Dec. 28, 1965 N. E. BOYER 3,225,410

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Fig. 1.

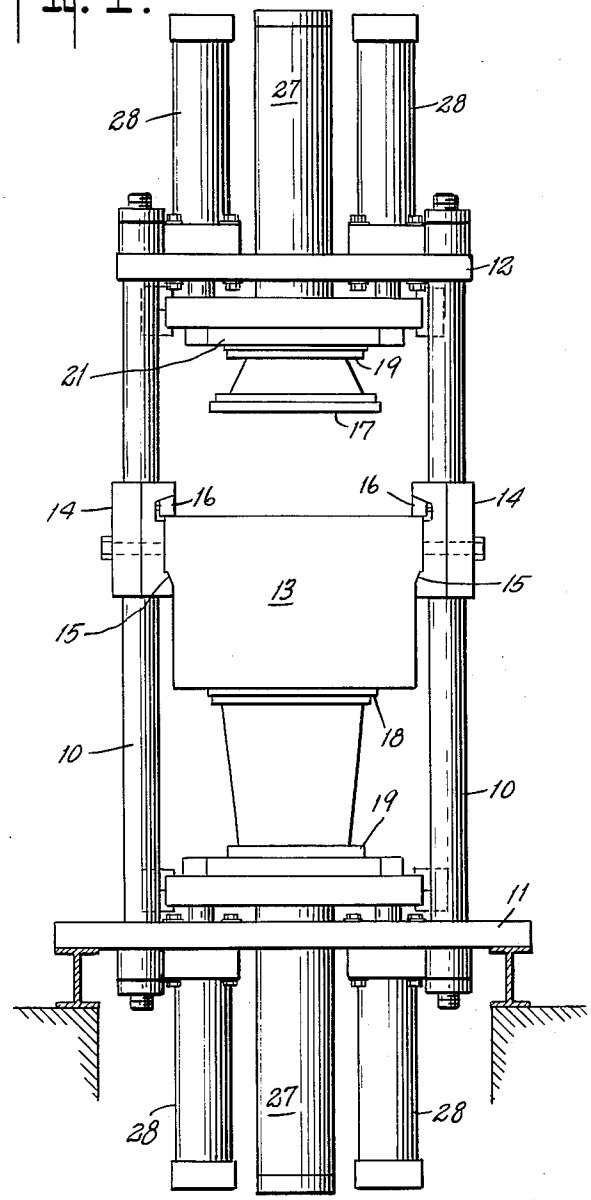
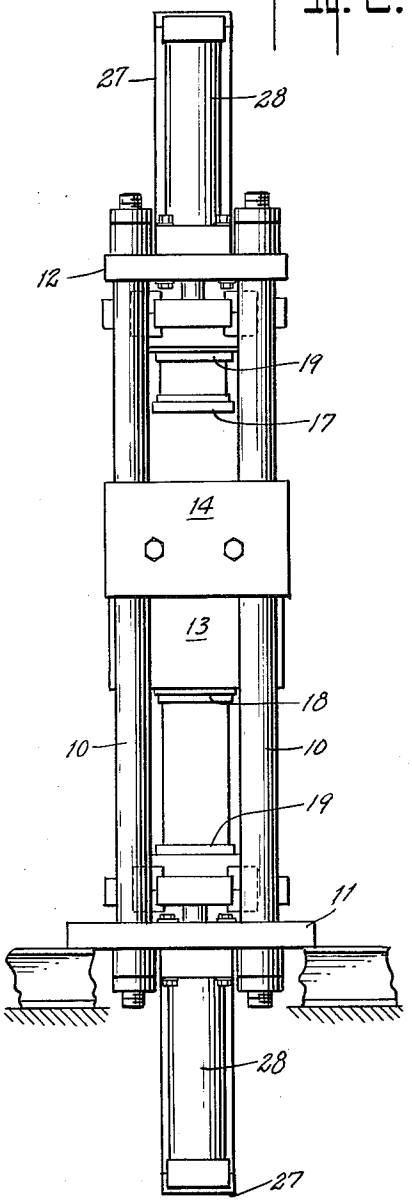


Fig. 2.



