W. M. GENTLE.

COMPRESSING MACHINE.

APPLICATION FILED OCT. 14, 1909.

988,328.

Patented Apr. 4, 1911.

5 SHEETS—SHEET 1.

Fig-3-

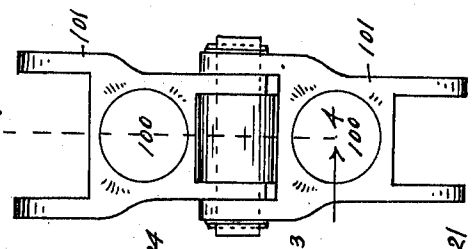


Fig-4-

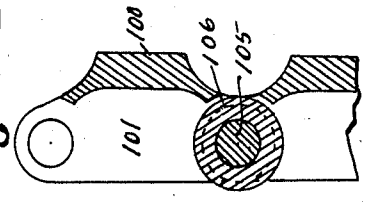


Fig-1-

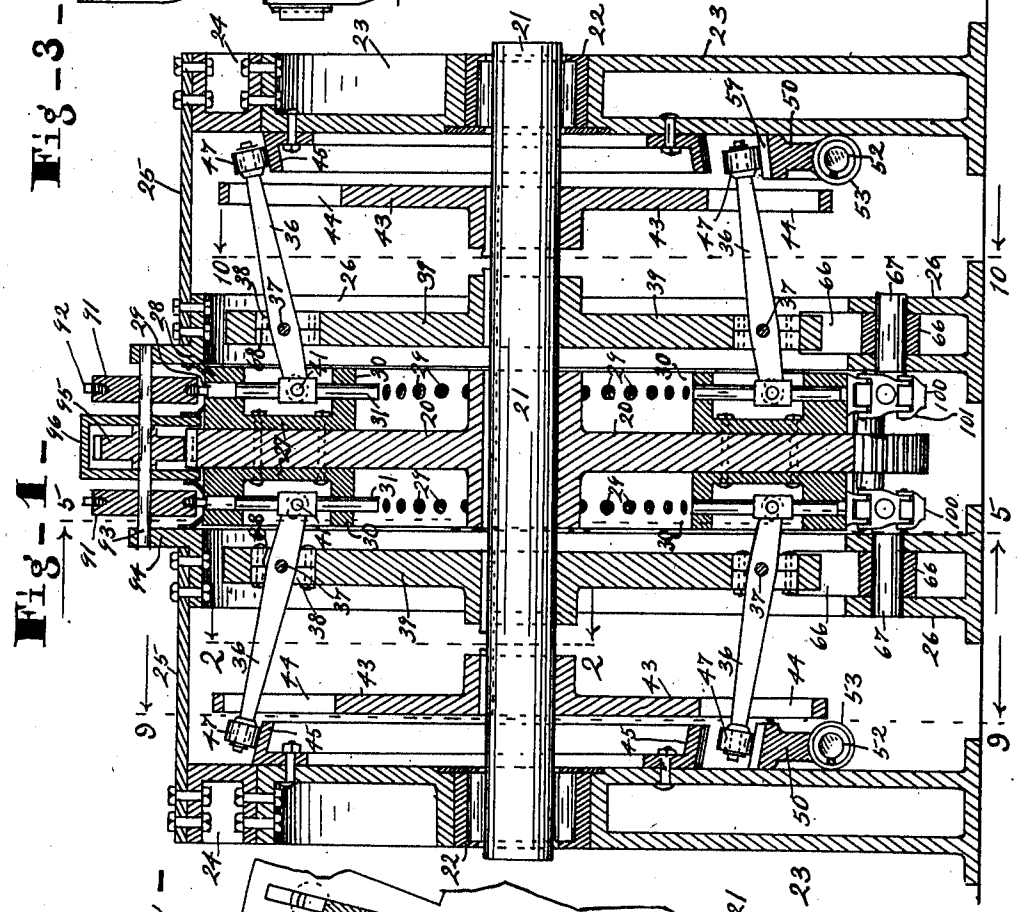
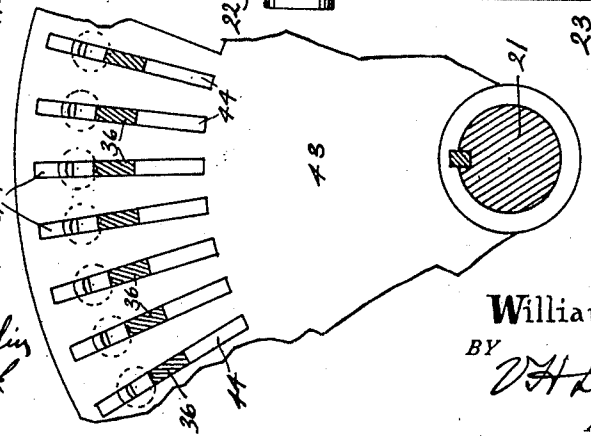


Fig-2-



WITNESSES:

O. M. McLaughlin

G. H. Bobst

INVENTOR.

William M. Gentle

BY

W. H. Lockwood

ATTORNEY.

W. M. GENTLE.

COMPRESSING MACHINE.

APPLICATION FILED OCT. 14, 1909.

988,328. Patented Apr. 4, 1911.

