

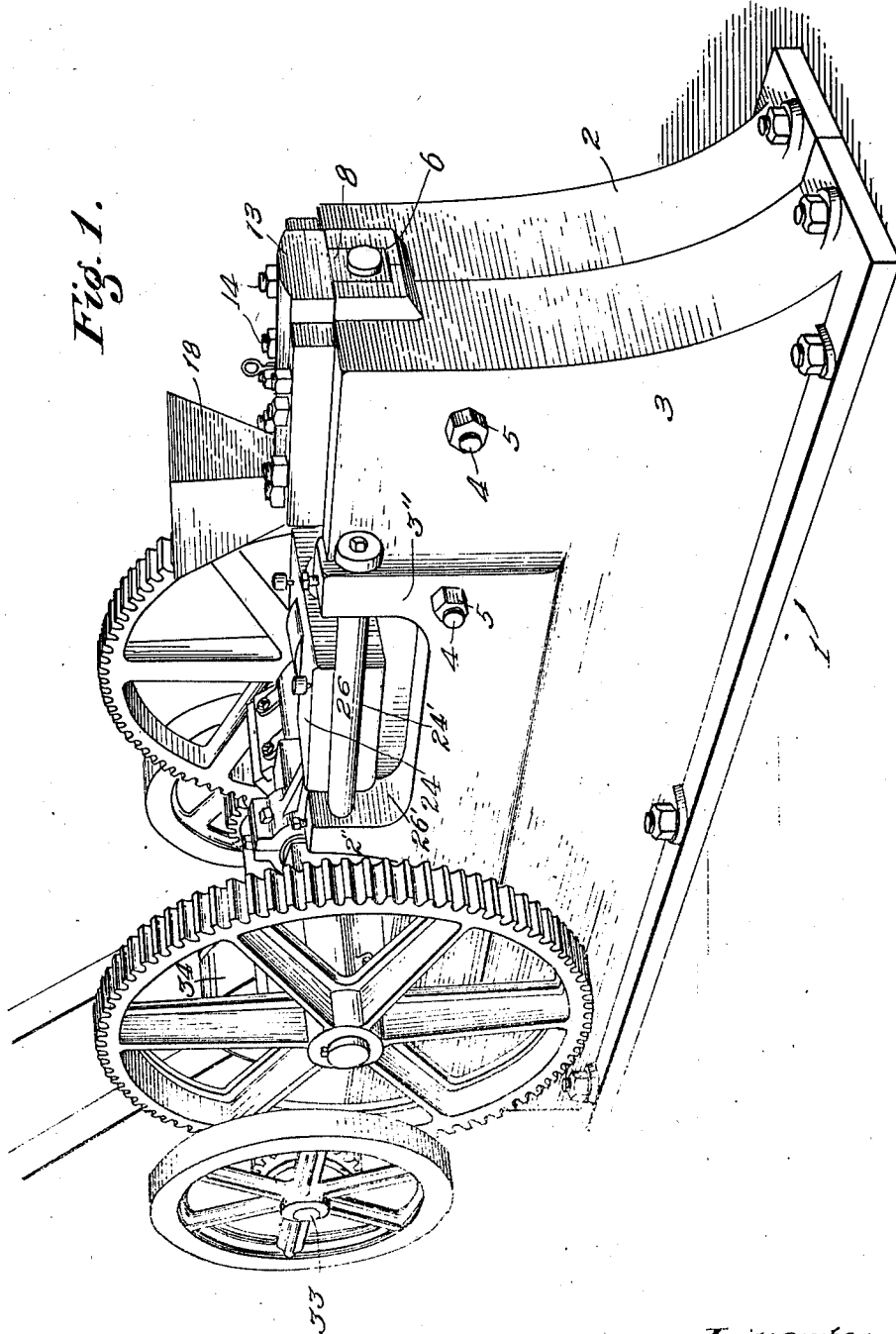
E. FERNHOLTZ.
BRIQUET MACHINE.

APPLICATION FILED DEC. 27, 1908.

Patented Mar. 22, 1910.

4 SHEETS—SHEET 1.

952,960.



