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HYDRAULIC SALT PRESS

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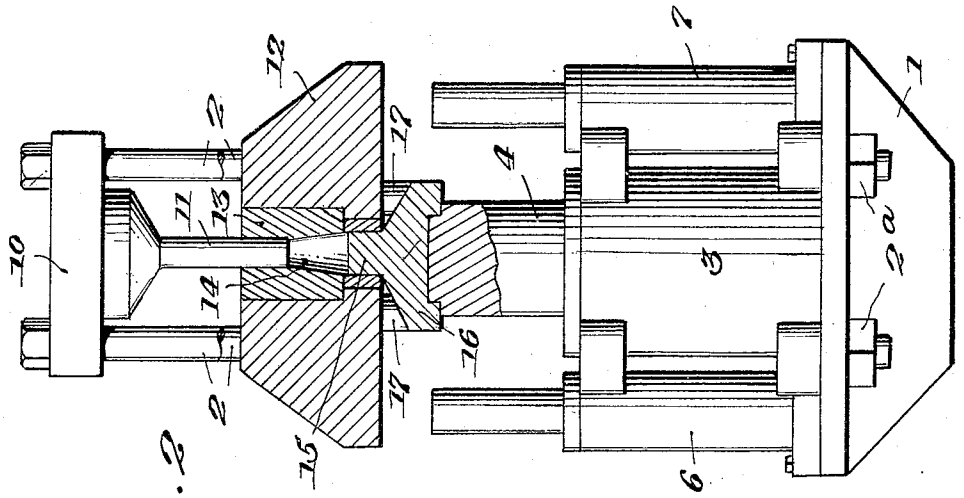


Fig. 2.

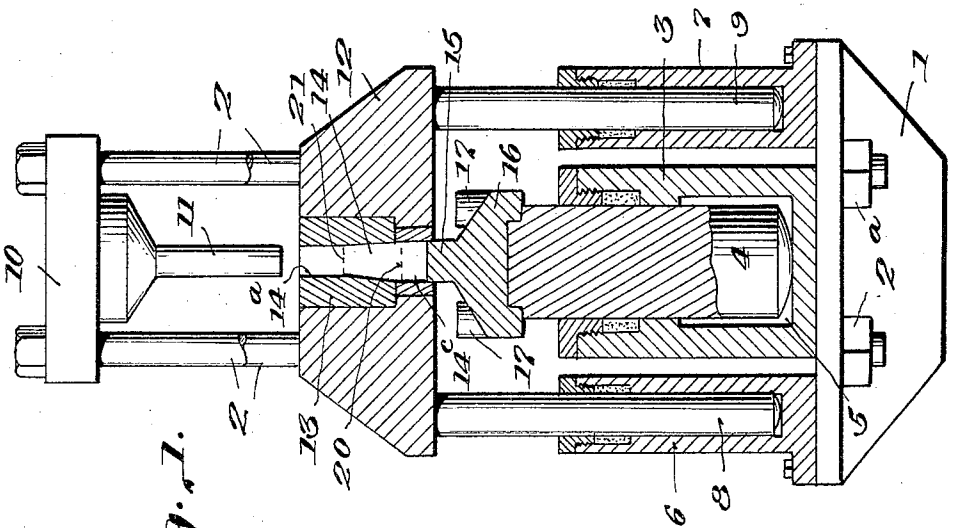


Fig. 1.

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UNITED STATES PATENT OFFICE

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HYDRAULIC SALT PRESS

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My invention relates to salt presses and particularly to such as use heavy pressure, produced for example by means of hydraulic rams and the like. It is in the nature of an improvement over my prior invention of a hydraulic salt press patented to me July 10, 1923, No. 1,461,093. The object of the invention is to produce a press of the type described in said patent, that will produce a compressed salt block both ends of which will be of uniform density, which has heretofore been impossible to accomplish in salt presses of ordinary construction.

The ordinary salt press has a mold box or die for holding the salt, the lower end of which is closed by an element having little or no movement in any part which would tend to move the salt in an upward direction; while the compression is produced entirely from above by a die or plunger which enters the mold box either due to impulsion from a hydraulic ram or by being held on a stationary support while the mold box is moved upward as in my patent. In order to facilitate removal of the compressed salt block, the mold is expanded toward one end, usually the bottom end, to form a truncated pyramid. The base of this figure has heretofore been the base of the mold block, and as in my patent aforesaid, the bottom of the mold has been closed by a disc or plate resting on the head of a hydraulic ram. Pressure then being applied entirely from beneath, the mold box is moved upward with its bottom closed by the said plate, the compression plunger enters the upper end of the mold, and live pressure on the salt is exerted entirely from above. At the end of the operation, it is found that the salt block is less dense at and near the bottom or expanded portion, where it rested on the closing plate moving with the block and mold, than at the top where it received live pressure from the entering plunger.