5 SHEETS—SHEET 2.

Fig. 5.

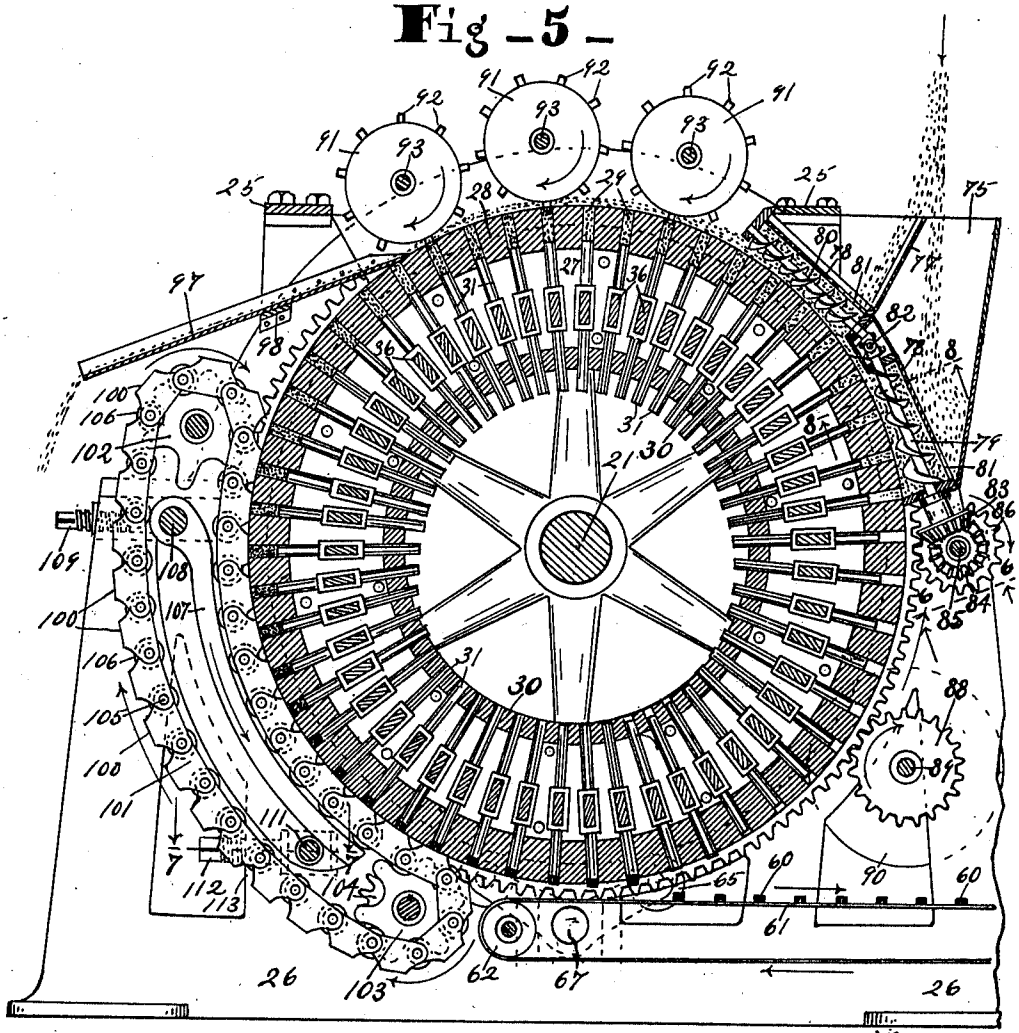


Fig. 6.

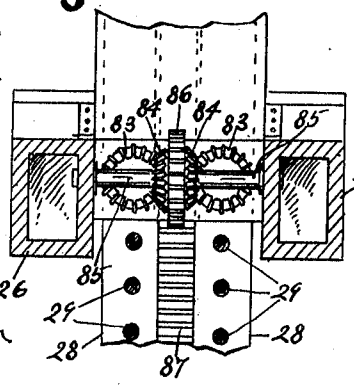


Fig. 7.

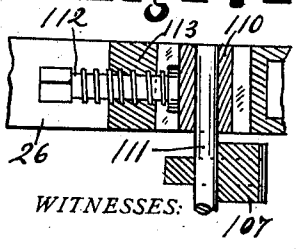
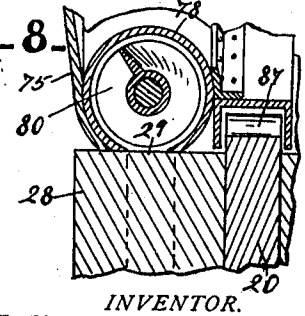


Fig. 8.



WITNESSES:

O. M. McLaughlin

G. H. Bonifay

INVENTOR.

William M Gentle.

BY

W. H. Lockwood

ATTORNEY.

W. M. GENTLE.

COMPRESSING MACHINE.