Witnesses

C. C. Holly.
H. H. Kirby.

Inventor
Emil Fernholtz

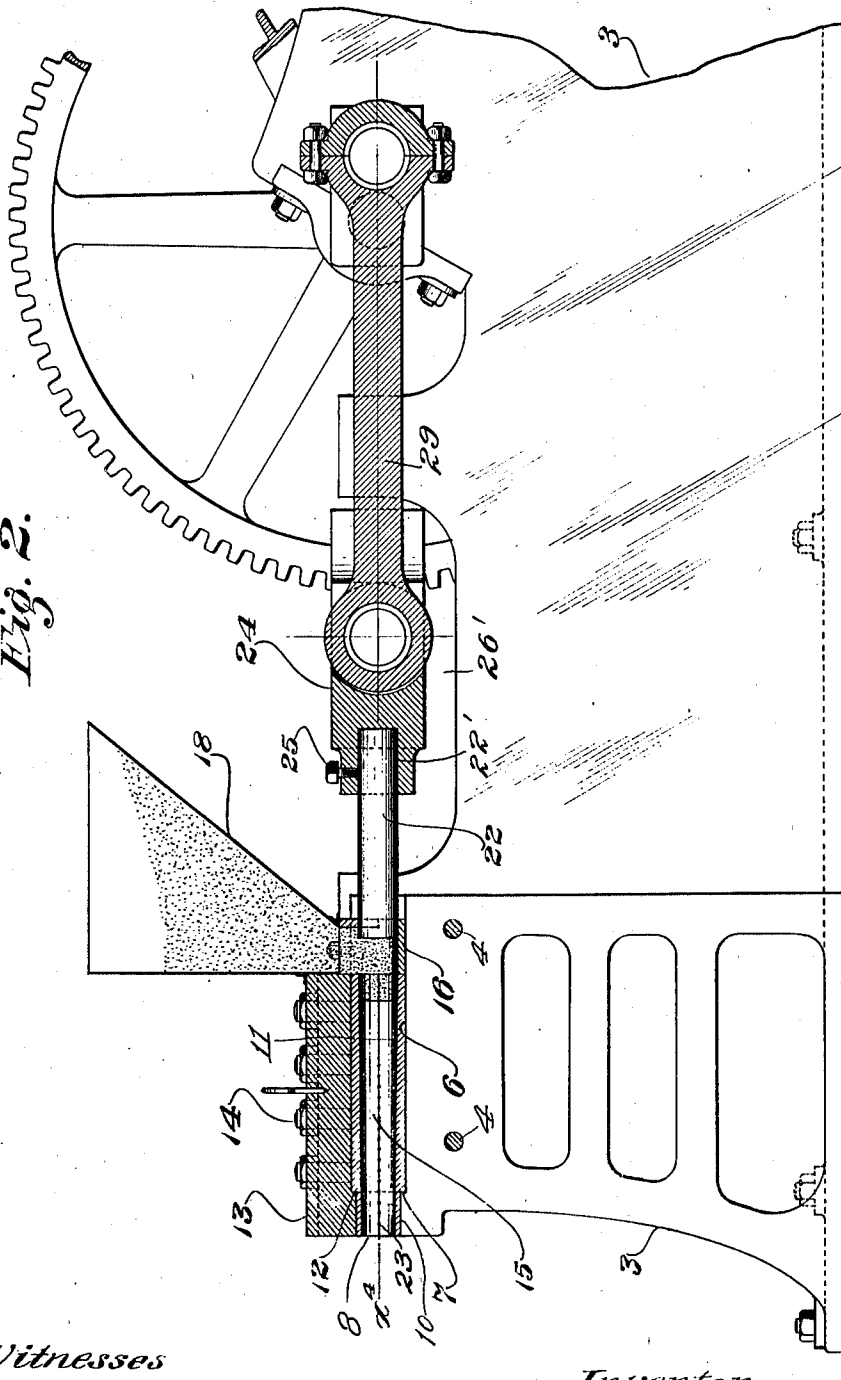
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4 SHEETS—SHEET 2.

Fig. 2.



