H. M. PLAISTED.

MULTIPLE POWER RAMMER.

APPLICATION FILED SEPT. 13, 1909.

979,196.

Patented Dec. 20, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

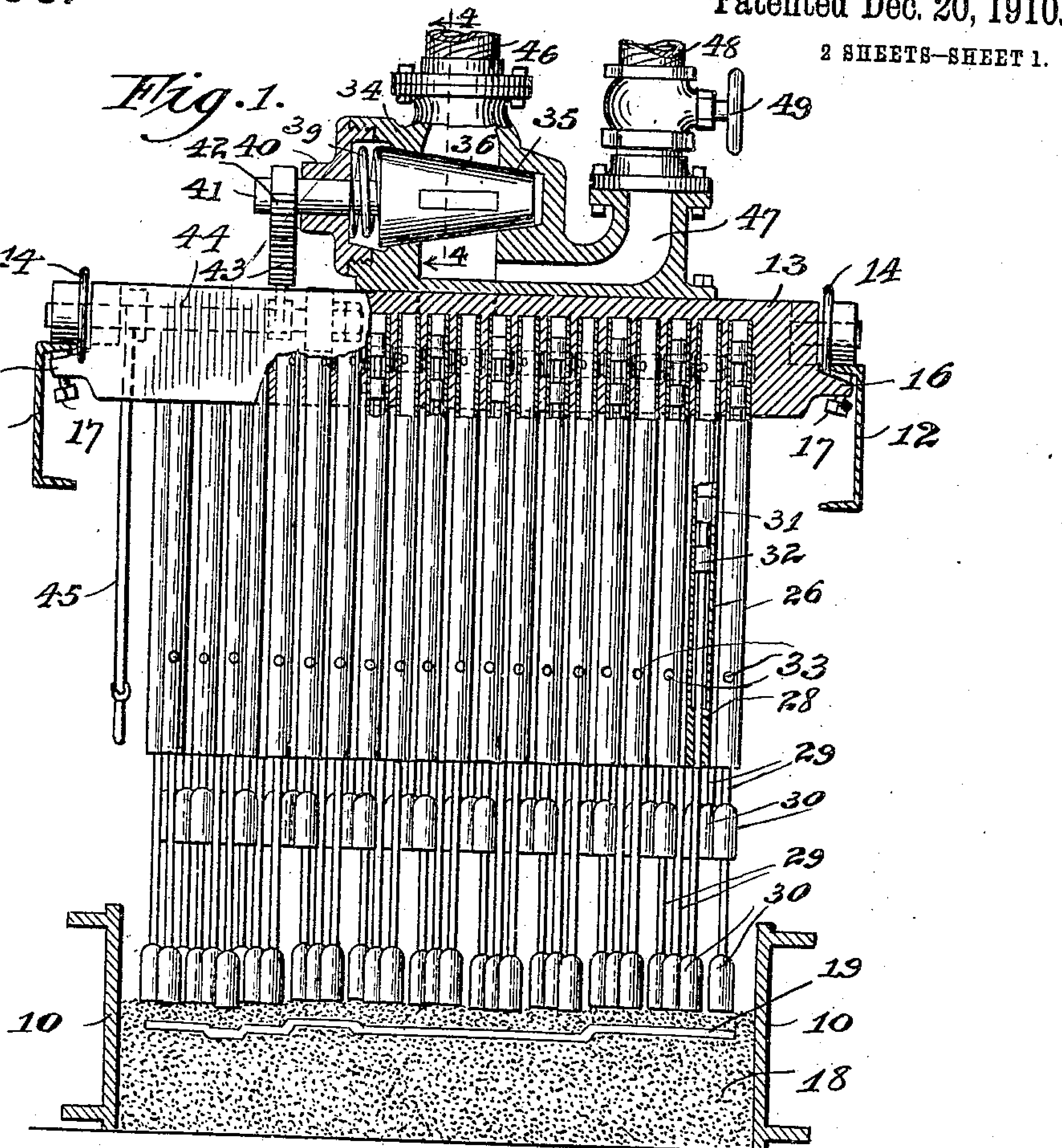
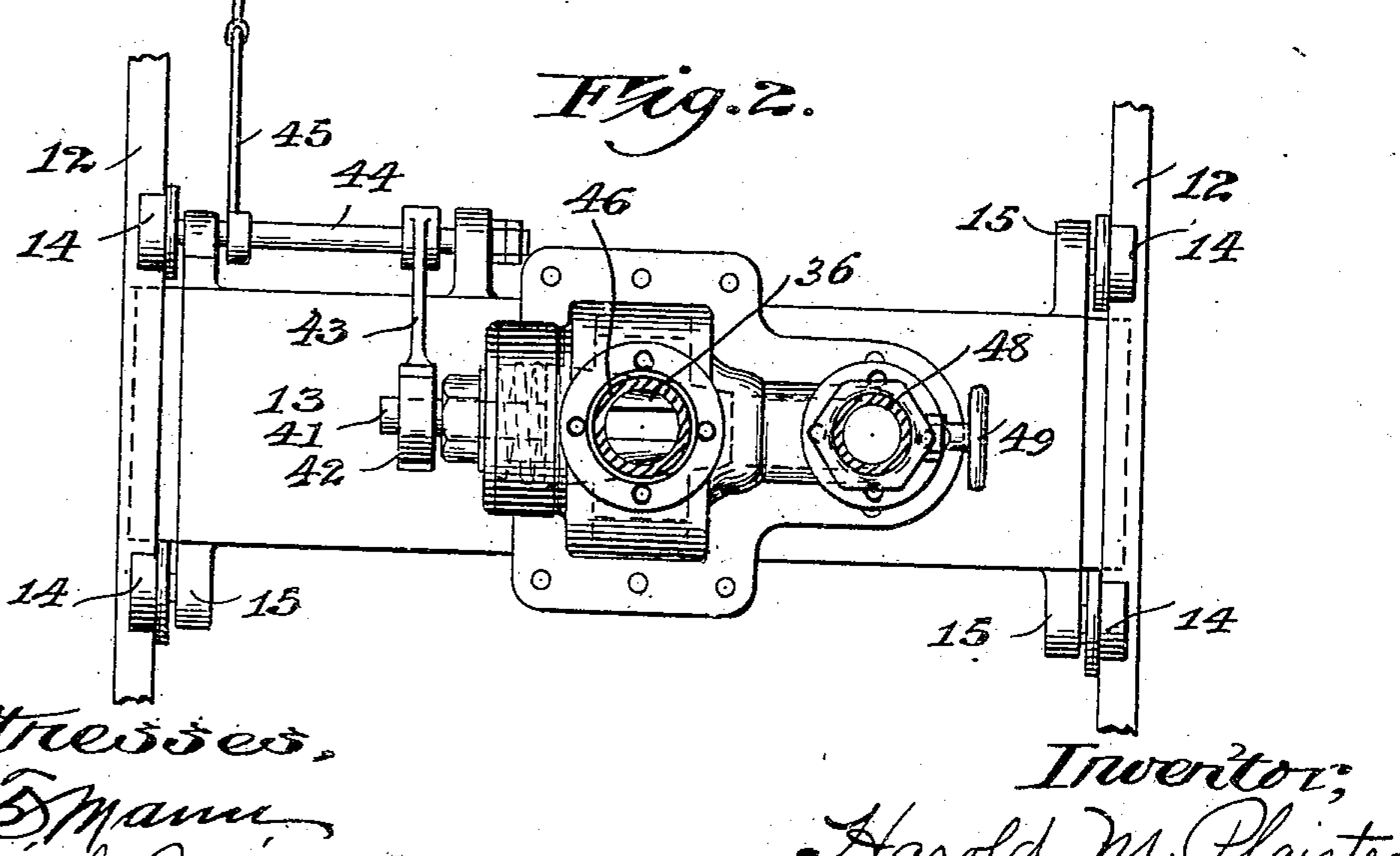


Fig. 2.



