Feb. 16, 1926. 1,573,565

P. C. MULLIGAN

ART OF BRIQUETTING

Filed July 21, 1924 5 Sheets-Sheet 1

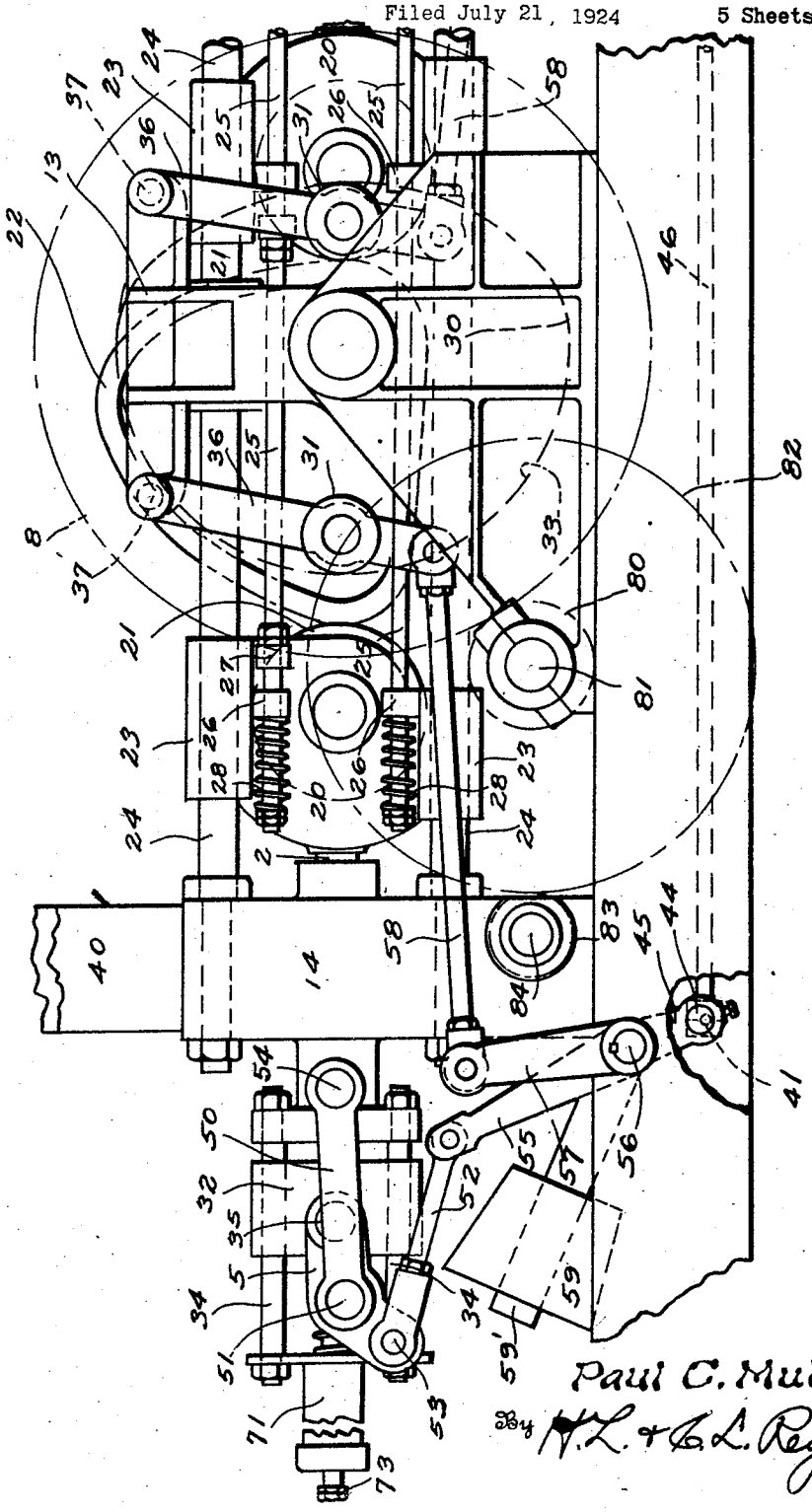


Fig. 1

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Filed July 21, 1924 5 Sheets-Sheet 2