Witnesses

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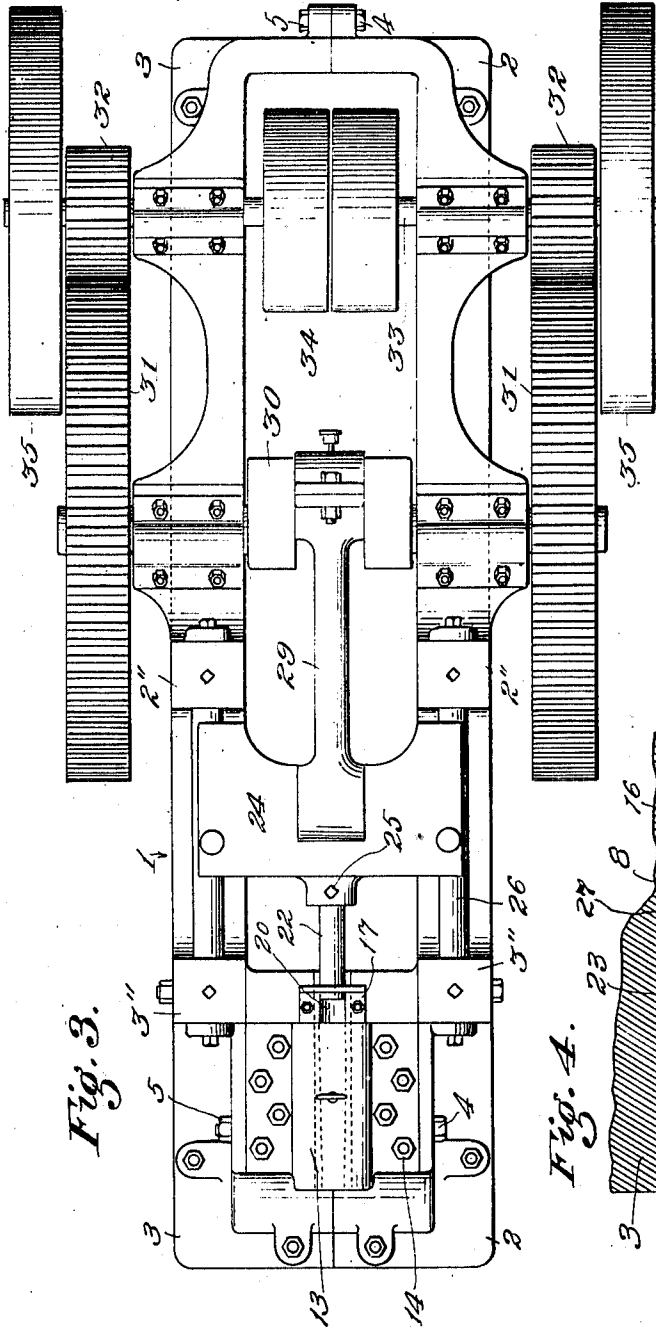


Fig. 3.

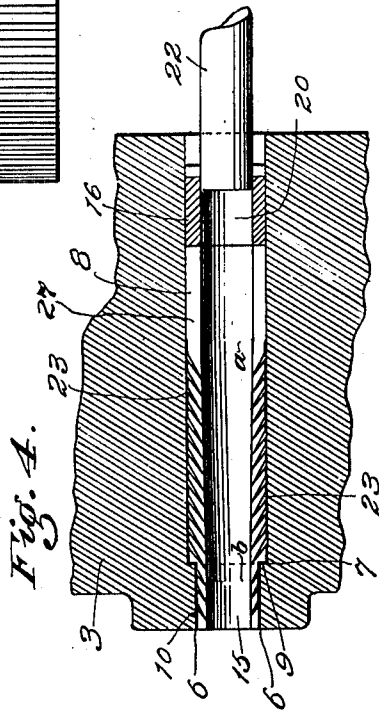


Fig. 4.

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4 SHEETS—SHEET 4.

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Fig. 8.

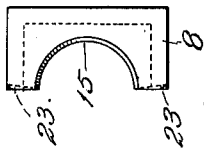


Fig. 7.

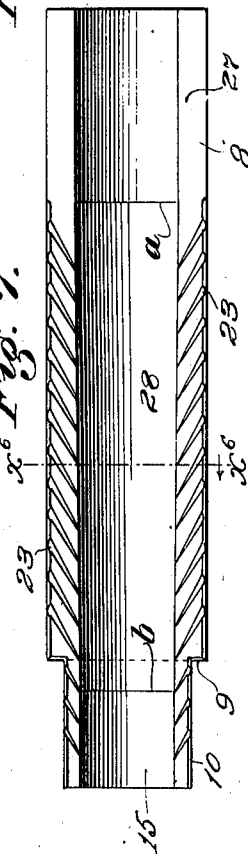


Fig. 10.