Briefly stated I attain my object and avoid the objections stated by using a floating mold block with two plungers, one entering it from above and one entering it from beneath, in such manner and under such conditions that live pressure is exerted throughout the mold in both directions, and the salt block is thereby rendered of uniform density.

My invention is illustrated in the accompanying drawing in which

Fig. 1 is a side view with parts in section showing the parts in their initial positions before compression.

Fig. 2 is a similar view showing the parts in operative position after compression.

Referring to the drawing, 1 is a base plate to which the machine is secured. The upper working portions of the machine are carried on four vertical tie rods 2 secured to the base at 2*a* and at their upper ends similarly secured in a crosshead 10 which carries the upper plunger 11. 3 is a central hydraulic cylinder resting on the base and containing a ram 4 which is supposed to be fitted and packed in the usual manner to permit pressure to be exerted in chamber 5 whereby to force the ram upward. 6 and 7 are auxiliary hydraulic cylinders containing rams 8 and 9 fitted and packed in the same manner and adapted to reciprocate on lines parallel to the path of travel of ram 4. Mounted to slide on the tie rods 2 is a floating mold block 12 carrying within it the mold box 13 in which the mold 14 is formed with the upper and lower portions 14*a* and 14*c* cubical, and its central portion in the form of a truncated pyramid, both cubical and pyramidal portions having their four outer edges smoothed off to prevent chipping of the block as fully explained in my said patent. Mounted upon the head of the ram 4 is a block 16 provided with shoulders 17 normally lying beneath and away from the lower face of the mold block 12. Projecting centrally from the upper face of the block 16 is a die or plunger 15 which enters the cubical chamber 14*c* of the mold 14 and normally, as shown in Fig. 1, projects therein a sufficient distance to seal the opening and afford a firm base for the charge of salt. The mold block when at rest is supported on the heads of the auxiliary rams 8 and 9, and all the rams are retracted. The central ram 4 being shorter than the others permits the shoulders 17 to retract away from the mold block 12 as already stated.

In the drawing herewith, the tie rods 2 are shown broken away in part in order to expose the working parts to view.

The operation of my improved press is as follows: With the press in the position shown in Fig. 1, a charge of salt is placed in the mold box 14. Pressure is then applied under the rams 4, 8 and 9 and they move upwardly together with the parts 15, 16 and 17 until the salt within the mold box 14 comes in contact with the end of the plunger 11 which has entered the cubical space 14*a*. During this time, the gap or open space is maintained between the shoulders 17 and the bottom of the mold block 12. At this point compression of the salt between the ends of plungers 11 and 15 begins to take place. Flow of pressure under the rams 8 and 9 is now stopped, leaving them standing at the position shown in Fig. 2. With the mold block 12 no longer being raised by the rams 8 and 9, said block pauses, and the pressure under the ram 4 causes the head 16 to be forced upwardly and the die or plunger 15 to be forced into the lower end of the mold 14*c*, further compressing the salt in the same. This further compression of the salt due to the plunger 15 being forced into 14*c*, causes friction to be created between the salt and the inner walls of the mold box 14 sufficient to carry said mold 14 and the mold block 12 which carries it in an upward direction at approximately the same speed as that at which the plunger 15 is entering the bottom. Thus the press is so timed in its operation that the end of the plunger 15 reaches the point 20 at the same time that the plunger 11 reaches the point 21. Thus from the time that pressure is first applied to the salt until the block is finished, both ends of the block are under "live" pressure, and both ends of the block are constantly being pressed further into the mold box; while on account of this "live" press on each end of the block throughout the entire pressing period both ends are compressed under the same conditions and the block is therefore of uniform density throughout.

After the salt block is finished rams 8 and 9 are again subjected to pressure, and are brought up against the block 12. While in this position pressing upward against the block, pressure is released under the ram 4, and it begins to recede. With the pressure released under ram 4 and still being applied under rams 8 and 9, sufficient pressure is brought to bear on the block at point 21 to cause it to be pushed out of the mold 14 so that it comes out of the press resting on the end of the plunger 15. It should be observed that the different movements thus described in the ejection of the block are so closely related and connected that at no time is the block subjected to the slightest drop, which might tend to injure it. For further detailed description of this operation of ejection reference may be had to page 3, lines 20 et seq. of my Patent No. 1,461,093.

In describing the upper and lower portions of the mold box 14*a* and 14*c*, I have used the expression cubical, for simplicity's sake. It will be understood that in practice these would not be strictly cubical, but would be four-sided prisms with the intersecting edges smoothed off as illustrated and described in my said patent. The lower unit 14*c* would be of greater diameter than the upper one 14*a* and somewhat less in length. These details however may be varied as may any of the non-essential features of the press, without departing from my invention, the essential feature of which consists in proportioning and arranging the parts so that the salt block will be subjected to live pressure in both directions and will thereby be rendered of uniform density.