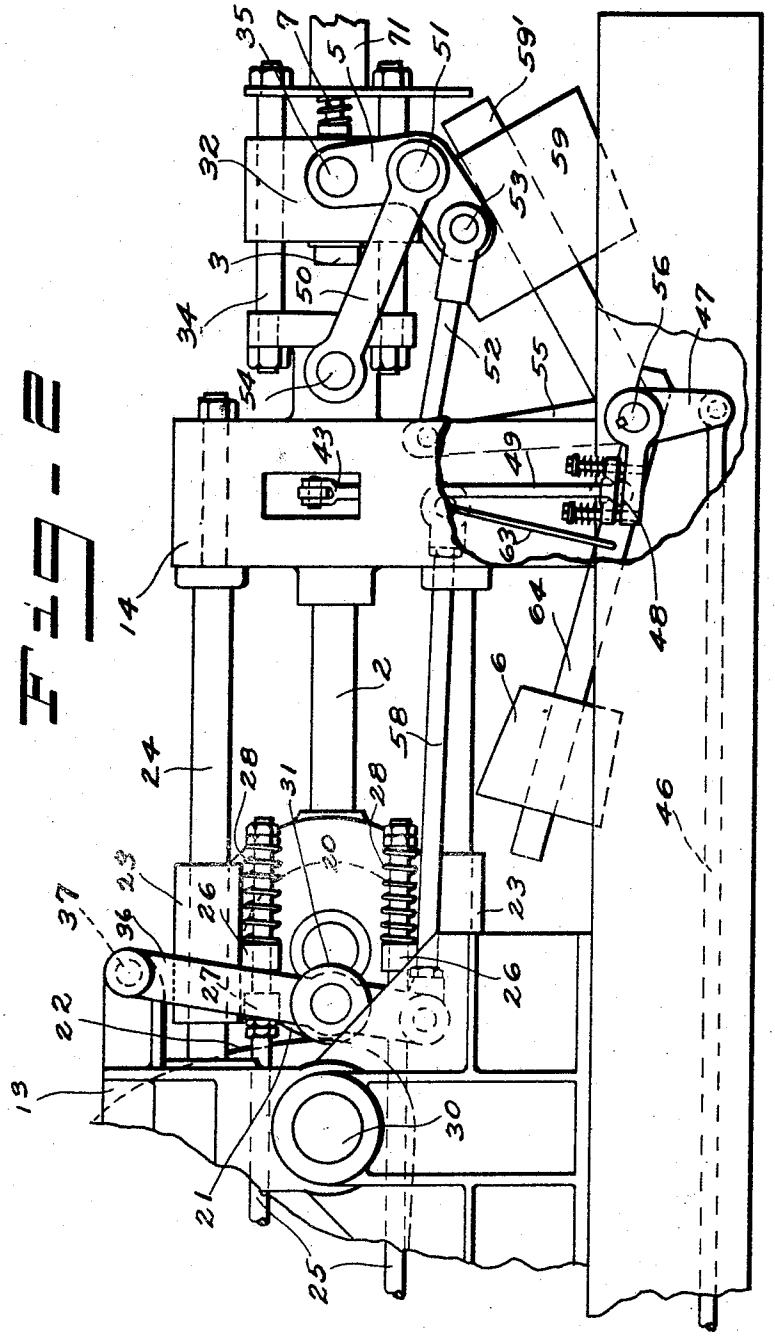


Fig. 2

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ART OF BRIQUETTING

Filed July 21, 1924 5 Sheets-Sheet 3

Fig. 4

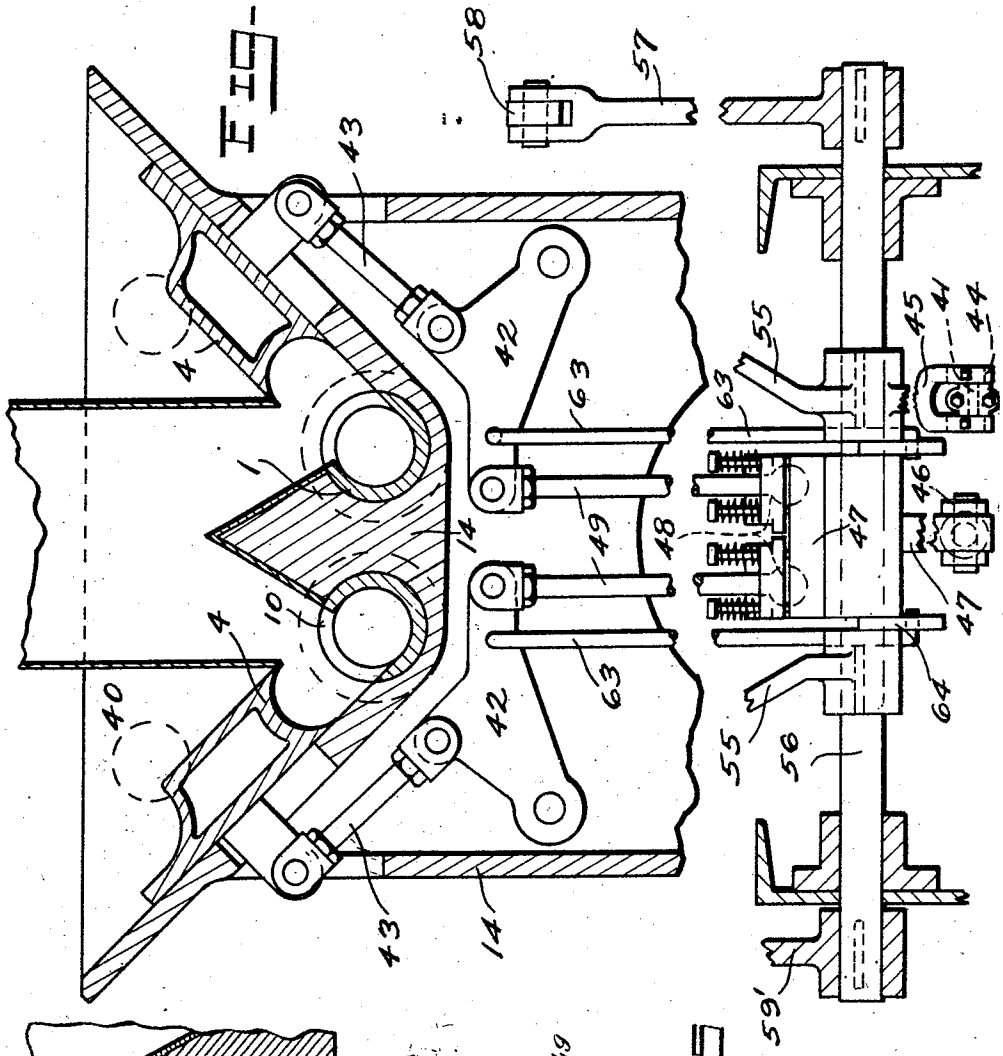
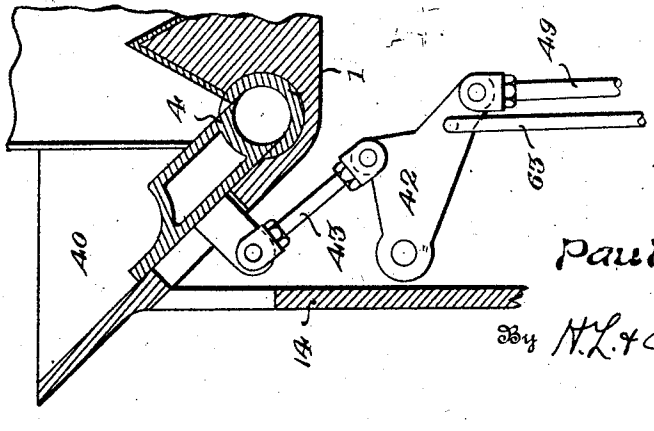