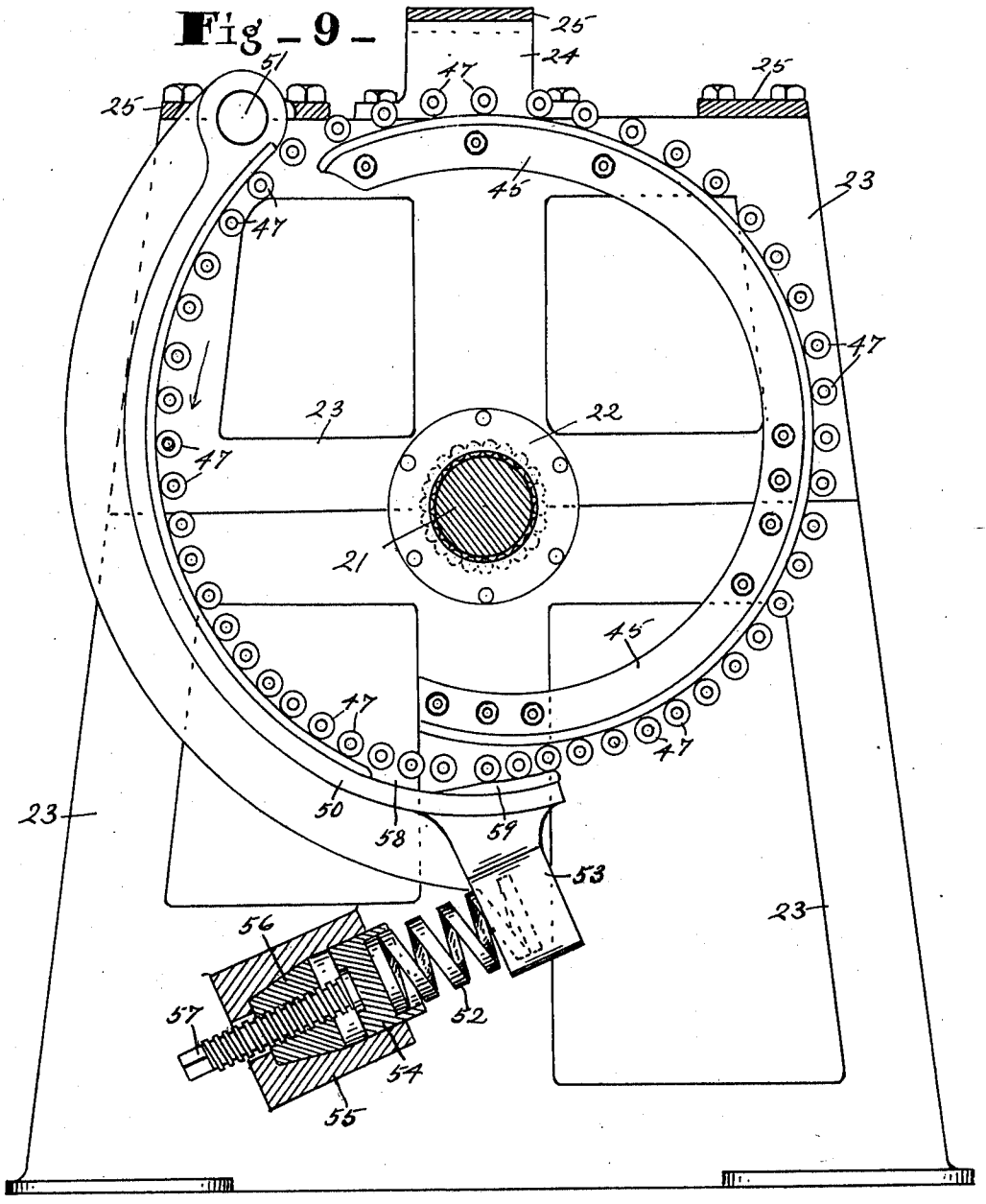
APPLICATION FILED OCT. 14, 1909.

988,328.

Patented Apr. 4, 1911.

5 SHEETS—SHEET 3.

Fig. 9.



WITNESSES:

O. M. McLaughlin

E. N. Bonnell

INVENTOR.

William M. Gentle.

BY

W. H. Eastwood

ATTORNEY.

W. M. GENTLE.

COMPRESSING MACHINE.

APPLICATION FILED OCT. 14, 1909.

