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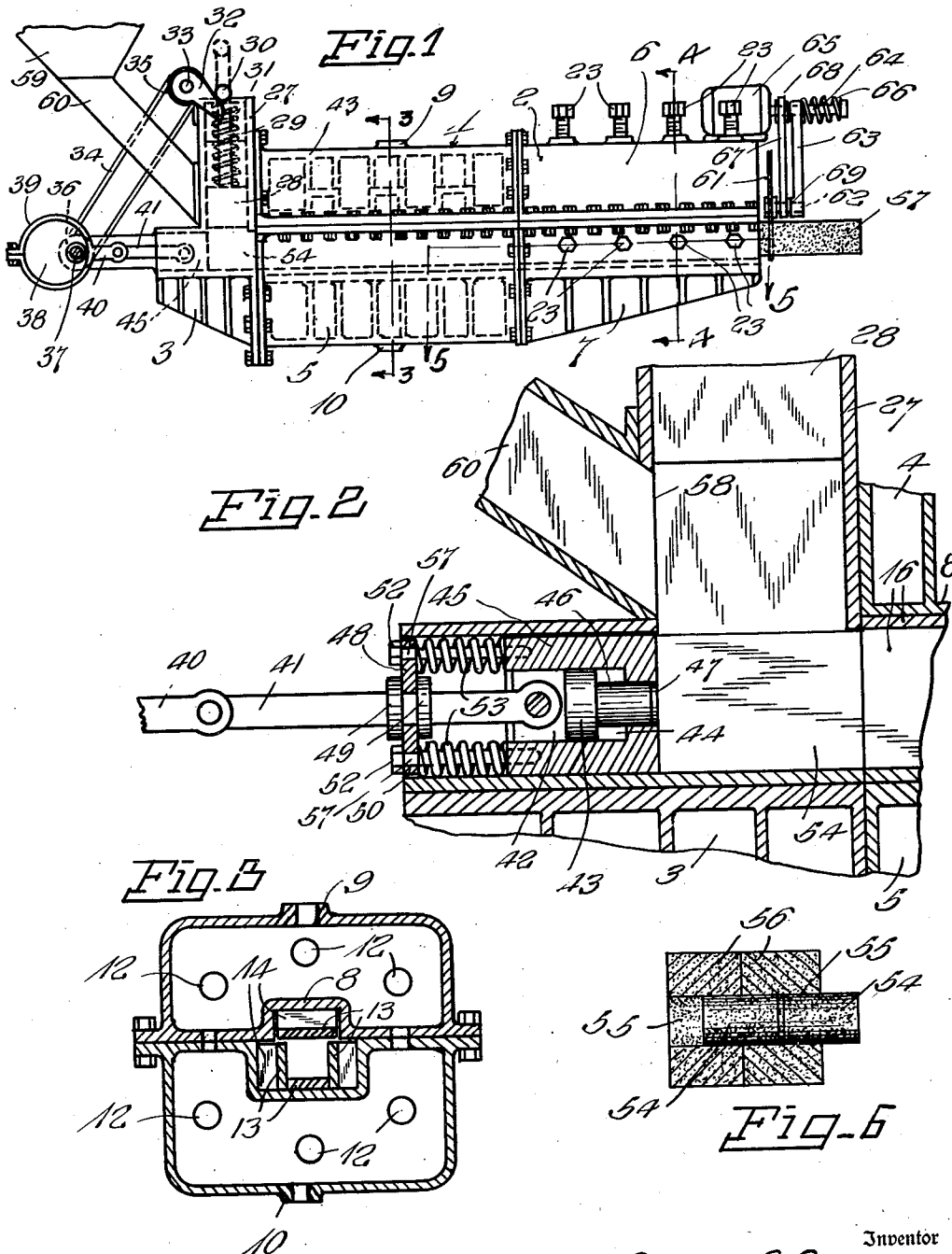
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2,332,170

