molds filled with material and the segmental gear 91 in position to rotate the pinion 88 and its associated parts to return the movable hopper to its position under the stationary hopper. It will be easily seen that with power applied to the driving pulley 68, power will be transmitted through the train of gears to gear wheel 60, whereby the segmental gears 91 and 92 will be operated to give intermittent action to the movable hopper, thereby transferring compressible material from the stationary hopper to the face of the mold table, and in said movement also eject the compressed material 120 from the face of the mold table, and said action upon gear wheel 60 will also cause the cams 56 and 57 to act upon the levers 29 and 39 to cause them and their associated parts to compress the material in the molds and also to eject it to the surface of the mold table. This continuity of action is entirely automatic and needs only nominal attention of an operator.

I claim:

1. In a fuel briqueting machine the combination of a mold, plungers to enter the mold, a stationary hopper, a movable hopper, levers for operating the plungers and cams for operating said levers, sleeves on the levers and means for altering the position of said sleeves whereby the levers will be moved to adjustably alter the position of the plungers relative to said mold.

2. In a fuel briqueting machine the combination of a mold, plungers to enter the mold, a stationary hopper, a movable hopper, levers for operating the plungers and cams for operating said levers, sleeves pivotally mounted on said levers, wedges in said sleeve and means for altering the position of said wedges whereby the sleeves will be moved to change the position of the levers and thereby adjustably alter the position of the plungers relative to said mold.

3. In a fuel briqueting machine the combination of, molds, upper and lower plungers to enter the molds, a stationary hopper, a movable hopper, a shaft, levers for operating the plungers and cams for operating the levers, sleeves on said levers, rollers on said sleeves, said rollers being positioned relative to said shaft so that when the upper plungers are in their highest position and the lower plungers are in their lowest position the centers of said rollers are in a line vertical to the center of said shaft and on opposite sides thereof substantially as described.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses at Los Angeles, county of Los Angeles, State of California, this 27th day of February A. D. 1912.

WILLIAM McQUIT GENTLE.

Witnesses:

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A. H. LIDDERS.