Fig. 5



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ART OF BRIQUETTING

Filed July 21, 1924 5 Sheets-Sheet 4

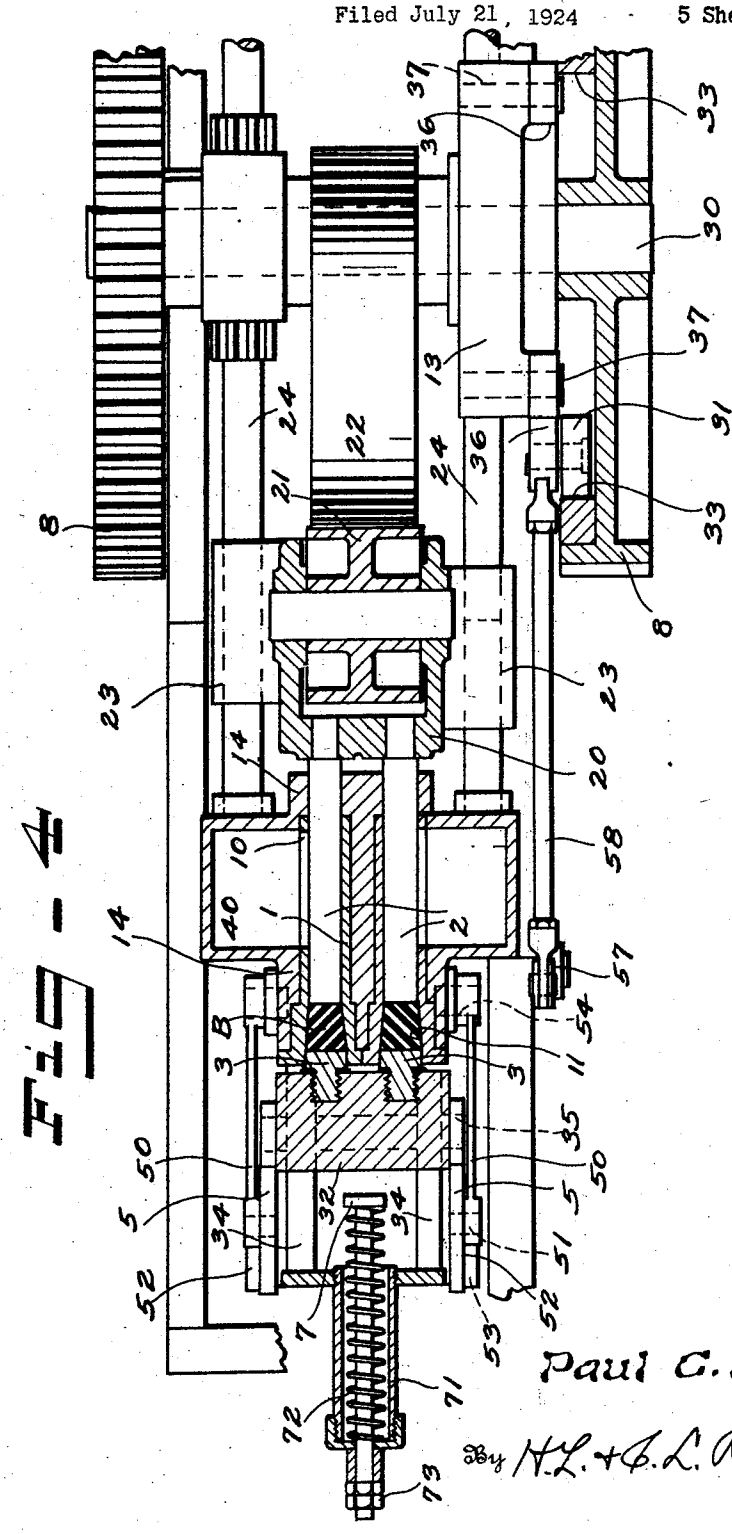


Fig - 4

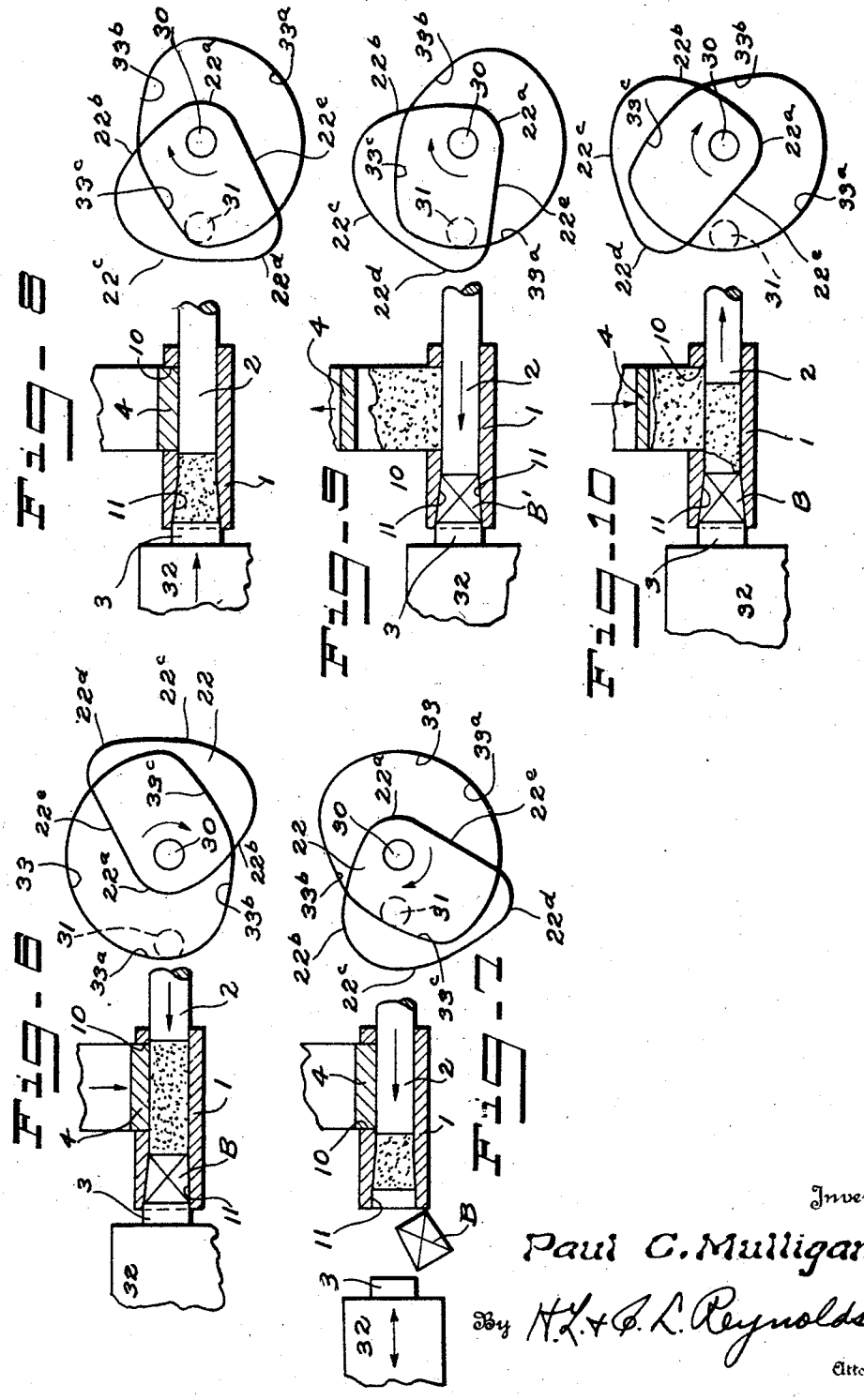
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ART OF BRIQUETTING

Filed July 21, 1924 5 Sheets-Sheet 5



Patented Feb. 16, 1926. 1,573,565

UNITED STATES PATENT OFFICE.

PAUL C. MULLIGAN, OF SEATTLE, WASHINGTON, ASSIGNOR TO HIMSELF, HERBERT G. SWALWELL, ISAAC M. FOSTER, AND LUTHER J. HULL, ALL OF SEATTLE, WASHINGTON.

ART OF BRIQUETTING.

Application filed July 21, 1924. Serial No. 727,321.

To all whom it may concern:

Be it known that I, PAUL C. MULLIGAN, a citizen of the United States of America, and resident of the city of Seattle, in the county of King and State of Washington, have invented certain new and useful Improvements in the Art of Briquetting, of which the following is a specification.

My invention relates to an improvement in the art of briquetting, and in one aspect is embodied in an improved press for making briquettes. In another aspect it comprises an improved method of forming briquettes, especially by employing a plurality of mold-forming members, one of which is a reciprocable ram, whereby the briquette after its formation under pressure, is retained under pressure notwithstanding the removal or retraction of the reciprocable ram, until the initial tendency of the particles to rebound and separate has been overcome.

Commercial manufacture of briquettes from carbonized wood waste has heretofore been impracticable, owing to the tendency of the particles to separate, causing expansion of the briquette, immediately upon its formation. My present invention is particularly intended for use in the practical, commercial manufacture of briquettes from such materials, although it will be understood that it will operate with equal or greater success with less resilient materials.