BRIQUETTE MACHINE

Filed April 21, 1941

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

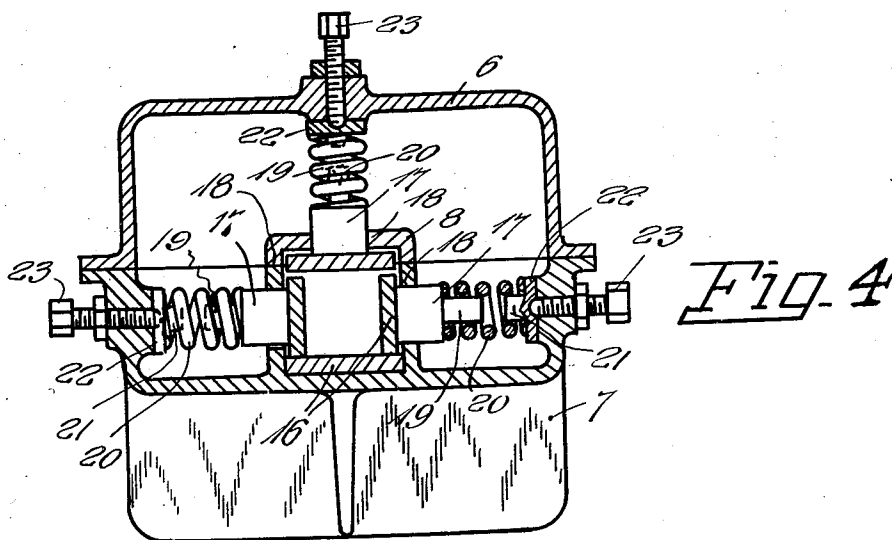


Fig. 4

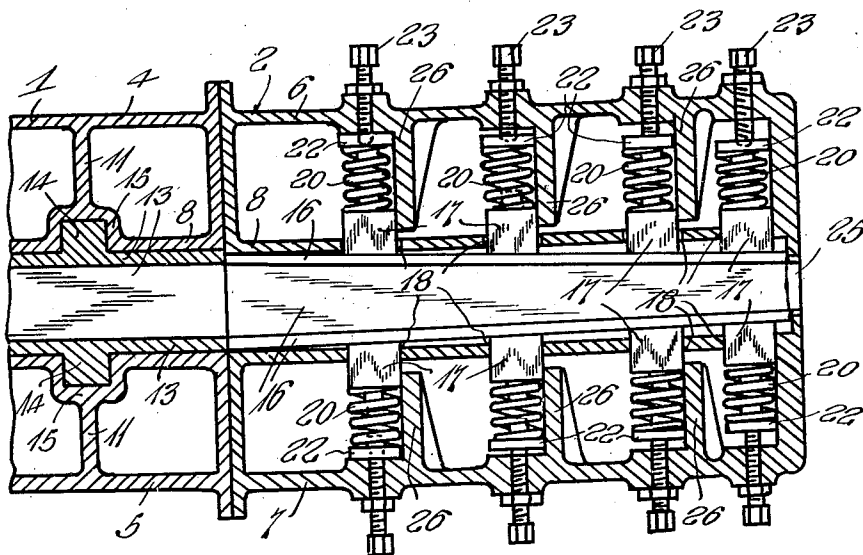


Fig. 5

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BRIQUETTE MACHINE

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5 Claims. (Cl. 25—12)

This invention relates to a briquetting machine and it is one object of the invention to provide a machine of this character by the use of which saw dust, ground shavings, and other wood waste may be formed into briquettes under very high pressure.

Another object of the invention is to provide a briquetting machine of such construction that as the material is compressed into blocks, portions of the blocks will be formed into dowels which hold the blocks in engagement with each other and form an elongated mass of interconnected blocks or sections, means being provided for cutting the mass between the blocks or at such points that a desired number of blocks will remain in engagement with each other.

Another object of the invention is to provide a briquetting machine wherein the material is intermittently delivered into a compressing chamber in front of a compressing piston which is reciprocated in timed relation to the feeding mechanism and forces the delivered material through the compressing chamber in the form of blocks disposed in contacting engagement with each other.

Another object of the invention is to so form the plunger for forcing the material through the compressing chamber that a core-forming plunger operating through the piston will be held in retracted or inoperative position within the piston until pressure is developed which is sufficient to force the plunger forwardly to extended position for punching a core from the block and into a previously formed block where it serves as a dowel for holding the blocks in engagement with each other.

Another object of the invention is to so assemble the piston and plunger that they may be operated through the medium of a single piston rod operatively connected with a cam carried by a rotary drive shaft.

Another object of the invention is to provide a machine of this character wherein the blocks are subjected to very high pressure as they move through the compression chamber, compression being effected through the medium of strips constituting liners for walls of the chamber and forced inwardly by springs mounted in an improved manner.

Another object of the invention is to so mount the strips and cooperating springs that the strips converge toward the front end of the machine and thus cause pressures applied to the blocks to be progressively increased during forward

movement of the united blocks toward the outlet at the front of the machine.