988,328. **Patented Apr. 4, 1911.**

5 SHEETS—SHEET 4.

Fig-11-

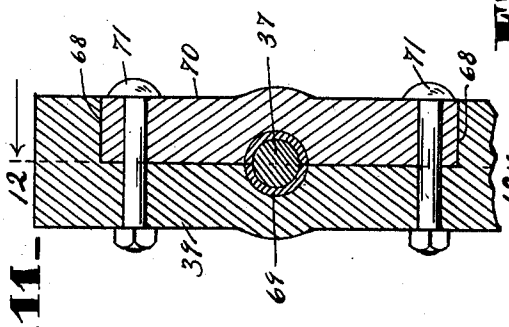


Fig-12-

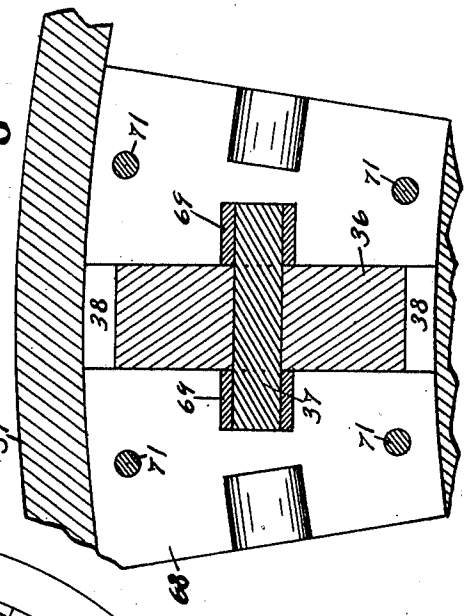
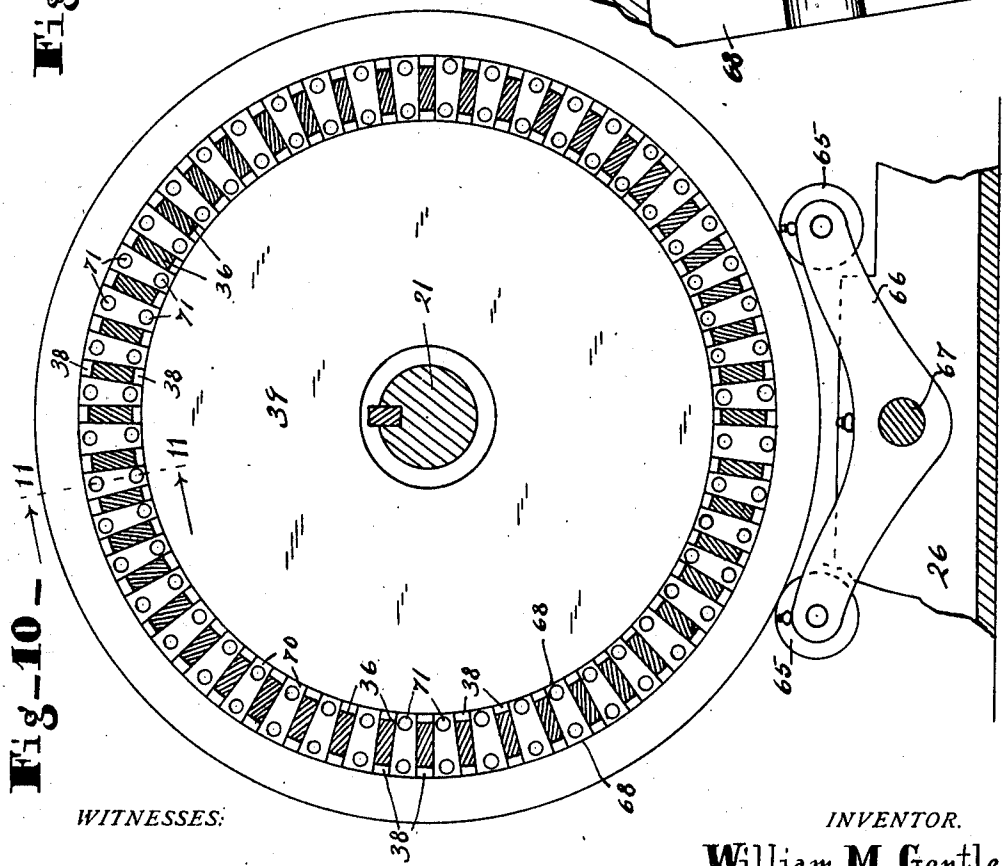


Fig-10-



WITNESSES:

O. M. McLaughlin

E. H. Bowman

INVENTOR.

William M. Gentle.

BY

V. H. Lockwood

ATTORNEY.