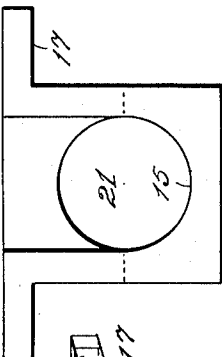


Fig. 9.

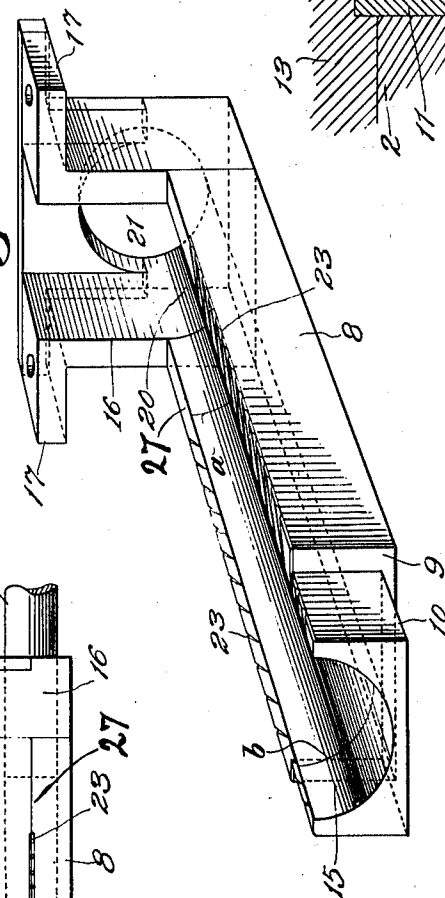


Fig. 5.

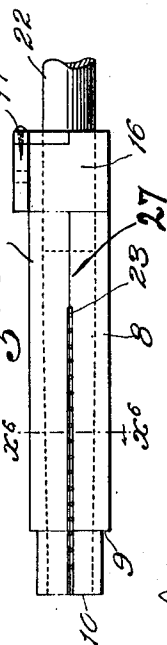
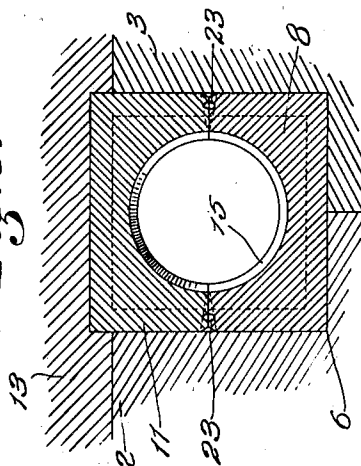


Fig. 6.



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UNITED STATES PATENT OFFICE.

EMIL FERNHOLTZ, OF LOS ANGELES, CALIFORNIA, ASSIGNOR TO THE NATIONAL BRIQUETTING AND CLAY WORKING MACHINERY COMPANY, OF PHOENIX, ARIZONA TERRITORY, A CORPORATION OF ARIZONA TERRITORY.

BRIQUET-MACHINE.

952,960.

Specification of Letters Patent.

Patented Mar. 22, 1910.

Application filed December 27, 1906. Serial No. 349,729.

To all whom it may concern:

Be it known that I, EMIL FERNHOLTZ, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Briquet-Machine, of which the following is a specification.

It is one of the objects of this invention to provide a briquet machine of few and simple parts, by means of which loose, non-plastic material, as coal, peat, lamp-black, sawdust, and various other forms of carbonaceous and vegetable materia may be formed by a continuous and uninterrupted process, into compact condition in suitable shapes and sizes for use as fuel in stoves, fireplaces and furnaces, and for general purposes.

I regard this invention as pioneer in that the compression takes place in a passage-way that is continuously open to the end of the machine at the discharge-end, and such compression is effected by the application of tremendous force concentrated from ponderous fly-wheel means upon a small cross-sectional area of the material to be compressed, through a high-speed horizontal hammer of great ponderosity terminating in a single centrally-arranged plunger or ram that reciprocates in such passage-way to strike rapid and tremendous blows upon successive charges of uncompressed material which are thereby driven against previously-compressed charges of material, the passage-way being of such form as to frictionally resist the movement there-through of the material after it has been compressed, but to allow the compressed material to be driven onward at each stroke; the principle being that the tremendous power applied is transformed into high heat under great pressure in the material being compressed, thereby producing a physical change in such material.