Another object of the invention is to so mount the lining strips that they will be braced against longitudinal movement and thus prevented from being shifted longitudinally out of proper position as the united blocks are forced forwardly between the strips toward the outlet at the front end of the machine.

Another object of the invention is to provide a machine wherein the compression chamber is water-jacketed in order to prevent overheating, due to the very high pressure exerted.

Another object of this invention is to provide a machine of this character consisting of sections which may be easily taken apart when cleaning or repairs are necessary and then easily and quickly reassembled.

In the accompanying drawings:

Fig. 1 is a side elevation of the improved briquetting machine.

Fig. 2 is a vertical sectional view taken longitudinally through the rear portion of the machine.

Fig. 3 is a transverse sectional view on the line 3—3 of Fig. 1.

Fig. 4 is a sectional view on the line 4—4 of Fig. 1.

Fig. 5 is a sectional view taken longitudinally through the forward portion of the machine, on the line 5—5 of Fig. 1.

Fig. 6 is a view showing two of the compressed blocks in section and dowels in elevation.

This improved briquetting machine has front and rear sections 1 and 2, and a head 3 at its rear end, the front section 1 consisting of upper and lower castings 4 and 5 which are bolted to each other and the rear section 2 also consisting of upper and lower castings 6 and 7 which are bolted to each other. The adjoining ends of the front and rear sections are bolted to each other and the head 3 is bolted to the rear end of the rear section. It will thus be seen that when it is necessary, the sections of the casing of the machine may be taken apart and after repairs are made or portions cleaned, easily reassembled. The castings forming the sections of the casing have inner walls which cooperate with each other to form a compression chamber 8 which extends longitudinally through the casing substantially axially thereof and, at its front end is provided with an outlet. The rear section 2 is water jacketed so that heat developed during forming of the blocks may be absorbed, the casting 6 being formed with an inlet port 9 to receive a pipe

through which water is delivered into the casing section and the lower casting 7 being formed with an outlet port 10 to receive a discharge pipe. The webs 11 and abutting ends of the casing sections 1 and 2 are formed with ports 12 in order that the casing may be reinforced without interfering with circulation of cooling water through the casing section. Lining strips 13 of strong steel are mounted within the compression chamber 8 and, referring to Fig. 5, it will be seen that the strips 13 within the portion of the chamber formed in casing section 2, are formed with lugs 14 engaged in pockets 15 in order that the strips may be braced against longitudinal movement as blocks of compressed material are forced through the compression chamber 8. Lining strips 16 extend longitudinally in the portion of the compression chamber 8 within the casing section 2, and certain of these strips carry lugs 17 which pass through openings 18 in walls of the chamber, as shown in Fig. 4, and are formed with stems 19 about which engage inner ends of springs 20. These springs have their outer end portions engaged about the stems 21 of abutments 22 against which inner ends of screws 23 bear and from an inspection of Figs. 4 and 5, it will be seen that when the screws are tightened, the lining strips will be forced away from walls of the compression chamber and the springs placed under desired tension. It will also be noted that the lining strips converge toward the outlet 25 at the front end of the casing so that, as the blocks of compressed material are shifted forwardly, they will be compressed from their sides by action of the springs and the material ejected in a highly compressed condition. The fact that front ends of the lining strips abut the front wall of the casing about the outlet and the fact that the lugs 17 bear against rear faces of the webs 25, causes the strips to be braced against forward shifting movement and the strips cannot move out of their proper positions while compressed blocks are being forced forwardly toward the outlet.

The head 3 is constructed as shown in Figs. 1 and 2, and has a neck 27 disposed vertically and in which a plunger 28 operates. This plunger has a stem 29 formed with a cross head 30 at its upper end and a spring 31 urges the plunger downwardly. A cam 32 carried by a shaft 33 serves to shift the plunger upwardly through engagement with the cross head as the shaft rotates, and rotary motion is transmitted to the shaft by a belt 34 trained about a pulley 35 carried by the shaft. The lower portion of belt 34 is trained about another pulley 36 carried by a drive shaft 37 to which rotary motion is imparted in any desired manner and this shaft 37 also carries a cam disc 38 about which is mounted a collar 39 carrying an arm 40. One end of a piston rod 41 is pivoted to the arm 40 and the other end of the piston rod is pivoted to an ear 42 projecting outwardly from a plunger 43. The plunger operates in a pocket 44 formed in a piston 45 with the reduced end portion of stem 46 of the piston engaged in an opening 47 at the inner end of the piston, and when the plunger is shifted forwardly in the pocket, its stem will pass through the opening and protrude from the front end of the piston. A cross head 48 is carried by the piston rod between collars 49 and this cross head is formed with openings 50 through which pass rods 51 carried by the piston and having heads 52 at their outer ends constituting abutments against which the cross head is yieldably held by