It will be understood then, that it is an object of my invention to provide a method and means whereby briquettes when formed may be held under pressure for a time sufficient to counteract the initial tendency to expand, and until the particles have set in their compressed relation.

A further object is the provision of an improved press whereby briquettes may be conveniently, economically and rapidly manufactured.

A further object is the provision of improved feeding means for the briquette material, which will cooperate with the mold-forming members.

A further object is the provision of a generally improved and simplified briquette press, and the provision therein of means for applying sufficient pressure to the materials, yet capable of being released or of relieving such pressure in case of danger or overloading of the mold.

My invention comprises the novel press and the combination of parts therein, and the novel method, all for forming briquettes, as shown in the accompanying drawings, described in this specification, and particularly defined by the claims terminating the same.

In the accompanying drawings I have shown, both diagrammatically and in detail, a preferred form of the briquette press, by means of which my improved method may be carried out, the diagram illustrating more particularly the cycle of operations comprising my method.

Figure 1 is an elevation, with parts broken away, of the left hand end of the press, and Figure 2 a like view of the right hand end with parts in the two views shown in the positions they would occupy at a selected instant in the cycle of operation.

Figure 3 is a transverse section through one end of the device, illustrating particularly the feeding means and operative connections between the two ends.

Figure 4 is a horizontal section through one end of the press, taken on the axis of the molds.

Figure 5 is a detail section similar to Figure 3, showing the feed mechanism in its advanced position.

Figures 6, 7, 8, 9 and 10 are diagrams, respectively indicating the successive steps in the cycle of operation of the press.