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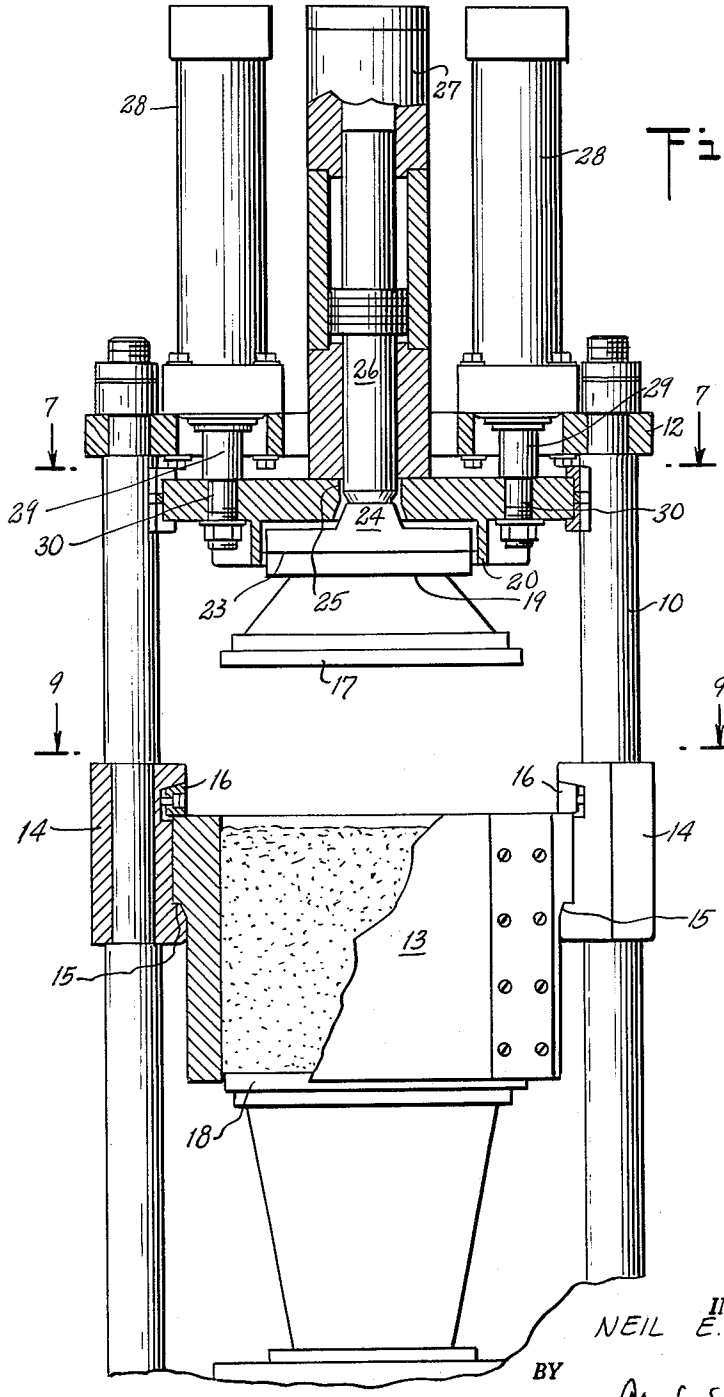


Fig. 3.