Witnesses.

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2 SHEETS—SHEET 2.

Fig. 3.

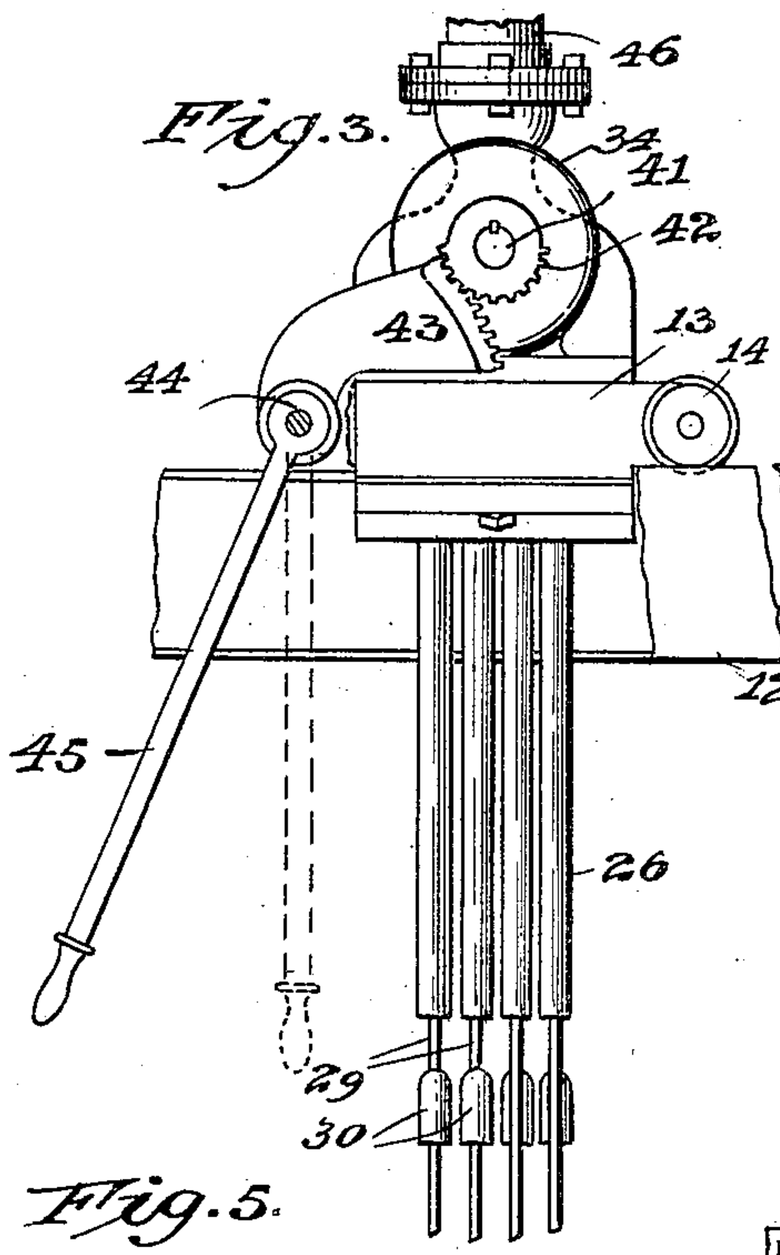


Fig. 4.