According to my invention the briquette is formed in a mold which includes an open-ended mold sleeve 1, a ram 2, reciprocable in one end of said sleeve, and a head 3 which is adapted to close the open delivery end of the mold sleeve against pressure exerted by the ram 2, thus to form the briquette within the mold sleeve 1 and between the head 3 and the ram 2. The mold sleeve has an entrance or feed aperture 10 toward which a feeder 4 advances material from a hopper 40. This feeder in certain positions cooperates with the mold sleeve 1 and in effect, at such times, forms one of the mold-forming members. Means are provided for suitably controlling the move-

ments of the ram 2, the head 3 and the feeder 4, and I have found it possible to control these by means of two cams, the peripheral cam 22 controlling the ram 2 and the internal cam 33 controlling the head 3. The feeder is indirectly controlled from one of these, as the cam 33, as will be apparent hereinafter.

It will be understood that the machine may be, and preferably is, formed of a plurality, perhaps two, angularly-spaced units, so that like molds are formed at opposite ends of the machine, and it will be understood also, that additional molds and associated members are formed at each end, two being shown. The principle of operation however, will be understood by reference to a single mold only, and this cycle of operation has been illustrated in Figures 6–10 inclusive. By reference to these figures, and first to Figure 6, it will be seen that the head 3 is stationary and closes the delivery end of the mold sleeve 1, retaining in place therein the briquette B, which had previously been formed. Although the ram 2 has been retracted to its full extent to uncover the feed aperture 10, the briquette B is retained in place in the delivery end of the mold sleeve, preferably by making this delivery end slightly expanded beyond the normal diameter of the mold sleeve, or by slightly belling or flaring this end, as is indicated at 11. Thus any tendency of the briquette to expand peripherally or longitudinally, acting upon the inclined surfaces of the delivery end 11, merely tends to force it outward, and this tendency is restrained by the then stationary head 3.

In the phase represented in Figure 6 the feeder 4 has advanced to project loose materials into the mold sleeve 1, and has now closed the feed aperture 10. In so advancing the materials they are given an initial compression. The low point 22^a of the cam 22 is contacted with by a follower 21 (Figures 1, 2 and 4), and is about to advance the ram 2. The follower 31 (Figures 1, 2 and 4) is engaging a like low spot 33^a of the cam 33, and is about to retract the head 3.

The next step is shown in Figure 7. Riding over the rise 22^b of the cam 22, the ram 2 has advanced, and riding over the rise 33^b of the internal cam 33 the head 3 has been retracted simultaneously, and preferably by a slightly greater amount, until the briquette B has been forced forward by the advance of the material before the ram 2, and has dropped from the delivery end of the mold sleeve 1. In this action the fresh materials are given a second compression.

Following this the concentric portion 22^c of the cam 22 is reached, and the advance of the ram 2 is temporarily halted. However, by reason of the advance 33^c of the cam 33, the head 3 is rapidly returned to its place in the delivery end 11 of the mold sleeve, while the advance of the ram is temporarily halted. It will be seen, then, that the head 3 is only removed from position in the end of the mold sleeve long enough to permit expulsion of the formed briquette, but, by reason of halting of the ram, before any of the fresh material can be expelled. The end of this phase is shown in Figure 8.

Following this, and as seen in Figure 9, the head 3 is held in place by the concentric portion 33^a of its control cam, whereas the ram 2 is now advanced through the medium of the rise 22^d of the cam 22. The feeder 4 at this time is retracted, through means which will be described hereafter, and receives a fresh charge beneath it. The advance of the ram 2 gives the final compression to the new briquette B′ and advances it until it is entirely within the belled end 11 of the mold sleeve 1.

From this point on the cam 22 drops away rapidly at 22^e, thus permitting rapid retraction of the ram 2 while the head 3 remains in position. Reopening of the feed opening 10 then occurs and as the feeder 4 is again advanced, this delivers a fresh charge to the mold sleeve 1 and places the parts finally in the position shown first in Figure 6.

The diagrams, Figures 6–10 inclusive, represent elementarily, the steps which take place in my method, and represent in diagrammatic form, the parts of the machine which carry out such method. As I have stated above, I have found it most economical to employ a double-ended press with two or more molds at each end. Such an arrangement is illustrated in Figures 1–5 inclusive. A pair of mold sleeves 1 are formed as bushings fitting into a standard 14 forming part of the machine frame, and upon which the hopper 40 is likewise mounted. The rams 2 for each pair of mold sleeves likewise reciprocate in the standard 14, being controlled in its movement by the slide 20, which carries the cam follower 21 and which is guided for longitudinal movement by means of sleeves 23 formed upon the slide 20 and sliding upon the longitudinal guide rods 24. Such guide rods are conveniently supported between and tie together the standards 14 at opposite ends of the machine it being understood that one such standard is positioned at each side of the central shaft 30 carrying the cams 22 and 33. The slides 20 at opposite sides of the shaft 30 are connected for simultaneous actuation by means of tie rods 25 passing through lugs 26 formed upon the slides 20. The slides are relatively yieldable longitudinally of the rods, the inner faces of the lugs being engageable by collars or bumpers 27 fixed upon the rods 25 and springs 28

being interposed between the ends of the rods 25 and the lugs 26.

It will be noted that as the rams 2 at one end of the machine are advancing into the mold sleeve, the rams at the opposite end are being retracted, and this action is controlled through a single peripheral cam 22 by means of the tie rods 25. Thus, as the rams at the left end, for example, are being forced into the mold sleeve by means of the rise 22^b, the rams at the right end are being retracted through the pull of the connecting rods 25. When so retracted to clear the feed opening 10 there is, of course, no need for further retraction of the right hand ram, but the left hand ram must be given its final advance movement through the rise 22^d, and it is for this reason that the springs 28 are employed, these permitting yielding longitudinally between the two slides 20, the one at the right hand end being held by the concentric portion 22^c, while the ram at the left hand end is being farther advanced by the rise 22^d. It will be noted also that the portion 22^e is in fact cut away and for this portion of the movement of the left hand ram, for example, it is controlled wholly by rise of the right hand follower 21 along the rise 22^b, motion being communicated through the tie rods 25. This cutting away of the portion 22^e is merely to avoid the necessity for machining the same, inasmuch as there is no requirement that the follower 21 actually engage this portion of the cam 22.