W. M. GENTLE.

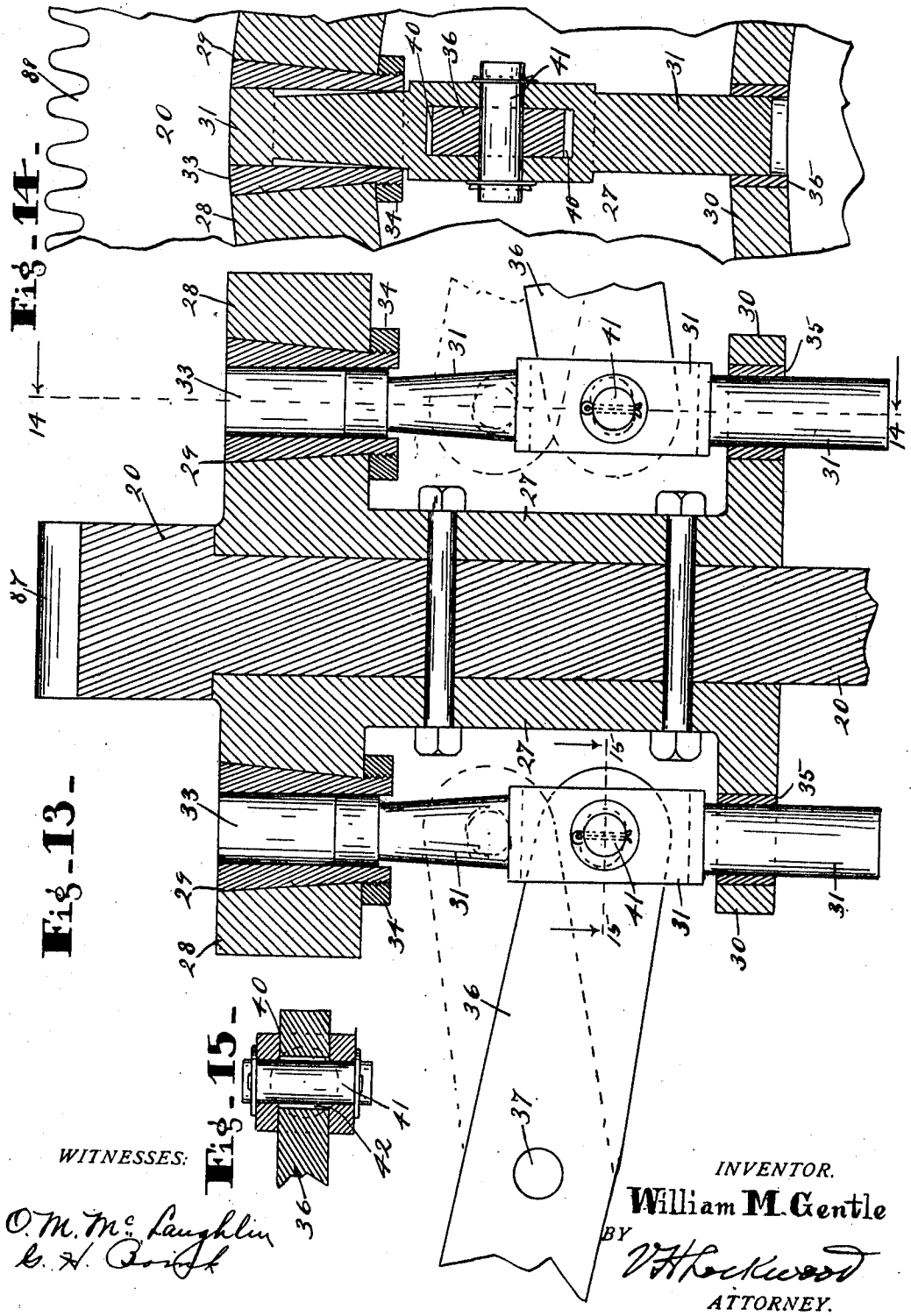
COMPRESSING MACHINE.

APPLICATION FILED OCT. 14, 1909.

988,328.

Patented Apr. 4, 1911.

5 SHEETS—SHEET 5.



WITNESSES:

O. M. McLaughlin

E. H. Bright

INVENTOR.

William M. Gentle

BY

V. H. Lockwood

ATTORNEY.

UNITED STATES PATENT OFFICE.

WILLIAM M. GENTLE, OF GREENWOOD, INDIANA.

COMPRESSING-MACHINE.

988,328. Specification of Letters Patent. Patented Apr. 4, 1911.

Application filed October 14, 1909. Serial No. 522,539.

To all whom it may concern:

Be it known that I, WILLIAM M. GENTLE, of Greenwood, county of Johnson, and State of Indiana, have invented a certain new and useful Compressing-Machine; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings.

The object of this invention is to improve the construction of compressing machines particularly adapted for the manufacture of briquets and the like of coal or other material.

The chief feature is the construction for mounting and operating the compressing plungers, whereby they will not bind. This object is accomplished by mounting the plungers so they will have free bearings at each end, and applying the power for actuating the plungers at a point between the bearings. To this end the plungers are radially mounted in a mold plate attached to a mold wheel, and a lever is provided for the actuation of each plunger, said lever being fulcrumed between its ends in a disk mounted beside the mold wheel and on the same shaft as the mold wheel so as to revolve therewith. The outer or free ends of the levers are controlled and operated by a stationary cam in connection with which they travel. This lever construction also gives a very great compressing power to the plungers.

Another feature of the invention consists in the combination of a cam plate pivoted at one end and spring-actuated at the other end for giving the plunger levers their compressing action, said lever being provided in its bearing surface with a recess at a point immediately following the highest compression point, and the point at which the mold closing means ceases to close the mold. This terminates the compression at or immediately before the mold closing means moves away from the mold, so that there will be no tendency for the plunger to discharge the briquet or push it partially outwardly until the proper time for discharge arrives, whereby it can be discharged upon a conveyer or the like.

Another feature of the invention consists in providing a discharge point or surface on the free or spring-actuated end of said pivoted plate that is almost or substantially diametrically opposite the fulcrum thereof, whereby there will always be a positive discharge without any irregularity therein due to the yielding action of the spring which holds the free end of the cam plate. In other words, the resistance will be met by the cam plate *per se*, and since it is rigid, the discharge will be always positive.

Another feature of the invention consists in providing an endless chain formed of links having external plates adapted to cover and close the outer ends of the molds, and these links are held in closing position by a cam bar which is fulcrumed at one end and adjustably held at the other end by a screw. This permits one end to be readily released in case a link or roller becomes stuck, or any other reason arises for releasing the cam bar.

The nature of the invention will be understood from the accompanying drawings and the following description and claims.

