UNITED STATES PATENT OFFICE

2,507,491

BRIGUETTING MACHINE

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Application January 29, 1946, Serial No. 944,099

7 Claims. (Cl. 25—12)

My present invention relates to an improved press for making straw fuel briquettes, and the invention is embodied in a press of the type utilizing a power operated and reciprocating plunger operating in a compression chamber for forming compact and durable solid articles. While various fibrous materials may be compressed in the machine, the present embodiment of the invention is especially designed for comminuting and pressing straw into compact briquettes, or other shapes, for storing, shipping and other purposes.

In carrying out my invention means are provided in connection with a feed hopper for breaking and simultaneously ramming the broken straw as it is ejected into the compression chamber; and to this end the reciprocating plunger for compressing the straw, in charges from the hopper, may be provided with a rotary cutter for severing the charges from the bulk and for further comminuting the pretreated straw.

The invention involves certain novel combinations and arrangements including a reciprocating plunger having a rotary and adjustable cutting head operating as a presser, feeding means for the material, and combinations and arrangements for operating the various parts of the machine, as will be pointed out.

In the accompanying drawings I have illustrated one complete example of the physical embodiment of my invention wherein the parts are combined and arranged according to one mode I have devised for the practical application of the principles of my invention, but it will be understood that changes and alterations may be made in these exemplifying drawings within the scope of my claims without departing from the principles of the invention.

In the drawings:

Figure 1 is a vertical longitudinal sectional view of a press embodying my invention;

Figure 2 is a top plan view of the press in Figure 1;

Figure 3 is an enlarged view of the plunger, detached, and broken away to illustrate details of construction;

Figure 4 is a face view showing the cutting edge of the combined rotary and reciprocating plunger, and broken away to show a portion of the gear ring mounted on the plunger; and

Figure 5 is a top plan view of the slide-head of the plunger with pitman connected thereto, and the bearing socket at the front of the slide head.

In the assembly view of Figure 1 the operating parts of the press are supported upon the machine bed B, which is bolted in usual manner to a suitable base, and power is supplied to the press as will be described.

The press includes a horizontally disposed cylinder 1 which forms a compression chamber 2, and a conical or V-shaped feed hopper 3 is mounted on and located above the cylinder for continuously feeding the material through the lower port 4 to the interior of the compression chamber.

For preparing and feeding the straw from the hopper, a number of vertically reciprocating beaters 5, 5, 5, are pivotally supported on the complementary bearings of a crank shaft 6 that is arranged transversely of the hopper and supported in journal bearings 7. The crank shaft is revolved through power applied to the driven pulley 8, and the vertically reciprocating beaters or rams 5, in the form of metal bars of considerable weight, feed the material through the port 4 to the compression chamber.

In order to minimize the heat generated by friction of the operating parts within the compression chamber, the latter is provided with an exterior jacket 8, having inlet and outlet ports 10 and 11 respectively, as seen in Figure 2, for connections with a cooling water system, and the circulating water within the jacket is utilized for conveying undesirable heat from the compression chamber.

Any suitable abutment or a taper bore may be employed for retaining the briquette within the compression chamber during the pressing operation of the material, for instance, a releasable gate 12 that is pivoted at the front of the chamber, and fastened to the cylinder while the machine is in operation, and means are provided for releasing the abutment or gate for withdrawal of the completed briquette.

The reciprocating plunger, mounted within the compression chamber, for compressing the straw, includes a slide-head 13 having a front cylindrical recess 14 that terminates in a semicylindrical socket 15 in the form of a rounded bearing seat; a combined reciprocating and rotatable head 16 in the form of a solid cylinder; and a combined cutting and pressing head 17 carried by the head 16, as best seen in Figure 3.

The rotary and reciprocable head 16, at its rear end is fashioned with a rounded seat 18 complementary to the seat 15 of the slide-head, and a coupling sphere or ball 19 is interposed between these seats to provide a bearing between the slide-head and the rotary slide head. The non-reciprocating slide head 13 and the rotary slide head 16 are coupled together by means of an an-
nular groove 20 of the rotary slide-head co-acting
with two radially disposed pins or studs 21, 21,
threaded in the cylindrical wall of the recess 14
of the non-rotary slide head. This coupling, it
will be noted, provides for reciprocating move-
ment of the coupled heads, and also permits a
rotary movement of the rotary slide-head with
relation to the non-rotary slide head.

For revolving or rotating the rotary slide head
a comparatively long driven gear is mounted
thereon, as indicated in the drawings. This
driven gear may be a gear ring 22 fixed or fastened
in any suitable manner.

The cutting head 17 is rigidly mounted on the
forward end of the rotary slide-head by means
of a shank 24 inserted in a socket of the rotary
slide head, and secured by a transverse pin 25,
in order that the cutting head may be replaced
if and when necessary.

The cutting head 17, in addition to performing
the functions of a presser against the material,
also cuts and disintegrates the bulk of straw
material. If this is fed through the port 4 into the
compression chamber. For this purpose the cut-
ting head is fashioned with a sharp cutting edge
26, of arcuate shape, that projects forwardly
from the front face of the cutting head a suffi-
cient distance, so that the straw, after being broken
by the breakers or beaters 5 in the hopper, is
further comminuted by the cutting head.

Thus the long straws are initially broken and
then rammed through the port into the compres-
sion chamber, and then these broken straws are
cut into short lengths to facilitate commina-
tion of the material into solid briquettes.