The actual head 3 is preferably formed as a hardened head which can be screwed or otherwise held by a slide 32 suitably supported from the standards 14, although in effect the slide forms part of the head. Movement of the slide 32 is preferably controlled through a toggle lever arrangement, the levers 5 being pivoted upon trunnions 35 at the sides of the slide 32, and being fulcrumed at 51 upon the end of the link 50, which in turn is pivoted at 54 upon the standard 14. Movement of the lever 5 is initiated through a link 52 pivoted to the lever 5 at 53, the link 52 being moved by an arm 55. By making the link 52 adjustable in length, the throw of the heads 3 is controlled as desired.

The lever 55 is keyed to a transverse rock shaft 56, to which is also keyed an arm or arms 57, these being connected through links 58 to an arm 36 pivoted at 37 to a frame member 13 and this arm 36 carrying the cam follower 31. By this means movement of the cam follower over a rise such as 33^b of the cam 33, will, through the connections described, break the toggle formed between the pivots 35, 51 and 53, and will retract the slide 32 carrying the heads 3. It is preferred that the heads should not be moved positively to a closure, as this would cause damage in the event of excess material or foreign matter becoming jammed in the delivery opening of the mold sleeve 1, and for that reason I have provided counterweights 59, adjustable along the arms 59′ which are likewise keyed upon the shaft 56, which act when the follower 31 passes over the drop 33^c, to move the heads 3 toward the end of the mold sleeve. In the event of the heads meeting an obstruction, the movement of the counterweights 59 is halted and the machine will not jam nor break.

Inasmuch as the movement of the feeder 4 at one end of the machine may be made to coincide with the movement of the heads 3 at the opposite end of the machine, I have found it convenient to connect these two parts at opposite ends and thus operate the feeders from the same cam as the heads. To accomplish this, one of the arms 55 is provided with a second arm 45 which is connected through a link 46 to an arm of a bell crank lever 47, which is loose upon the shaft 56 at the opposite end of the machine.

Through a yieldable ball and socket connection, illustrated at 48, the other arm of this bell crank lever 47 is connected to thrust links 49 which in turn actuate individual bell crank levers 42 connected by links 43 to the feeder 4. The links 43 are adjustable in length to vary the position of the feeder 4 at the ends of its stroke, and it will be noted that the lower ends of the feeder are shaped to correspond to the bore of the mold sleeve 1, and are formed to enter the feed aperture 10 in such way as to prevent leakage therefrom while the ram 2 is moving through the mold sleeve. In this manner also the inner surface of the feeder is scraped clean by the ram in its advance.

It will be noted that the thrust links 49 serve only to raise or retract the feeder 4, and in order to lower or advance them, that is to give an initial compression to fresh material entering beneath the feeder, I employ preferably a counterweight 6 upon an arm 64, pivoted to the shaft 56 and connected to the bell crank levers 42 by means of the links 63. By such means, in case of foreign matter or other obstructions entering between the feeder and the edge of the mold sleeve, the downward movement of the counterweight to close the feeder will be interrupted, and though the bell crank lever 47 continue its movement, the yieldable connection at 48 will give and will thus prevent breakage of the parts.

In order to vary the throw of the feeder, some adjustable means may be provided, and this is conveniently done at the connection between the arm 45 and link 46. At this point, therefore, I may provide a pivot pin 41 secured between the two trunnions 44 which are eccentric to the pin 41 and which are received in the end of the arm 45. The pin receives the end of the link 46. As the

arm 45 is a short one, and as the axis of the pin 41 is adjustable towards and from the pivot 56 of the arm 45, its throw is varied and consequently the throw of the mechanism following thereafter is also changed and to a considerable extent magnified.

In order to break the force of the slide 32 carrying the heads 3 as it moves open, and to start it immediately upon its return movement, which must be rapid, I may provide a bumper 7, which is shown in the form of a bolt, projectible from a casing 71 toward the slide 32 by means of a spring 72. The amount of projection of the bolt 7 and also the tension upon the spring 72, may, of course, be adjusted, as by means of the nuts 73.

It is believed that it will be apparent from the above description that as material is fed into the hopper 40 it will drop to the bottom thereof, and after each upward movement of the feeder 4 it will be caught thereby and the amounts forced into the mold sleeve 1 will be given an initial compression by the downward movement of the feeder. Thereupon the rams at this end, actuated by the cam 22, will advance this material, again compressing it somewhat against the heads 3, and expelling a previously formed briquette, the head 3 being withdrawn by operation of the toggle connections described. After retraction of the rams the heads 3 will hold the material, which has a tendency to rebound and expand, against the flared delivery end 11 of the mold sleeve, until this tendency has been overcome. This requires only an instant, for it is the initial rebound of the material, as the ram moves away, which tends to break up the briquette which has just been formed and which is not as yet homogeneous. Movement of the heads at one end controls movement of the feeder at the opposite end, and the mechanism then goes through the same cycle, advancing a new charge into the mold sleeve and compressing it, expelling a previously formed briquette, and finally completing the compression of the new charge.

The mechanism is simple, two cams controlling the entire operation for both ends and for a plurality of molds and feeders. It is provided with means permitting yielding at the several points where damage may occur if the machine becomes clogged, and yet it is entirely positive in its action. The pressure applicable to the briquettes may be varied merely by shifting the counterweights upon their arms and the various dimensions of the briquette may be varied somewhat and all parts of the machine adjusted to take care of wear and contingencies arising during the process of manufacture.