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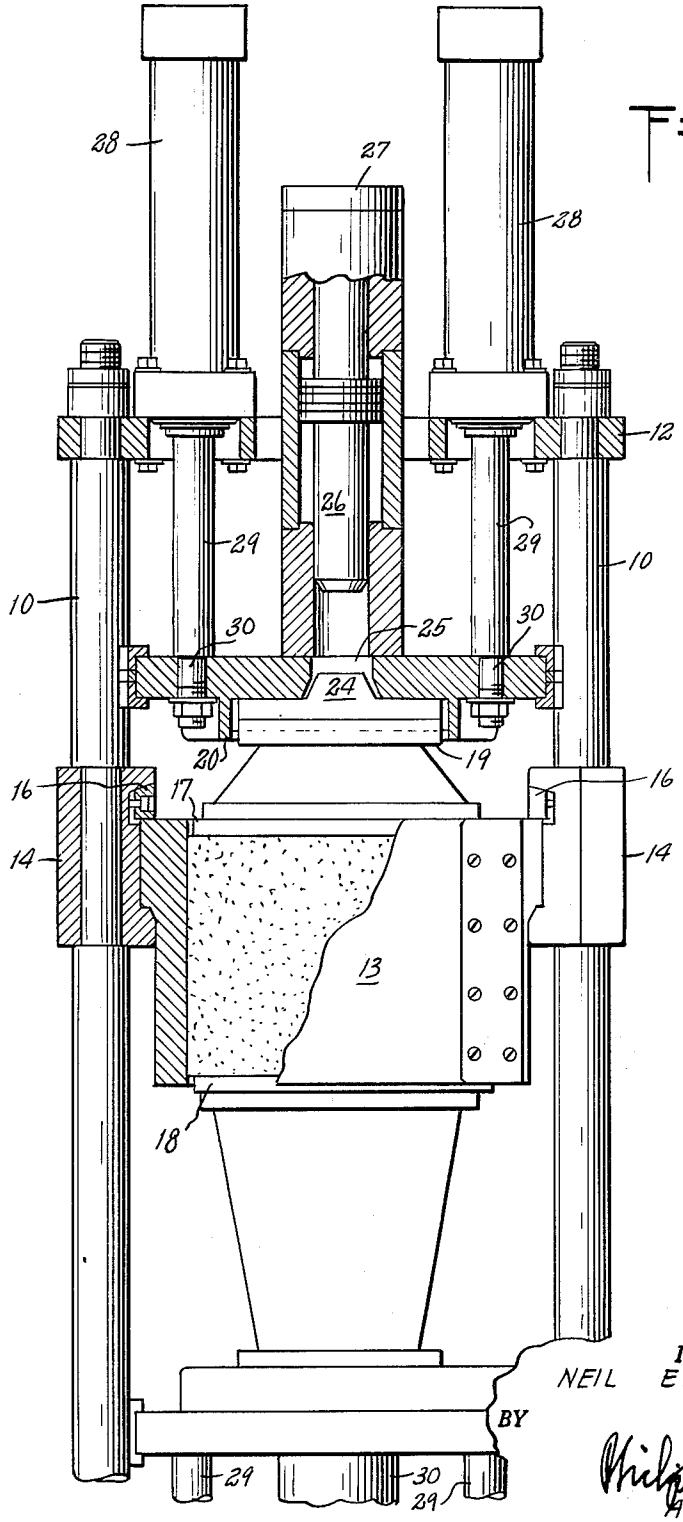
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Fig. 4.