In the drawings Figure 1 is a central vertical longitudinal section through the machine. Fig. 2 is a transverse section on the line 2—2 of Fig. 1, with some parts omitted. Fig. 3 is a plan view of a portion of the mold closing chains. Fig. 4 is a section on the line 4—4 of Fig. 3. Fig. 5 is a section transversely through the machine on the line 5—5 of Fig. 1. Fig. 6 is a section on the line 6—6 of Fig. 5. Fig. 7 is a section on the line 7—7 of Fig. 5. Fig. 8 is a section on the line 8—8 of Fig. 5. Fig. 9 is a section on the line 9—9 of Fig. 1. Fig. 10 is a section on the line 10—10 of Fig. 1 with parts omitted. Fig. 11 is a section on the line 11—11 of Fig. 10. Fig. 12 is a section on the line 12—12 of Fig. 11. Fig. 13 is a central upward portion of Fig. 1 on a larger scale and showing slight modifications, parts being broken away. Fig. 14 is a section on the line 14—14 of Fig. 13. Fig. 15 is a section on the line 15—15 of Fig. 13.

There is shown in the drawings herein a mold wheel 20 secured on a horizontal shaft 21 that is mounted at each end in a bearing 22 in end frames 23. Centrally upon each end frame there is a hollow block 24 secured, and plates 25 are secured to said blocks at their outer ends and their inner ends are secured to the top of annular frames 26, the annular frames being immediately on each side of the mold wheel. The four frames 23 and 26 are secured to the floor.

The mold wheel has secured to each side of the rim or web thereof annular mold plates 27, and each plate 27 has along its periphery

an outwardly extending flange 28 provided with radial openings 29 therethrough which constitute the molds. Therefore, there is an annular series of molds on each side of the mold wheel. Along the inner periphery of each plate 27 there is an outwardly extending flange 30 provided with radial holes through the same, through which the plungers 31 extend and whereby their inner ends are guided. The outer end of each plunger extends in the inner end of the mold opening 29.

The simple form of the mold structure just explained, as shown in Fig. 1, is shown on a larger scale in Fig. 13 and in somewhat modified form. In this modified form there are mold openings 29 and in them removable molds 33 tapering inwardly somewhat and externally threaded at their inner ends to receive nuts 34. The flange 30 also has bushings 35 through which the plungers operate, and the upper ends of the plungers are provided with heads that fit in the molds.

The plungers 31 are operated by levers or walking beams 36 pivoted between their ends on pins 37 in slots 38 in the outer portion of a disk 39 that is secured on the shaft 21. The short inner end of each lever 36 projects through a slot 40 in a plunger 31 and is pivoted by a pin 41 thereto. For this purpose the central part of the plungers is squared or rectangular, as shown in Fig. 14. The pivot pins 41 operate in slots 42 in the inner ends of the levers 36 to allow said levers to give vertical movement to the plungers. The outer ends of the levers 36 are guided by a disk 43 secured on the shaft 21 and having radial slots 44, through which the outer ends of the levers 36 extend, see Figs. 1 and 2.

The levers 36 are actuated by a cam plate or bar 45 secured to the inner surface or wall of each end frame 23, see Figs. 1 and 9. The cam plate or bar 45, as shown in Fig. 9, extends slightly more than halfway around the frame. Rollers 47 on the outer ends of the levers 36 travel upon the periphery of the cam 45 in the direction indicated by the arrows in Fig. 9. The function of the cam 45 acting through the levers 36 is to give the retreating movement to the plungers 31 particularly during the filling of the molds. The cam 45 is arranged so that it will not move the plungers entirely out of the molds, and hence the plungers close the lower part of the mold while they are being filled. In the operation of the machine it must be understood that the mold wheel and the disks 39 and 43 revolve while the cams 45 are stationary. The plungers are actuated for compressing the material in the molds after the molds have been filled by means of a cam plate 50 that is pivoted at one end to the bolt 51. The cam plates 50 are curved eccentrically of the center of the mold wheel and arranged so that they act with increasing force as the rollers 47 on the levers 36 leave the pivoted end of the cam plate and approach the free end thereof. The free end of the cam plate is spring-actuated by a powerful spring 52, one end of which is mounted in an arm 53 extending from the free end of the cam plate 50, and the other end of the spring 52 is mounted in the head 54 slidable in the frame 55 secured to the frame of the machine, and which has in it a nut 56 through which the screw bolt 57 operates, the outer end of the screw bolt being formed to receive a wrench, and the inner end rotatably mounted in the head 54. By this means the tension of the spring 52 is regulated. At 58 there is a depression or recess in the inner periphery of the cam plate 50, it being located at the point over which the rollers 47 of the levers 36 pass after the compression has been completed and just previous to the ejectment of the briquets or compressed material. On the inner surface of the extreme end of the cam plate 50 there is an ejecting plate or surface 59 secured that actuates the lever 36 and plungers 31 sufficiently to cause the plungers to entirely eject the briquets 60. The briquets are ejected from the underside of the mold wheel and fall upon a conveyer 61 running over a pulley 62 and driven by any suitable means, whereby the briquets are conveyed away from the machine.