The drive connection, of course, is immaterial, but as shown herein it comprises a pair of large gears 8 to one of which the cam 33 is secured, these gears being keyed upon the shaft 30, and pinions 80 in mesh with the gears 8. Upon the shaft 81 to which the pinions 80 are keyed, is secured a gear 82 which in turn is driven from a pinion 83. The latter is mounted upon a shaft 84 to which a pulley or other drive means may be secured. This gives a double reduction between the power source and the cam shaft 30, and provides ample power in the cams for the pressures required in forming the briquettes.

What I claim as my invention is:

1. In a briquetting press, in combination with a mold sleeve, a head movable to close one end thereof, and a ram reciprocable in its other end, means for controlling the movements of said head and ram to advance a charge before the ram to expel a previously formed briquette, then to close the delivery end of the sleeve with the head after expulsion of the said briquette and before expulsion of the said charge, then to advance the ram to complete the compression of the charge, then to withdraw the ram, and finally to withdraw the head as the ram begins its next advance.

2. In a briquetting press, in combination with a mold sleeve and a pair of opposed compression members cooperating to compress and expel a charge in said sleeve, means for controlling the movements of said compression members to advance one through the sleeve and simultaneously to withdraw the other from its delivery end, then to return the second member to close said delivery end, then to continue the advance of the first member towards the delivery end, and finally to retract said first member.

3. In a briquetting press, in combination with a mold sleeve having a feed aperture in its side and an open delivery end, a head movable to close said delivery end, a ram reciprocable in said mold sleeve past the feed aperture, a feeder movable to advance a charge through said feed aperture and to close it, and means controlling the movements of said head, said ram, and said feeder to advance a charge before said ram towards the delivery opening and simultaneously to withdraw said head to permit expulsion of a previously formed briquette, the feeder being maintained in position to close the feed aperture, then to return said head after expulsion of said briquette to close the delivery end, then to continue the advance of the ram to complete compression of the charge, the feeder being meanwhile retracted, and finally to retract said ram and advance the feeder with a fresh charge.

4. In a briquette press, in combination, mold forming members including a reciprocable ram, said members cooperating to com-

press a charge, and means for retaining the briquette thus formed under pressure prior to its release and after withdrawal of the ram.

5. In a briquette press, in combination, a plurality of mold-forming members including a sleeve, a ram reciprocable therein, and a head movable to open or close the end of said sleeve opposite the ram, said members cooperating to receive a charge, compress it, and expel the briquette after its formation, said sleeve being flared towards said head and cooperating therewith to retain the briquette under pressure after its formation and prior to its expulsion.

6. In a briquette press, in combination with a mold sleeve having a delivery end, a ram reciprocable therein to compress a charge and to expel a previously formed briquette, and a head movable to close or to open said delivery end of the sleeve, said sleeve and head cooperating to maintain a briquette in the sleeve under pressure after its formation and removal of the ram, and before its expulsion.

7. In a briquette press, in combination with a mold sleeve having a slightly expanded delivery end, a ram reciprocable in the opposite end of the sleeve to compress a charge and to expel a previously formed briquette, and a head for closing the delivery end during and for a period after compression of the briquette.

8. The method of forming briquettes with a ram reciprocating within a mold which consists in advancing the ram into the mold to compress a charge of material therein to form the briquette, and then maintaining the briquette under pressure for a period following retraction of the ram.

9. In a briquette press, in combination, two spaced sets of members cooperable to form a mold, a single set of control means positioned between said sets of mold-forming members, means connecting said control means with each of said sets of mold-forming members to actuate alternate sets in one direction, and means connecting like parts in each set of mold-forming members to actuate each other alternately in the reverse direction, said latter means including a yieldable connection.

10. In a briquette press, in combination, a set of mold-forming members including a mold sleeve, a ram reciprocable therein, and a head adapted to close the delivery end of said sleeve, two cams operable to control the ram and head, respectively, a second set of mold-forming members positioned beyond the cams from the first set, means connecting one cam with each ram to force it into the mold sleeve, connecting rods extending between said rams to retract each by the projection of the other, springs interposed between said connecting rods and the rams and yieldable to permit limited relative reciprocation of the rams, and operative connections between each head and the head-operating cam.

11. In a briquette press, in combination, a set of mold-forming members including a mold sleeve, a ram reciprocable therein, and a head adapted to open and close the delivery end of said sleeve, two cams operable to control the ram and head, respectively, a second set of mold-forming members positioned beyond the cams from the first set, operative connections between one cam and each head to effect positive movement of the heads alternately away from the sleeve and permitting such movement at all times, yieldable means for moving each head towards the mold, and operative connections between the other cam and said rams to reciprocate the latter.

12. In a briquette press, in combination, a set of mold-forming members including a mold sleeve, a ram reciprocable therein, and a head adapted to open or close the delivery end of said sleeve, two cams operable to control the ram and head, respectively, a feeder reciprocable to advance material into said mold, a second set of mold-forming members and a feeder therefor operable from said cams alternately with the first set, operative connections between each head and the head-operating cam, operative connections between each ram and the ram-operating cam, and means operatively connecting the head-operating means of each mold with the feeder to the opposite mold.

13. A briquette press as in claim 12, the connections to the feeders including a member yieldable upon interruption of the advance movement of the feeder.

14. A briquette press as in claim 12, the connections to the feeders including means for adjusting the extent of movement thereof independently of the movement of the corresponding head.

15. A briquette press as in claim 12, the connections to the feeders including means for adjusting the extreme positions in the path of movement of the feeders independently of the movement of the corresponding head.

16. In a briquette press, in combination, a mold sleeve, a head movable to open or close the delivery end thereof, means for effecting positive movement of the head away from the mold sleeve, and gravity-operated means for moving said head towards the mold sleeve.