The invention includes the machine and its combinations and parts as will more fully appear from the subjoined detailed description.

The invention may be embodied in various forms, and I do not limit the same to any specific form, but shall illustrate the same herein in the form at present deemed most desirable.

The bore of the open-ended matrix or

mold in which the compression takes place, is preferably tapering throughout a portion of its way, but may be straight throughout in some forms of machine embodying parts of my invention.

The accompanying drawings illustrate the invention.

Figure 1 is a perspective view of a briquet machine embodying my invention in one of its forms. Fig. 2 is a fragmental longitudinal mid-section of the same. Fig. 3 is a plan omitting the feed-hopper. Fig. 4 is a fragmental plan section on line x^4 , Fig. 2. Fig. 5 is a detached side view of the mold and feed-box with a fragment of the plunger in place. Fig. 6 is a cross-section on line x^6-x^6 , Figs. 5 and 7, showing also fragments of the base and cap. Fig. 7 is a plan of the bottom half of the mold, detached. Fig. 8 is a projection of the right end of Fig. 7, showing an elevation of the end of the mold that fits the feed-box. Fig. 9 is a perspective of the bottom of the mold, together with box. Fig. 10 is an elevation of the mold head or feed box.

1 is a base composed of two sections, 2 and 3, and secured together by means of bolts 4 and nuts 5. The forward, upper ends of said sections 2 and 3 are recessed, as seen at 6, the recess terminating at the forward end in a shoulder 7. Fitting into said recess 6 is a mold 8 whose forward end is shouldered as seen at 9, the mold proper extending forwardly of said shoulder for a portion of its length, as seen at 10. The shoulder 9 engages and bears against the shoulder 7 of the casting or sections 2 and 3, and takes up whatever force there may be from the opposite end of the mold. The other portion 11 of the mold fits into a recess 12 provided in the cap 13, which cap secures the two halves of the mold together. This cap is held in place by stud bolts 14 extending through the cap and into the base of the machine. The mold has a bore 15 which in the form shown, is gradually convergent toward the discharge end thereof throughout an intermediate portion of its length; the degree of convergence being determined and calculated by the amount of compression desired. The head or feed box of the mold comprises a U-shaped member 16 having rectangular extensions 17 arranged to accommodate and support a hopper

18 in any desirable manner. The U-shaped member 16 has a space 20 whose bottom is semicylindrical and in a line continuous with the bore 15 of the lower portion 8 of the mold. Into this space, the hopper discharges the material that is to be compressed into briquets, while through the opening 21 the plunger 22 operates moving into and out of the intake end of the bore of the mold to compress thereinto the material discharged from the hopper 18 into the space 20. The sectional halves 8 and 11 of the mold,—are provided with rearwardly-extending gradually-increasing ports or air ducts 23 which communicate with the interior of the mold, extend rearwardly with respect to the direction of movement of the material within the mold during the period of compression, and open into outlet channels *a* that lead to the open air. These ducts or ports are provided primarily to allow the excessive compressed air to escape from the body of the briquets as the compression proceeds. By reason of the rearward slant shown, the tendency of the progressing compressed material is to keep clear the inlets to said opening. The stroke of the plunger is preferably short, and travels over a space equal, or approximately equal, to double the length of the space 20 formed in the head 16 of the mold. Upon the forward stroke of the plunger 22, the material descending from the hopper into the space 20, is compressed and forced into the bore of the mold, and after a compact mass has been formed throughout such bore, the friction between such mass and the walls of the bore causes such resistance at the intake end that a high compression of the mass at such end takes place, and as the work progresses, the density of the mass becomes greater as it advances toward final discharge from frictional contact. The degree of such compression will depend upon the length and form of the bore. It is heightened by the choke bore construction shown, without making the bore of inordinate length.