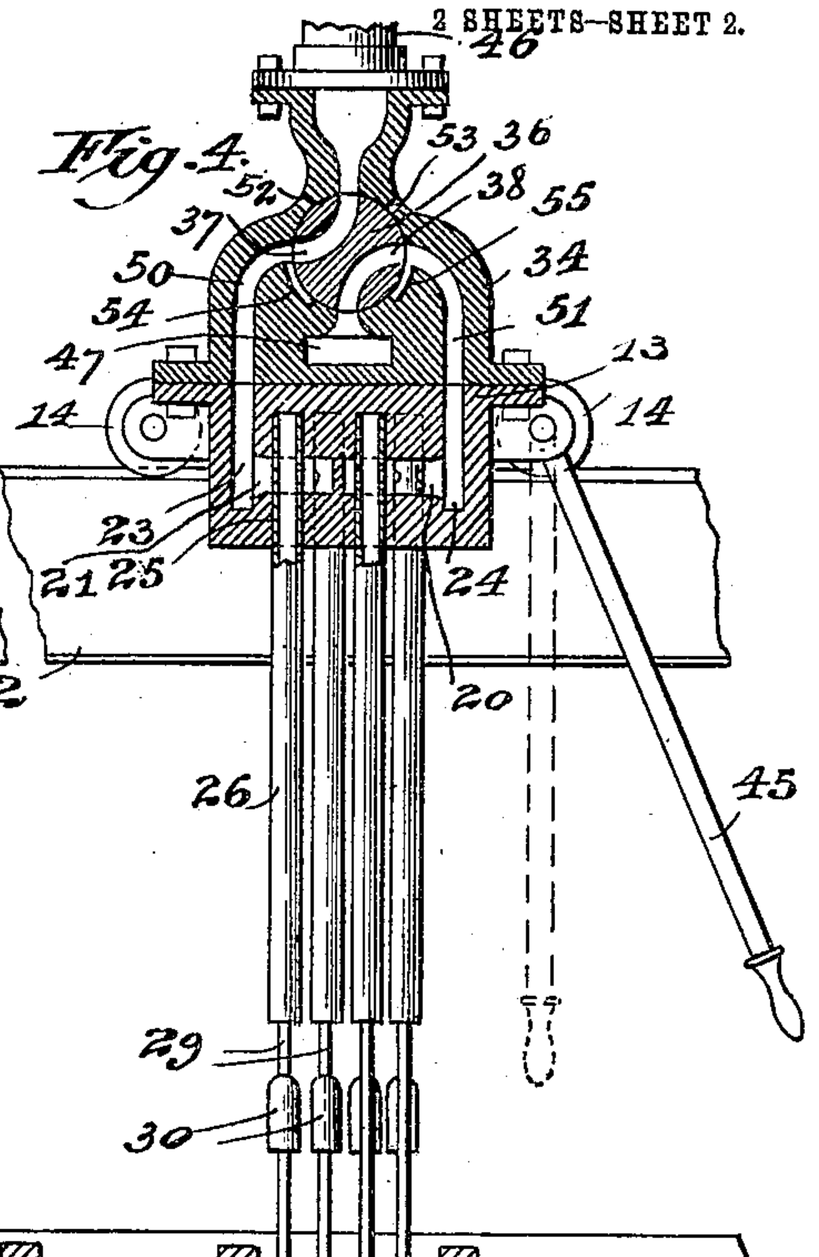
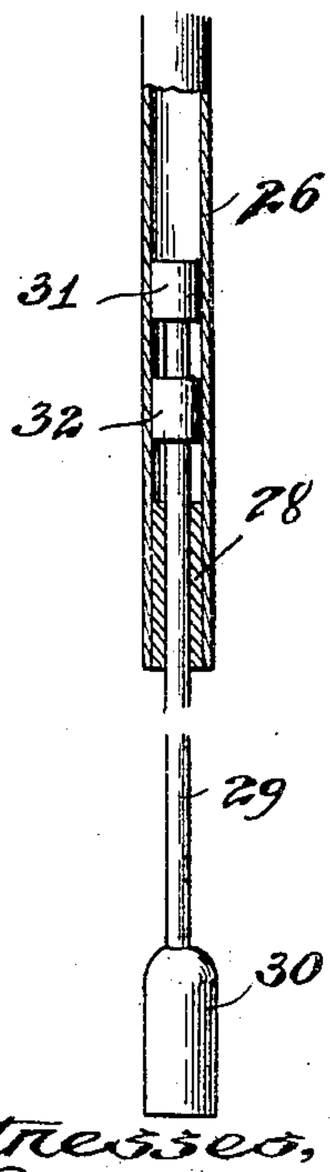


Fig. 5.