The disks 39 are not only supported by the shaft 21, but, since they are the fulcrums for the numerous plunger-actuating levers 36, and therefore are subjected to great strain from them, they ride on their undersides upon a pair of anti-friction wheels or rollers 65 mounted upon rocking arms 66 centrally pivoted by bolts 67 in the lower part of the annular frames 26, see Figs. 1 and 10. The mounting of the fulcrum pins 37 of the plunger-actuating rods 36 is indicated in Figs. 10, 11 and 12. There is an annular groove 68 extending entirely around the inner surface of each of the disks 39 corresponding with the slots 38 and into which said slots open. This groove or recess has a depth equal to about one-half the thickness of the disk 39, see Fig. 12. The inner surface of the groove is also provided with recesses for the bushings 69, in which the pins 37 are mounted. One-half of each bushing 69 rests in a suitable seat in the inner surface of the disk 39, and the other half rests in plates 70 that fit in the groove 68 and are secured to the disk 37 by bolts 71, as shown in Figs. 11 and 12. The purpose of this construction is to mount the fulcrum pins 37 centrally in the disks and enable them to be reached conveniently.

The molds of the mold wheel are filled, as indicated in Fig. 5, from a hopper 75 that is secured to the central frames 26 at the upper right-hand portion of the mold wheel

so that the material in said hopper will be carried by gravity into direct contact with the peripheral surface of the mold wheel. The hopper is divided into two chambers by the partitions 77 so as to amount practically to two hoppers, and each chamber has a bottom plate 78 spaced away from the mold wheel to accommodate the feeding screws 79 and 80, one in the lower part of each hopper. Each bottom of said hoppers has in the lower part thereof an opening 81 through which the material to be compressed passes and enters what may be termed a screw chamber in the lower part of each hopper chamber. The screws are joined together at 82 and the lower one is driven by a bevel wheel 83 that meshes with a bevel gear 84 on the shaft 85. The shaft 85, see Figs. 5 and 6, has secured on it a spur gear 86 that meshes with a gear or rack 87 on the periphery of the mold wheel. The mold wheel is driven by the pinion 88 on the shaft 89 which carries a driving pulley 90 through which power is supplied from a suitable source.

From the construction just described it is observed that the feeding screws operate immediately over the molds and by the two screws being coupled by a universal joint, they can conform substantially to the curvature of the mold wheel. They are arranged so as to feed the material at an upward inclination, as shown in Fig. 5, and therefore, will always succeed in filling all of the molds while they are passing under the hopper.

There are three pairs of tamping wheels 91, each provided with tampers 92 adapted to penetrate the outer ends of the molds, and said wheels are mounted on shafts 93 with bearings in the upwardly projecting flanges 94 that extend about the upper half of the frames 26. The shafts 93 are driven by spur gears 95 centrally secured thereon and in mesh with the gear or rack 87 of the mold wheel, and the pinions 95 are in a casing 96 that keeps the material away from the wheels 95 and rack 87, see Fig. 1. The tampers are preferably arranged at the top of the mold, as shown in Fig. 5, and the surplus material that does not enter the molds is carried off by the scraper 97, one end of which engages the periphery of the flange 29 of each mold plate 28. The scraper 97 is secured to the plate 98 mounted on the flanges 94.

The outer ends of the molds are closed after they have been filled and tamped by plates 100 on links 101 forming an endless chain. The mold closing chain at one end operates over a sprocket wheel 102 mounted on one of the flanges 94, and at the other end it operates over a sprocket wheel 103 mounted in the frame 26. The wheel 102 is an idler, while the wheel 103 is driven by a pinion 104 that meshes with the rack 87 on the mold wheel. It is understood that there is a pair of chains and also two of each kind of sprocket wheels, one on each side of the flanges 94. The links 101, which carry the mold closing plates 100, are connected by pivots 105 surrounded by rollers 106, and the plates 100 and links 101 on the side of the chain next to the mold wheel are forced against the mold wheel for closing the molds by the cam bar 107 that is fulcrumed by a pin 108 at its upper end, said pin being secured in a head slidably mounted in the frame 26 and adjustably held by the screw 109. The head carrying the pivot pin 108 is not shown, but it is substantially the same as the head 110 shown in Fig. 7. The lower end of the cam bar 107 is held in position by a rod 111 that extends through the bar 107 and also through the head 110, which slides in the frame 26 and is held in place and adjusted by the screw 112, which operates through a portion 113 of the frame 26. The screw 112 pushes the lower end of the cam bar toward the mold wheel.

What I claim as my invention and desire to secure by Letters Patent is:

1. A compressing machine including a mold wheel, radial molds carried by said wheel, means for closing the outer ends of the molds during part of the revolution of the mold wheel and uncovering the molds during a part of the revolution of the mold wheel, plungers with their outer ends operating in the inner ends of the molds for compressing the material in the molds when the outer ends are closed and ejecting the same when the outer ends of the molds are open, a guide secured to the mold wheel for guiding the inner ends of the plungers, levers pivoted to the plungers between said guide and the molds, a disk secured on said shaft beside the mold wheel in which said levers are pivoted between their ends, a cam pivoted at one end and spring supported at the other end and having a concave surface over which the outer ends of said levers travel for giving the compressing movement to the plungers, and another stationary cam having a convex surface over which the outer ends of the levers travel for controlling the plungers while not compressing them.

2. A compressing machine including a mold wheel, radial molds carried by said wheel, means for closing the outer ends of the molds during part of the revolution of the mold wheel and uncovering the molds during a part of the revolution of the mold wheel, plungers with their outer ends operating in the inner ends of the molds for compressing the material in the molds when the outer ends of the molds are open, a guide secured to the mold wheel for guiding the inner ends of the plungers, levers pivoted to

the plungers between said guide and the molds, a disk secured on said shaft beside the mold wheel in which said levers are pivoted between their ends, a cam construction for controlling and operating the outer ends of said levers, and a disk secured on said shaft between said cam construction and the fulcrum disk of the levers that is provided with radial slots through which the levers project and whereby they are guided.