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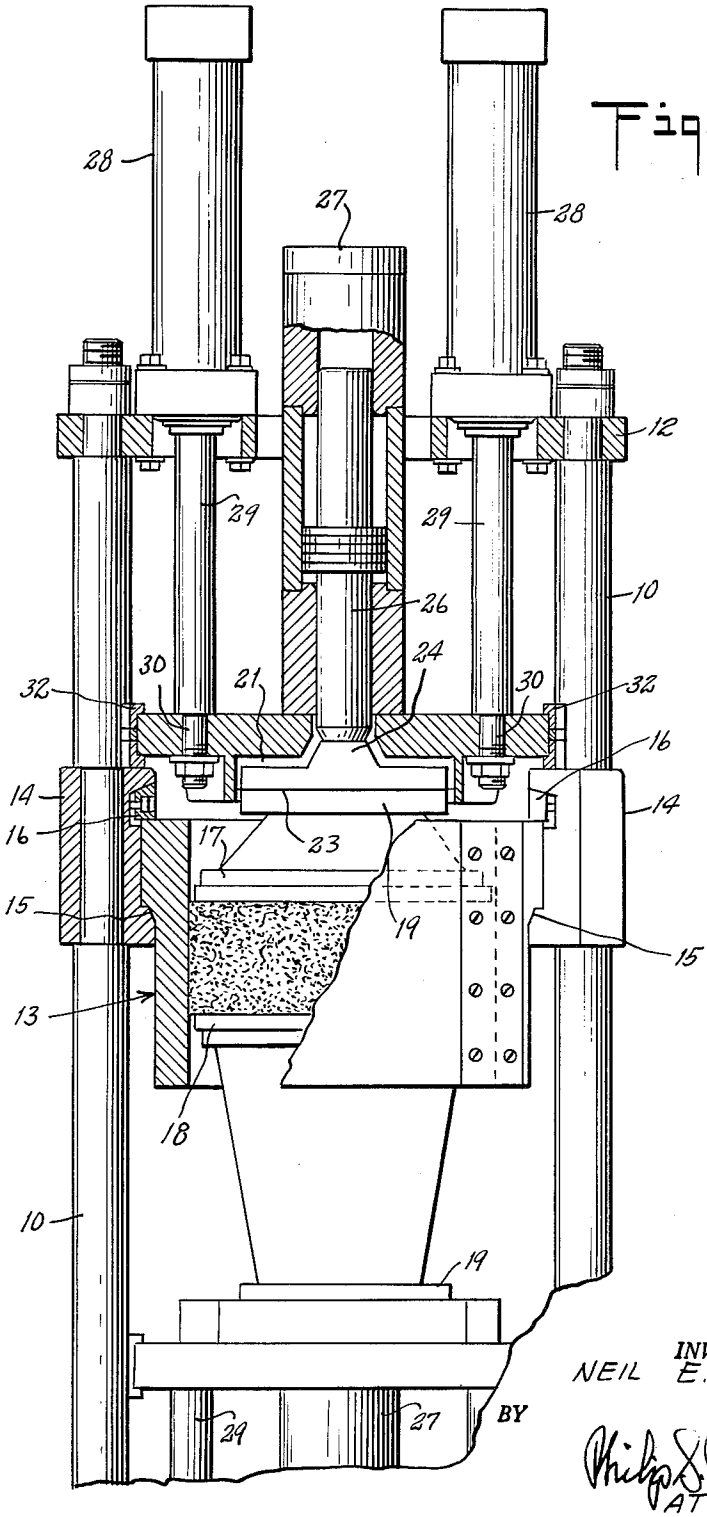
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Fig. 5.



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Fig. 6.