The broken straws are rammed from the
hopper, through the port, into the compression
chamber, the co-acting plunger reciprocating lon-
gitudinally, and the rotary cutting head moving
as part of the plunger, cuts the feeding mate-
rial and compressed material, until the succes-
sive strokes of the plunger have compressed a su-
fficient quantity of material to form the desired
briquette.

The briquette, or compressed solid cylinder
fashioned by the press, may be of varied lengths
depending upon the purpose desired, and suitable
means may be employed for securing the product
into desired lengths after the compacted article
emerges from the press.

For transmitting, power to operate the press a
driven crank shaft 27 is shown journaled in
bearings 28 of the machine bed, and the crank
shaft is connected in the reciprocating plunger
by the plunger 29 coupled at 30 to the rear end
of the plunger.

A pair of balance wheels or fly wheels 31, 31',
rigid with the crank shaft facilitates the transla-
tion of rotary movement to reciprocating move-
ment of the plunger, and the fly wheel 31' may
be equipped with a driving pulley 32 driven by
a belt, from a suitable source of power, not shown.

For imparting rotary movement to the rotary
portion of the reciprocating plunger, a coumer-
shaft 33 is journaled in bearings 34 at one side
of the axial center of the press, and a bevel pinion 35
on the rear end of the countershaft receives power from the complemnetary gear ring
36 of the fly wheel 31'.

Power from the countershaft is transmitted
through a gear wheel 37 rigid with the shaft to
the gear ring 22 of the rotary plunger-portion,
and a lateral opening is provided at 38 in the wall
of the cylinder for meshing action of the gear
wheel and gear ring.

The driven pulley 8 of the feeding crank shaft
6 is also driven from the countershaft 33 through
a belt drive, the drive pulley being indicated at
39 in Figure 2, with a belt 40 shown as passing
around the two pulleys 39 and 33.

As indicated in Figure 1, the knife edge 25 of
the cutting head of the plunger serves to cut,
with a shear action, the bulk of material as
it is fed through the port 4, and the advancing
plunger, on its successive strokes, intermittently
compresses successive charges of the comminuted
material. On the rear stroke of the plunger the
port is again uncovered and opened to permit
injection of another charge of material from the
hopper into the compression chamber, and these
successive charges are successively compressed to
form the briquette, or a solid bar of the material,
as the case may be. The generation of heat,
caused by friction of the operating plunger with-
in the compression chamber, is utilized in the
formation of the briquette, and any excess heat
is conveyed from the cooling jacket by the water
circulation system.

Having thus fully described my invention what
claim as new and desire to secure by Letters Patent
is:

1. The combination in a press of the reciprocat-
ing type and including a compression chamber,
of a reciprocating plunger mounted to reciprocate
in said chamber and operating means there-
for, means for feeding material into the chamber,
a rotary compressing-head rotatably mounted
on the plunger, and a cutting edge projecting from
the front face of the compressing head.

2. The combination in a press including a compres-
sion chamber, a feed hopper having a port
open to said chamber, and ramming means for
conveying material from the hopper through the
port, of a reciprocating plunger mounted to recip-
rocate in said chamber and operating means there-
for, a rotary compressing head, rotatably mounted
on the plunger and means for rotating said
head, and a cutting edge projecting from the
front face of the compressor head.

3. The combination in a press including a compres-
sion chamber, a feed hopper having a port
open to said chamber, and means for feeding
material from the hopper through the port, of
a reciprocating chamber in the chamber and oper-
ating means therefor, said plunger including a
rotary head having a front cutting edge, a gear
ring rigid with the rotary head, a driving gear
meshing with the gear ring, and means for rotat-
ing the driving gear.

4. The combination in a press having a compres-
sion chamber, a reciprocating plunger mount-
ed to reciprocate in said chamber having a rotary
presser head mounted thereon, and operating
means for the plunger, of a feed hopper having a
port open to the chamber through which the
material to be compressed is led to the chamber,
and power transmission mechanism between the
operating means and said rotary presser head
operable to rotate the presser head.

5. In a reciprocating press including a compres-
sion chamber, the combination therewith of a
plunger mounted to reciprocate in said chamber
having a non-rotary slide-head and operating
means connected therewith, a rotary slide head,
a longitudinal coupling and a rotary bearing
joint between said slide-heads, a presser head
mounted on the rotary slide head, a cutting edge
fashioned at the front of the presser head, and co-
acting transmission means between the rotary
slide-head and said operating means for rotating the rotary slide head.

6. In a reciprocable press including a compression chamber, the combination therewith of a plunger having a non-rotary slide-head and operating means connected therewith, a rotary slide head having an exterior annular groove, a pair of coupling pins radially mounted in the slide head and located in said groove, a rotary bearing between adjoining ends of said heads, co-acting transmission means between said rotary slide-head and said operating means, a removable pressor head fixed in the front end of the rotary slide-head, and a cutting edge projecting forwardly from the face of the rotary slide-head.

7. In a reciprocable press including a compression chamber, the combination therewith of a plunger having a non-rotary slide head having a thrust-bearing seat and a socket-recess, and operating means for said slide-head, a rotary slide head having a thrust bearing seat and a bearing ball between said seats, a pair of radially arranged coupling pins mounted in the wall of said recess and co-acting with an annular groove in the rotary slide-head, an elongated gear ring mounted on the rotary slide-head and power transmission means between said gear ring and said operating means, a removable pressor head fixed in the front of the rotary slide head, and a cutting edge projecting forwardly from the front face of said pressor head.

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