springs 53. From an inspection of Fig. 2, it will be readily seen that as the cam 38 turns with the drive shaft and the piston rod forces the piston forwardly, material in the chamber 54 of the head 3 will be forced forwardly into the compression chamber and compressed during this forward movement. The piston rod moves forwardly to such an extent that before completion of its stroke the material will be given a preliminary compression and the pressure will then have increased to such an extent that resistance of the springs will be overcome and the plunger will move forwardly relative to the piston and its stem will be projected through the opening 47 and serve as a punch to force the center portion of the block of compressed material forwardly. It will thus be seen that during operation of the apparatus, cores 54 of compressed material will be forced forwardly and since each core remains partially within the opening 55 of the block 56 from which it is forced and partially within the corresponding pocket of the block in advance thereof, the cores, which are of greater density than the blocks, will serve as dowel pins for connecting the blocks and forming a cylindrical body 57 of compressed material which is progressively forced forwardly out of the compression chamber. The fact that the material moves forwardly between the lining strips 16 which are urged inwardly by springs 20, causes the united blocks and the dowel pins or cores 54 to be highly compressed and form a very compact mass which is to be cut into briquettes of desired length. The piston 45 and the plunger 28 operate in such timed relation to each other that the piston moves forwardly to force a block of material into the compression chamber and then moves rearwardly to the position shown in Fig. 2, the plunger 28 being held in elevated position, above the inlet 58, during this movement of the piston by the cam 32, which then releases the cross bar 30 so that the spring 31 may force the plunger downwardly to move another charge of material into the chamber 54 for forming another block during the next forward movement of the piston. The material is delivered from a hopper 59 through a spout 60 having its lower end registering with the inlet 58.

In order that the cylindrical body of compressed material discharged from the machine may be cut into briquettes of desired length, there has been provided a saw 61 fixed to a shaft 62 which is rotatably mounted in the free end of an arm or bar 63. This arm is rotatably mounted about the shaft 64 of a motor 65 mounted at the front end of the casing section 2 and a spring 66 yieldably holds the arm raised so that the saw will be out of the way of the advancing mass of compressed material. A belt 67 which is trained about pulleys 68 and 69, transmits rotary motion to the saw shaft to rotate the saw at high speed and cause the compressed body to be cut into briquettes as the arm is swung downwardly and inwardly over the material.

Each briquette consists of a number of blocks which are held in end to end engagement by the cores or dowel pins and since the material is subjected to very high pressure as it moves forwardly through the machine, there will be no danger of the blocks separating. The mass of material forced forwardly under pressure and ejected from the outlet at the front of the machine, may be circular in cross section, rectangular, or of any other desired shape, but, in the

present illustration, the lining strips are so arranged that the material will be square in cross section and the briquettes will have flat side faces and resemble sticks of wood. While it has been stated that the material used for forming the briquettes may be saw dust, shavings, or the like, it is to be understood that any material customarily used for forming briquettes may be used with this briquetting machine.

Having thus described the invention, what is claimed is:

1. A briquetting machine comprising a casing having a chamber therein provided with a rear inlet and an outlet at its front end, means for forming charges of material into blocks and forcing the blocks forwardly through the chamber, means for punching portions from the blocks and projecting same forwardly to form openings in the blocks and forwardly extending dowels engaged in the openings of adjoining blocks and holding the blocks in end to end engagement with each other, lining strips in the chamber, springs for urging the strips transversely of the blocks and applying high pressure thereto to form the blocks and dowels into an elongated mass of highly compressed material reinforced by the dowels, said mass being forced out of the outlet as the blocks are formed and forced forwardly, and means for cutting sections from the mass of material reinforced by the dowels and forming briquettes of desired length.

2. A briquetting machine comprising a casing having a chamber therein provided with a rear inlet and an outlet at its front end, means for compressing material in the chamber and forming blocks moved forwardly through the chamber, means for punching portions of compressed material from the blocks and forcing same forwardly into other blocks to serve as dowels holding the blocks in end to end engagement with each other, strips extending longitudinally in said chamber and having lugs passing through openings in walls of the chamber to prevent longitudinal movement of the strips, springs for bearing against said lugs and urging the strips inwardly for applying pressure to the blocks and forming an elongated mass of highly compressed material, said mass being forced forwardly and progressively ejected through the outlet of the casing as the blocks are formed, means for placing said springs under predetermined tension, and means for cutting sections from the ejected mass of material to form briquettes of desired length.