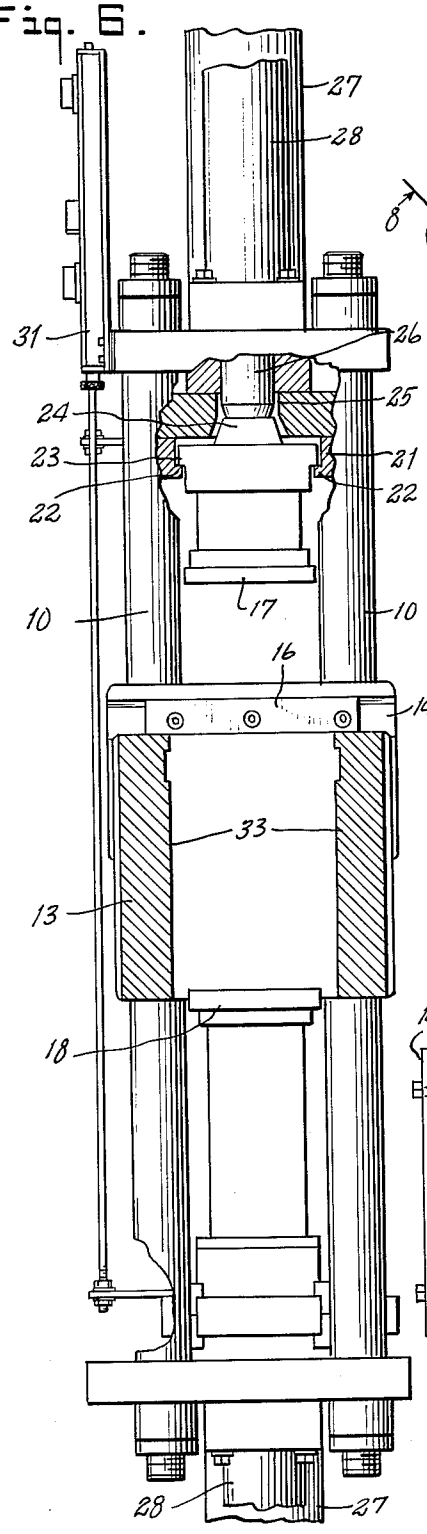


Fig. 7.

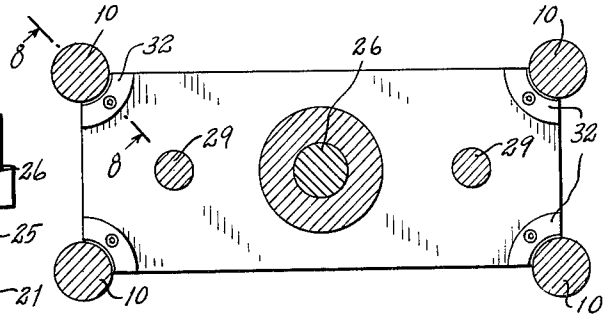


Fig. 8.

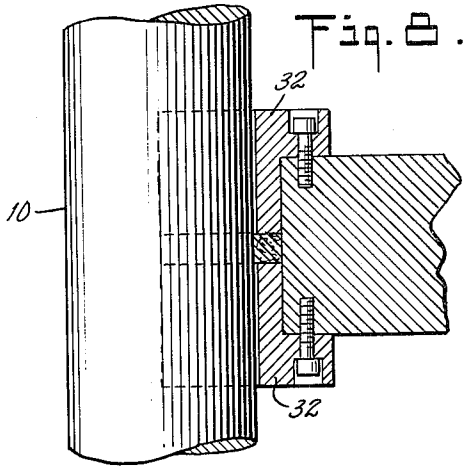
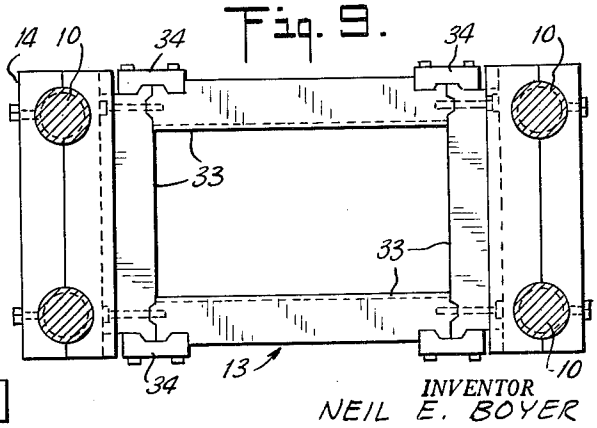


Fig. 9.



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United States Patent Office 3,225,410 Patented Dec. 28, 1965

3,225,410

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4 Claims. (Cl. 25—84)

The invention herein disclosed relates to heavy duty presses of the type designed for production of high density refractory brick, tile and the like.

Objects of the invention primarily are to obtain uniformity of product with a desirably high rate of production.

Particularly it is a purpose of the invention to assure a high quality product of constant density, free of pressure cracks or other flaws or weaknesses.

In accomplishing these highly desirable results use is made of oppositely acting power hammers attached to upper and lower platens of the mold box arranged to come into action as the mold is closed to forcibly distribute and rearrange the granular material to a state of uniform compactness, preserving such uniformity through the final stage of compression.

Other important objects of the invention have been to build this press in a simple structural form of rugged character well adapted to meet various requirements in the art of molding various refractories, ceramics, granular metals and other such materials.