17. In a briquette press, in combination, a mold sleeve, a head movable to open or close the delivery end thereof, a cam controlling movement of said head, operative connections between said cam and head to effect positive movement of the head away from the sleeve and permitting such move-

ment at all times, and yieldable means for moving said head towards the mold sleeve.

18. In a briquette press, in combination, a frame member, a mold sleeve supported therein, a head movable to open or close the delivery end of said sleeve, a cam controlling movement of said head, a toggle lever pivoted by one end to said head, operative connection between its other end and said cam, and a link pivotally supporting said lever between its ends from the frame member.

19. A device as in claim 18, the pivot of the toggle lever upon the head lying always at the same side of a line connecting the two pivots of the link, and yieldable means for moving said head towards the mold sleeve, the cam being operable only to move the head away from the sleeve.

20. In a briquette press, in combination, a frame member, a mold sleeve supported therein, a head movable to open or close the delivery end of said sleeve, a cam controlling movement of said head, a toggle lever pivoted by one end to said head, operative connection between its other end and said cam, a link pivotally supporting said lever between its ends from the frame member, and spring means positioned in the path of said head to check its movement away from the sleeve and to initiate its return movement.

21. In a briquette press, in combination, a mold, a hopper thereabove and communicating therewith, a feeder reciprocable therein, means for positively retracting said feeder, and yieldable means for advancing the feeder.

22. In a briquette press, in combination, a mold, a hopper thereabove and communicating therewith, a feeder reciprocable therein, means for positively retracting said feeder, and a weighted arm operable to advance the feeder.

23. In a briquette press, in combination, two molds spaced at opposite ends of the machine, a hopper above and communicating with each mold, a feeder reciprocable in each hopper, a transverse rock shaft adjacent each mold, cam means operatively connected to oscillate each rock shaft, a bell-crank lever loose upon each rock shaft and operatively connected to the adjacent feeder, and operative connection between each bell-crank lever and the rock shaft at the opposite end.

24. In a briquette press, in combination, two mold sleeves spaced at opposite ends of the machine, a hopper above and communicating with each mold, a head movable to cooperate with each mold sleeve in forming a mold, a feeder reciprocable in each hopper, a transverse rock shaft adjacent each mold, cam means operatively connected to oscillate each rock shaft, a lever loose upon each rock shaft and operatively connected to the adjacent feeder, means energized from each rock shaft to operate the adjacent head, and operative connection between each of said levers and the rock shaft at the opposite end.

25. In a briquette press, in combination, two mold sleeves spaced at opposite ends of the machine, a hopper above and communicating with each mold, a head movable to cooperate with each mold sleeve in forming a mold, a feeder reciprocable in each hopper, a transverse rock shaft adjacent each mold, cam means operatively connected to oscillate each rock shaft, a lever loose upon each rock shaft and operatively connected to the adjacent feeder, means energized from each rock shaft to operate the adjacent head, operative connection between each of said levers and the rock shaft at the opposite end, and means in said latter connections to vary the throw of the feeders.

26. In a briquette press, in combination, two mold sleeves spaced at opposite ends of the machine, a hopper above and communicating with each mold, a head movable to cooperate with each mold sleeve in forming a mold, a feeder reciprocable in each hopper, a transverse rock shaft adjacent each mold, cam means operatively connected to oscillate each rock shaft, a lever loose upon each rock shaft and operatively connected to the adjacent feeder, means energized from each rock shaft to operate the adjacent head in one direction, a weighted arm fixed upon each rock shaft to operate the corresponding head in the opposite direction, and operative connection between each of said levers and the rock shaft at the opposite end.

27. In a briquette press, in combination, two mold sleeves spaced at opposite ends of the machine, a hopper above and communicating with each mold, a head movable to cooperate with each mold sleeve in forming a mold, a feeder reciprocable in each hopper, a transverse rock shaft adjacent each mold, cam means operatively connected to oscillate each rock shaft, a lever loose upon each rock shaft and operatively connected to the adjacent feeder, means energized from each rock shaft to operate the adjacent head in one direction, said latter means including a connection yieldable under extraordinary stresses, a weighted arm fixed upon each rock shaft to operate the corresponding head in the opposite direction, and operative connection between each of said levers and the rock shaft at the opposite end.

28. In a briquette press, in combination, a mold sleeve having a side-opening feed aperture, a hopper leading thereto, a ram reciprocable in said sleeve past the feed aperture, a feeder reciprocable in said hopper, the advancing end of said feeder entering the said feed aperture and its face conform-

ing to the inner periphery of the mold sleeve, and means controlling the movement of said feeder and ram to maintain the former in advanced position until the ram has advanced therepast.

29. In a briquette press, a mold sleeve having an open delivery end, the axial bore thereof being formed to resist radial and backward pressures.

30. In a briquette press, a mold sleeve having an open delivery end, the axial bore of the sleeve at its delivery end being flared outwardly.

31. In a briquette press, a mold sleeve having an open delivery end, the axial bore thereof being formed to resist radial and backward pressures, and means associated therewith for resisting outward pressures.

32. In a briquette press, a mold sleeve having an open delivery end, the axial bore thereof being formed to resist radial and backward pressures, means associated therewith for resisting outward pressures, and a ram movable through said sleeve to advance material towards and to compress it within said delivery end.

33. In a briquette press, a mold sleeve having an open delivery end, the axial bore of the sleeve at its delivery end being flared outwardly, and a head movable towards the said delivery end to resist outward pressures, and removable therefrom.

34. In a briquette press, a mold sleeve having an open delivery end, the axial bore of the sleeve at its delivery end being flared outwardly, a head movable towards the said delivery end to resist outward pressures, and removable therefrom, and a ram movable towards said head to advance material through the sleeve and to compress it within said flared delivery end.

Signed at Seattle, King County, Washington, this 25th day of June 1924.

PAUL C. MULLIGAN.