3. A compressing machine including a mold wheel, radial molds carried by said wheel, means for closing the outer ends of the molds during part of the revolution of the mold wheel and uncovering the molds during a part of the revolution of the mold wheel, plungers with their outer ends operating in the inner ends of the molds for compressing the material in the molds when the outer ends are closed and ejecting the same when the outer ends of the molds are open, a guide secured to the mold wheel for guiding the inner ends of the plungers, levers pivoted to the plungers between said guide and the molds, a disk secured on said shaft beside the mold wheel having radial slots through which said levers project, means removably mounted in connection with said disk for fulcruming said levers, and a cam construction for controlling and operating the outer ends of said levers.

4. A compressing machine including a shaft, a mold wheel secured thereon, molds carried by said mold wheel, means for closing the outer ends of the molds, radial compressing plungers with their outer ends projecting into the inner ends of the molds, a guide secured to the mold wheel for guiding the inner ends of the plungers, levers pivoted to the plungers between said guide and the molds, a disk secured to said shaft beside the mold wheel with radial slots through which said levers extend, an annular recess in one side of said disk that registers with said slots, plates secured in said recess on each side of each lever, fulcrum pins carried by said plates whereby said levers are fulcrumed, and a stationary cam construction for controlling and operating the outer ends of said levers.

5. A compressing machine including a mold wheel, radial molds carried by said wheel, means for closing the outer ends of the molds during part of the revolution of the mold wheel and uncovering the molds during a part of the revolution of the mold wheel, plungers with their outer ends operating in the inner ends of the molds for compressing the material in the molds when the outer ends are closed and ejecting the same when the outer ends of the molds are open, a guide secured to the mold wheel for guiding the inner ends of the plungers, levers pivoted to the plungers between said guide and the molds, a disk secured on said shaft beside the mold wheel in which said levers are pivoted between their ends, a cam construction for controlling and operating the outer ends of said levers, a rocking bar pivoted between its ends to the frame below said disk, and rollers on the ends of said rocking bar upon which said disk rides.

6. A compressing machine including a revoluble mold wheel, molds carried thereby with their outer ends open, plungers closing their inner ends, a hopper mounted adjacent said mold wheel so that material to be compressed will tend to enter the molds from said hopper a plurality of screws connected by universal joints and mounted in the lower part of the hopper and extending adjacent and tangentially of the series of molds and at an upward inclination so that when operated they will tend to carry the material upwardly on the mold wheel, and means for driving the screws.

7. A compressing machine including a revoluble mold wheel, molds carried by said wheel with their outer ends open, plungers for closing their inner ends, a hopper arranged in connection with the mold wheel so that material therein will tend to enter the molds by gravity, said hopper having a plurality of chambers, a screw mounted in the lower part of each chamber and adjacent the series of molds so as to tend to feed the material upwardly on the mold wheel, said screws being connected by universal joints, and means for actuating the screws.

8. A compressing machine including a revoluble mold wheel, molds carried thereby with their outer ends open, plungers closing their inner ends, a hopper mounted adjacent said mold wheel so that material to be compressed will tend to enter the molds from said hopper by gravity, a screw mounted in the lower part of the hopper and extending adjacent and tangentially of the series of molds and at an upward inclination so that when operated it will tend to carry the material upwardly on the mold wheel, means for driving the screw, and a bottom plate in said hopper immediately over the screw and inclined upwardly with an opening in the lower end thereof through which the material can pass to the screw and mold wheel.

9. A compressing machine including a revoluble mold wheel, a peripheral rack centrally located thereon, a series of molds carried at each side of the mold wheel with their outer ends open, a hopper for filling the molds, tamping wheels following the hopper and mounted above the wheel, there being a tamping wheel for each series of molds for tamping the outer end of the material, a shaft on which a tamping wheel for each series of molds is secured, and a spur wheel on said shaft that engages the

rack on the mold wheel, whereby the tamping wheels will be actuated, means for starting the outward movement of the plungers before the molds are closed, whereby both ends of the material will receive a preliminary concentration before the final compression.

10. A compressing machine including a shaft, a mold wheel secured thereon, molds carried by said mold wheel, radial plungers with their outer ends projecting into the inner ends of the molds, a guide secured to the mold wheel for guiding the inner ends of the plungers, levers pivoted to the plungers between said guide and the molds, a disk secured on said shaft besides the mold wheel in which said levers are pivoted between their ends, a cam plate pivoted at one end thereof to the frame and with a concave surface that engages the outer ends of said levers for giving them the compressing movement, a spring construction for yieldingly holding the other end of said cam plate, and an elevation on the end of the cam plate that is substantially diametrically located from the pivot end thereof for actuating the plungers to discharge the briquets, whereby such discharge action will be positive.

In witness whereof, I have hereunto affixed my signature in the presence of the witnesses herein named.

WILLIAM M. GENTLE.

Witnesses:
O. M. McLAUGHLIN,
G. H. BOINK.