The power applying apparatus may be of any suitable construction: by making the same ponderous and powerful and operating it at high speed, each charge will be subjected to a forceful blow, as it is rammed into the mold, thus condensing the same at the outset before the impulse is expended in moving forward the previous charges. The cross-head 24 therefore is constructed of a massive solid block of metal and constitutes a horizontal hammer of great ponderosity provided forwardly and substantially centrally thereof with a socket 22' to receive the plunger or ram 22 which is held therein by a bolt or set-screw 25, so that the same may be replaced by a new one when necessary. By constructing the compression means of massive heavy solid material, and

employing but one plunger, the greatest force of reciprocation is directly centralized in the plunger; consequently thoroughly and intimately uniting the carbonaceous particles used in manufacture of briquets, etc. Said block or cross-head 24 is provided with longitudinal lateral grooves 24'.

26 are guide rods secured by upright ribs 2'', 3'' of the base and extending across cut away portions 26' of the casting or base 1, and arranged to engage the grooves 24' provided in the cross-head 24, whereby the cross-head is guided in its reciprocatory movement, and its level as well as that of the plunger steadily maintained. By recessing the upper portions of the two halves of the base as shown at 26' room for the ponderous cross head 24 to move on the guide rods 26 is provided. The pitman 29 is pivotally secured in said cross-head at one end and to the crank shaft 30 at the other end. On said shaft 30 are mounted the gear wheels 31 with which the pinions 32 mounted on shaft 33 mesh and impart motion to said large gears 31 by the drive pulley 34 connected with any source of power.

35 are fly-wheels provided to increase the momentum of the driving pinions 32.

The operation of forming condensed charges will rapidly proceed until the first amount of material forced into the bore is ejected at the extremity of the bore by reason of the continued operation of the feed and plunger. The intake end 27 of the mold is imperforate for a distance to contain one or more of the compressed charges and these form a closure for the intake end of the bore so that each return stroke of the plunger tends to produce a vacuum in the imperforate intake end of the bore and pressure of the atmospheric air will force material from the hopper to fill the vacated space as soon as the end of the plunger escapes from the bore. The compression of the material in the manner described causes a high compression of the atmospheric air contained in the charges and it is necessary that the briquets be forcibly held in shape a sufficient length of time to allow the internal strain on the charges to be relieved by the escape of such air. To prevent the vents along the bore from being clogged, the same are widened and directed rearwardly and outwardly as shown.

In practical operation the pressure of the plunger on the material being compressed is so great that the rear end of each compressed charge becomes polished or hardened to such an extent that the succeeding charge will not strongly adhere thereto, and consequently the product is formed with transverse planes of cleavage, and will readily separate into briquets, each containing one charge and forming a solid homogeneous and hard body.

The bore is preferably of uniform diameter throughout the imperforate intake portion 27, and of diminishing diameter throughout the greater part of the perforate portion 28, as indicated between the lines *a, b*, in Fig. 7, and from the line *b* the outlet is of uniform diameter. The end of the plunger 22 is of uniform diameter with the intake portion 27 and snugly fits the same, as indicated in Fig. 4. The opening 21 in the head or feed box of the mold corresponds in cross-section to the plunger and the intake end of the bore, and the plunger is reciprocated through said opening and into the uniform portion of the bore, the length of stroke being sufficient to carry the end of the plunger into the intake portion of the bore a considerable distance and out into the opening of the feed-box sufficiently far to allow the required charge to fill the space between the plunger and the preceding compressed charge. In practical operation the movement of the charges through the bore toward the discharge end, tends to keep the inner ends of the openings 23 free, thus allowing the compressed air and expressed water to find egress at such openings. Any particles that may enter such openings will pass on without clogging the mold on account of the flaring shape of said openings.

I have used the machine herein described for making briquets of various materials among which may be mentioned peat, coal and lamp-black, some of which material contained as high as thirty per cent. of water when fed to the machine. It is deemed advisable to feed the material in as dry a condition as may be convenient.

It is found in actual practice that the power when thus applied is effective to produce from lignite, lamp-black or peat a briquet resembling bituminous coal in hardness, density and color. The briquets thus made from dark-brown lignite pressed without a binder and with about 17% moisture, are black in color and have a thermal value equal to the best bituminous coal. The briquets come out of the mold in a hot condition and a considerable portion of the moisture quickly evaporates. The briquets thus made are polished and externally free from grime or dirt and burn with about the same amount of smoke as wood.