3. A briquetting machine comprising a casing having a chamber therein provided with a rear inlet and an outlet at its front end, means for compressing material in the chamber and forming blocks moved forwardly through the chamber, means for punching portions of compressed material under increased pressure from the blocks and forcing same forwardly into adjoining blocks to serve as dowels holding the blocks in end to end engagement with each other, strips extending longitudinally in said chamber and having lugs passing through openings in walls of the chamber to prevent longitudinal movement of the strips, springs for bearing against said lugs and urging the strips inwardly for applying pressure to the blocks and forming an elongated mass of highly compressed material, said mass being forced forwardly and progressively ejected through the outlet of the casing as the blocks are formed, abutments for outer ends of said springs, screws threaded through walls of the casing with their inner ends bearing against said abutments

whereby adjustment of the screws places the strips under predetermined pressure, and means for cutting sections from the ejected mass and forming briquettes of predetermined length.

4. A briquetting machine comprising a casing having a chamber provided with an outlet at its front end, a head at the rear end of the casing having an upstanding feed neck provided with a side inlet, a cylinder extending horizontally from the head in alinement with the chamber, a plunger slidable vertically in the neck for forcing material into the chamber and forming a compressed block in front of the cylinder, a stem for said plunger extending upwardly out of the neck and having a cross bar at its upper end, a driven shaft rotatably mounted adjacent the upper end of said neck, a cam carried by said shaft having a radially extending finger for engaging the cross bar and intermittently shifting the plunger upwardly during rotation of the shaft, a spring for urging the plunger downwardly when the cam moves out of lifting engagement with the cross bar, a drive shaft rotatably mounted, a cam carried by said drive shaft, means for transmitting rotary motion from said drive shaft to the driven shaft, a horizontal piston slidable longitudinally through the cylinder, a piston rod actuated from the cam of the drive shaft, a flexible connection between the piston rod and the piston for permitting continued forward movement of the rod relative to the piston under increased pressure after the piston has moved a block of material forwardly in the chamber, a punch associated with said piston and having movement with the piston rod for punching a portion of a block forwardly and forming an opening and a forwardly extending portion for entering the opening of the adjoining block to serve as a dowel connecting the blocks and reinforcing the same, means for subjecting forwardly moving blocks to transverse pressure and forming a mass of highly compressed material progressively ejected from the chamber, and means for cutting the ejected mass into sections constituting briquettes of desired length.

5. A briquetting machine comprising a casing having a chamber provided with an outlet at its front end, a head at the rear end of the casing having an upstanding feed neck provided with a side inlet, a cylinder extending horizontally from the head in alinement with the chamber, a plunger slidable vertically in the neck for forcing material into the chamber and forming a compressed block in front of the cylinder, a stem for said plunger extending upwardly out of the neck and having a cross bar at its upper end, a driven shaft rotatably mounted adjacent the upper end of said neck, a cam carried by said shaft for engaging the cross bar and intermittently shifting the plunger upwardly during rotation of the shaft, a spring for urging the plunger downwardly when the cam moves out of lifting engagement with the cross bar, a drive shaft rotatably mounted, a cam carried by said drive shaft, means for transmitting rotary motion from the drive shaft to the driven shaft, a horizontal piston slidable longitudinally through the cylinder, a punch slidable longitudinally in a bore formed axially of the piston, a piston rod actuated from the cam of the drive shaft and having its front end pivoted to the punch, collars carried by said piston rod, a cross head fitting about the piston rod between the collars, pins carried by the piston and extending rearwardly therefrom with their rear portions pass-

ing through the cross head and formed with heads for engaging the rear face of the cross head, springs about the pins between the piston and the cross head and providing a yielding connection between the cross head and the piston for permitting forward movement of the punch relative to the piston by increased pressure after the piston by increased pressure has moved a block of material forwardly in the chamber, said punch when moved forwardly relative to the piston serving to force material forwardly under increased

pressure from a block into an opening formed in another block and serve as a dowel for connecting and reinforcing the blocks, means for subjecting forwardly moving blocks to transverse 5 pressure and form of the blocks and dowels an elongated mass of highly compressed material reinforced by the dowels and moved forwardly out of the chamber, and means for cutting portions from the compressed mass to form briquettes 10 of desired length.

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