The drawings accompanying and forming part of the following specification are illustrative of a present practical embodiment of the invention. Structure however may be modified and changed as regards the present illustration, all within the true intent and scope of the invention, as hereinafter defined and claimed.

FIG. 1 is a front elevation of a press for producing fire brick, showing the upper platen raised with the upper die clear of the mold box and the lower platen elevated with the lower die closing the bottom of the mold box.

FIG. 2 is a side elevation of the same with top and bottom dies in the same relative positions.

FIG. 3 is an enlarged front view of the press partly in section to show how the anvil plates carrying the dies are hung on the platens with lost motion to take the blows of the air hammers which are located between the hydraulic mold closing cylinders.

FIG. 4 is a broken part sectional front elevation similar to FIG. 3 showing the mold closed and the top and bottom hammers in operation to compact and integrate the granular block forming material.

FIG. 5 is a broken part sectional view similar to FIGS. 3 and 4 showing the mold completely closed, at the end of the compacting and forming cycle.

FIG. 6 is a broken part sectional side view of the press.

FIG. 7 is a cross sectional view on substantially the plane of line 7—7 of FIG. 3, looking down on the platen.

FIG. 8 is an enlarged broken sectional detail on substantially the plane of line 8—8 of FIG. 7 showing one of the corner guides for the top platen.

FIG. 9 is a cross sectional view on substantially the plane of line 9—9 of FIG. 3 showing construction of the mold box and the removable mounting of the same on the four corner columns.

The frame of the machine is shown as made up of four substantial corner posts or columns **10** mounted on a bed plate **11** and connected at the top by a head plate **12**.

The mold box **13** is shown mounted in readily removable relation on the corner posts by supporting brackets **14** having ledges **15** on which the mold box seats and is held by overstanding wedge gibs **16**.

Top and bottom dies **17**, **18** are formed to close the upper and lower open ends of the mold box.

These dies are attached to and carried by anvil plates **19**, loosely connected with the upper and lower platens, to take the blows of the compacting hammers.

The lost motion connections between the anvils and platens are shown as comprising flanges **20** dependent or extended from the inner faces of the plates shaped to form enclosures about and loosely confining the anvils, these enclosures having removable longitudinal walls **21** having shoulder ledges **22** engageable by companion shoulders **23** on the side edges of the anvil plates.

The latter are shown in the sectional views as having center, conical embossments **24** extending partly through openings **25** in the platens for striking engagement by the rams **26** of the air hammers **27**.

These hammers are mounted on the outer faces of the platens in position between the hydraulic cylinders **28** which are mounted in pairs beneath the bed plate **11** and on top of the head plate **12**.

The piston rods **29** of the hydraulics are directly connected to the upper and lower platens as shown at **30**.

In operation the mold is charged with the mix while the parts are in the position indicated in FIGS. 1 and 3 with upper die raised clear of the mold box and the lower die at the proper level closing the bottom of the mold.

The upper platen is then lowered by the upper hydraulic cylinders as shown in FIG. 4 to close the top of the mold box, this movement being relatively fast speed but low pressure of the hydraulics.

As the mold is closed to the FIG. 4 position high pressure operation of the hydraulics at slower speed is initiated and operation of their air hammers **27** is started.

FIG. 5 shows the top and bottom dies reaching the fully compacted position.

At or before this time the operation of the air hammers is stopped and with completion of the mold forming cycle the top platen is raised to the FIG. 1 position and at or approximately the same time the lower platen rises to lift the molded form up to the discharge position approximately in line with the top of the mold box.

The complete molding cycle may be fully or partly automatic with limit switches or the like operated by the press and timed to cut in the air hammers when the mold is closed and to stop these hammers when compaction is completed.

Connections for effecting such timing are indicated at **31** in FIG. 6.

FIGS. 7 and 8 show how the platens may be guided by having segmental shoes **32** secured in the corners of the same slidingly engaged over the corner posts **10**.

FIG. 9 shows how the mold box **13** may be made up of interlocked side walls **33** secured in assembled relation by overlapping interlocking braces **34**.

Other details of construction may vary to meet special requirements.