What I claim is:

1. A briquet machine comprising a base composed of two parts divided on a vertical longitudinal line, there being a mold-recess in the forward upper part of the base, the same extending across said line and there being cut-away portions behind the mold-recess; a mold in the mold-recess, said mold being separable on a horizontal longitudinal line; guide-rods extending across the cut-away portions of the base; a cross-head mounted upon the guide-rods, and a plun-

ger carried by the cross-head and operating in the mold.

2. A briquet machine comprising a base composed of halves whose upper portions are recessed for a part of their length and means for securing said halves together, a mold fitting the recess in said base and composed of sections separable longitudinally and from said base, said mold being provided with a bore tapering toward the discharge end of the same and having lateral vents which extend rearwardly at a gradually increasing depth with respect to the forward movement of the compressed charge, one section of said mold having formed integral therewith a feed-box communicating with the bore of said mold and forming a U-shaped support having rectangular extensions, a hopper mounted on said extensions and communicating with said feed box, a plunger arranged to operate in the bore, geared means for operating said plunger, and a cap for removably securing said mold in said base.

3. A briquet machine comprising a base composed of two sections joined together and provided in the upper portion thereof with a recess, a mold having shoulders and consisting of two sections fitting said recess, said mold having a bore tapering gradually toward the forward extremity of the same, one section of said mold having provided forwardly thereof a U-shaped feed-box terminating in rectangular extensions, a hopper carried by said extensions and communicating with said feed-box, a cap recessed interiorly and arranged to engage the shoulders of said mold, means for securing said cap to said base, a plunger operating in the bore of said mold, means for operating said plunger comprising a solid cross-head having a socket, said plunger engaging said socket, means for securing said plunger in said socket, a pitman connected at one end with said cross-head and at the other end with a crank shaft, means for maintaining the level of said cross-head, and means for imparting motion to said crank shaft.

4. A briquet machine comprising a base composed of two sections joined together and provided in the upper portion thereof with a recess, a mold having shoulders and consisting of two sections fitting said recess, said mold having a bore tapering gradually toward the forward extremity of the same, one section of said mold having provided forwardly thereof a U-shaped feed-box terminating in rectangular extensions, a hopper carried by said extensions and communicating with said feed-box, a cap recessed interiorly and arranged to engage the shoulders of said mold, means for securing said cap to said base, a plunger operating in the bore of said mold, means for operating said plunger comprising a slotted cross-head, guides se-

cured in said base and fitting said slots in said cross-head, the forward end of said cross-head being provided with a socket, said plunger being arranged to fit said socket, and means for securing said plunger therein, a crank shaft, connections between said crank shaft and said cross-head, and geared means for operating said crank shaft.

5. A briquet machine comprising a base formed in two parts separable on a vertical longitudinal line and having a mold-recess in the upper forward part and having cut-away portions behind the recess, guide-rods extending across the cut-away portions; a mold in the mold-recess, said mold being separable on a horizontal longitudinal line and having a bore tapering toward the discharge end and provided with laterally-receding gradually-deepening vents along the line of separation, the lower half of said mold having an integral feed-box communicating with the bore of the mold and forming a support, a hopper on said support and discharging into the feed-box, a cross-head upon said guide-rods, and a plunger carried by the cross-head and operating in the mold.

6. A briquet machine comprising a base formed in two parts separable on a vertical

longitudinal line and having a mold-recess in its upper forward part and having cut-away portions behind the recess; a mold in the mold-recess, said mold being separable on a horizontal longitudinal line and having vents along the line of separation, and said mold being provided with an offset, there being a corresponding offset in the mold-recess, the offset of the mold engaging the offset of the recess to hold the mold in place, and said mold being provided with a bore extending centrally therethrough and tapering toward the discharge end; a feed-box formed integral with the lower half of the mold and communicating with the bore and forming a support; a hopper on the support and discharging into the feed-box; guide-rods extending across the cut-away portions of the base, a cross-head mounted to slide upon the guide-rods, and a plunger carried by the cross-head and operating in the mold.

In testimony whereof, I have hereunto set my hand at Los Angeles California this 21st day of December 1906.

EMIL FERNHOLTZ.

In presence of—

JAMES R. TOWNSEND,
TILLIE E. ADAM.