What I claim is:

1. A hydraulic press for forming salt blocks having relatively movable members combining to bound a forming space subject to reduction in capacity to compress a contained substance, and represented respectively by a lateral restraining wall and terminally opposed elements, one of which elements normally lies in said space and the other is adapted to progress into said space bounded laterally by the wall member, means for causing the second element to enter said space and thereafter for causing both said elements to approach each other so as to exert live pressure on the substance under compression in both directions to define a predetermined limit of compression, and means becoming operative at the limit of compression to withdraw said elements only and to withdraw the compressed substance therewith.

2. A compressing mechanism having two vertical male dies, one fixed and one movable and a cooperating vertical female die member of which the female die member and one male member are upwardly movable to cause the second male member to enter the female member and assume proper compression relation with the first male member, and actuating devices for the female member having means for effecting mutual approach of the male members therein to compression, and thereafter continued movement upward of the female member to cause downward pressure from the first male member on the block under compression and at the same time to lift the female member away from the second male member, and thereby force out the compressed block.

3. A compressing mechanism comprising a floating mold block, a mold therein, a fixed die or plunger normally lying away from the mold block, a movable die or plunger normally engaging one end of the mold to close the same, means to move said mold block and

said second die or plunger relatively to the first die or plunger to cause the latter to enter the mold, means then becoming operative to retard the movement of the mold block, said second die or plunger continuing its movement whereby the dies or plungers approach each other in the mold effecting compression therein, and means thereafter becoming operative to continue the movement of the mold block, so as to cause it to leave the second die or plunger, and means acting simultaneously to stop the movement of the second die or plunger, whereby said block will leave said mold while the mold continues to advance with respect to the first or fixed die or plunger.

4. A hydraulic press for compressing material such as salt comprising the following instrumentalities: a pair of vertical coaxial dies one of which is fixed and the other movable, a hydraulic ram connected with the movable die, a floating mold block between said dies, and supplemental hydraulic means for actuating said mold block, the parts being so proportioned and arranged that when the rams are fully retracted the upper end of the movable die closes the lower end of the mold to receive a charge, when the rams are simultaneously energized the mold block with the mold thus sealed is moved upward to receive the end of the fixed die, after which continued movement of the first ram and the movable die is caused to raise the mold block and the charge in the mold so as to produce live pressure thereon from both dies, and finally the movable die is retracted to remove the compressed charge from the mold.

5. A hydraulic press for compressing material such as salt comprising the following instrumentalities: a pair of vertical coaxial dies one of which is fixed and the other movable, a hydraulic ram connected with the movable die, a floating mold block between said dies, and supplemental hydraulic means for actuating said mold block, the parts being so proportioned and arranged that when the rams are fully retracted the upper end of the movable die closes the lower end of the mold to receive a charge, when the rams are simultaneously energized the mold block with the mold thus sealed is moved upward to receive the end of the fixed die, after which continued movement of the first ram and the movable die is caused to raise the mold block and the charge in the mold so as to produce live pressure thereon from both dies, and finally actuation of the second hydraulic means acting on the mold block and retraction of the first ram are caused to force the mold farther up on the fixed die while the movable die is withdrawn from the lower end of said mold and the compressed charge follows said movable die under pressure from the fixed die.

6. A hydraulic press for compressing material such as salt, comprising the following instrumentalities: a floating mold block containing a mold open top and bottom, a fixed die and a movable die and hydraulic means supporting the movable die and the mold block respectively with means to operate said hydraulic means simultaneously and alternately so as to first adjust both dies in the mold, second, compress the charge under live pressure from both dies, and third, withdraw the lower die by raising the mold block with respect to the upper or fixed die.

7. A hydraulic press for compressing material such as salt, comprising the following instrumentalities: a base plate, vertical tie rods secured to said base plate, a crosshead connecting said rods, a floating mold block mounted to slide on the tie rods and carrying within it a vertical mold box, a fixed die secured to said crosshead and adapted to extend down into the mold when the mold block is raised, hydraulic rams mounted on said base plate, a movable die supported on one of said rams and adapted to be forced thereby upwardly into the mold and other of said rams supporting and adapted to raise and lower the mold block as a whole, together with means to energize said rams first simultaneously and then alternately as described.

8. A hydraulic press for compressing material such as salt, comprising the following instrumentalities: a base plate, a frame, fixed and movable dies, a floating mold block between said dies movable on the frame, and hydraulic means engaging said movable die and said mold block respectively, with means to energize the same as described.

9. A hydraulic press for compressing material such as salt, comprising the following instrumentalities: a floating mold block movable vertically, fixed and movable dies above and below said mold block respectively, and hydraulic means for operating said movable die and said mold block together and separately.

In testimony whereof I hereunto affix my signature.

GEORGE KERSHNER.