With the hammers properly synchronized opposing forces are balanced and all energy is contained within the mold, thus to concentrate forces and relieve external parts.

The construction for results accomplished is simple, compact and of reasonably low cost.

The power hammers going into action at opposite ends of the mold box as the mold closes quickly distribute and work loose granular material into a uniformly compact dense mass, providing high production of a high grade product free of the faults common in simple press products. The double hammer operation above and below drives out entrapped air, closing any voids and preventing formation of bridges or laminations.

Different power hammers may be used but what is known as the McKiernan-Terry No. 5 Pile Hammer with

a 200 pound ram and operating at a speed of 300 blows per minute has been used successfully in a press operating in a pressure range of about 75 tons.

While particularly useful for the production of high density refractory brick the invention is not restricted to this particular field but may be used for other purposes such as for sintered metals, concrete block shapes and for metal forming and the like.

What is claimed is:

1. A hammer press for compacting fire brick or other material to substantially uniform density comprising the combination of an open ended mold box, platens guided for movement toward and away from the open ends of said mold box, a pair of pressure applying power cylinders mounted in spaced parallel stationary relation in respect to and at the outer side of each platen, pistons operating in said spaced pressure applying cylinders and connected with said platens, a hammer cylinder mounted on the outer side of each platen between the power cylinders and pistons connected with that platen, rams operating in said hammer cylinders, said platens having openings in line with said rams, anvils at the inner sides of said platens in line with said ram openings in position for engagement by said rams, means confining said anvils to said platens with limited free movement of said anvils toward and away from said platens and dies for closing the open ends of the mold box, connected with said anvils to receive the impact force of the rams and to transmit the effect of hammer blows to material confined in the mold box independently of mold closing pressure applied by the power cylinders.

2. The invention according to claim 1 in which said means for confining the anvils to the platens with limited free movement comprises guides for directing said anvils in movement toward and away from the platens and stop shoulders on said guides and anvils cooperatively engageable to limit separating movement of the anvils away from the platens.

3. Duplex hammer press comprising the combination of an upright mold box open at the top and at the bottom, upper and lower platens guided for movement toward and away from the upper and lower ends of the mold box, anvil plates carried by said platens, upper and lower dies on said anvil plates for closing the upper and lower ends of the mold box, guiding means on said platens loosely confining said anvil plates and dies to limited free motion on the platens in alignment with the mold box and including companion stop shoulders on the platens and anvil plates limiting the extent of free motion of the anvil plates in respect to the platens, power means connected with the platens for shifting said platens in respect to the mold box for opening and closing the mold box and for applying and holding pressure on contents of the mold box engaged by the dies and power hammers mounted on the upper and lower platens, said hammers having oppositely operating rams acting on said loosely guided anvil plates in opposed counterbalancing relation to balance the impact force of one hammer against the impact force of the other hammer and thereby to contain and concentrate compaction forces of the two hammers within the mold box and whereby with said anvil plates loosely confined to the platens said hammers are free to compact contents of the mold unrestrained by the platens which carrying them and the platens, under closing pressure, are free to follow up the compaction effected by the hammers, unrestrained by the hammers.

4. A hammer press for compacting fire brick or other material to substantially uniform density comprising the combination of an open ended mold box, platens mounted adjacent the open ends of the mold box, at least one of the platens is guided for movement toward and away from an open end of the mold box, a pair of pressure applying power cylinders mounted in spaced parallel stationary relation in respect to and at the outer side of said movable platen, pistons operating in said spaced pressure applying cylinders and connected with said movable platen, a hammer cylinder mounted on the outer side of each platen between the power cylinders and pistons connected with the movable platen, rams operating in said hammer cylinders, said platens having openings in line with said rams, anvils at the inner sides of said platens in line with said ram openings in position for engagement by said rams, means confining said anvils to said platens with limited movement of said anvils toward and away from said platens and dies for closing the open ends of the mold box, connected with said anvils to receive the impact force of the rams and to transmit the effect of hammer blows to material confined in the mold box independently of mold closing pressure applied by the power cylinders.

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