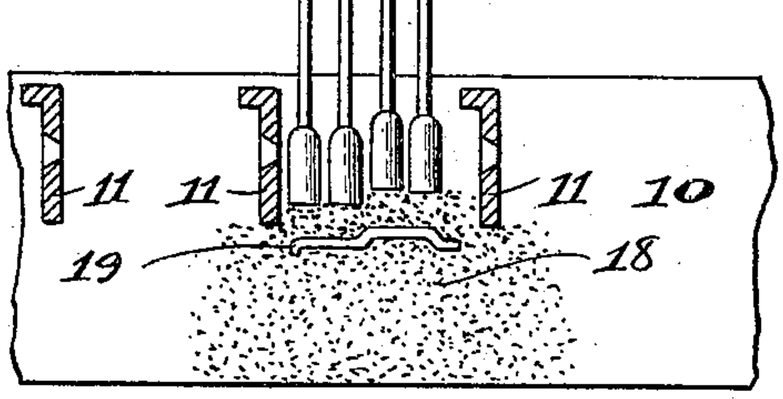


Fig. 6.

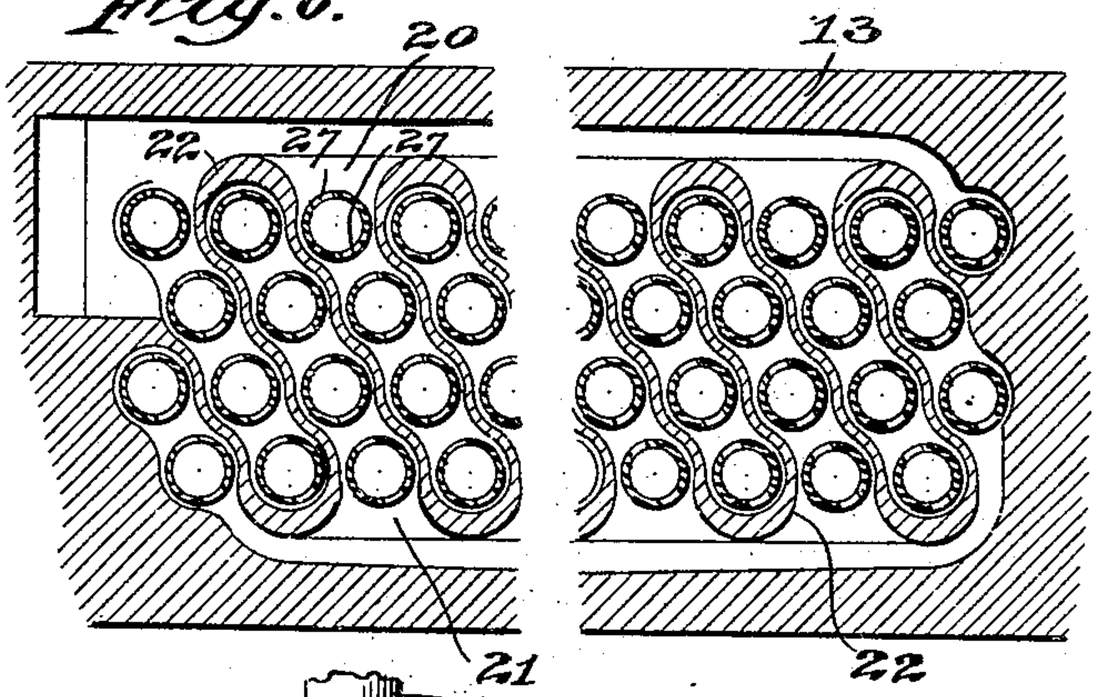
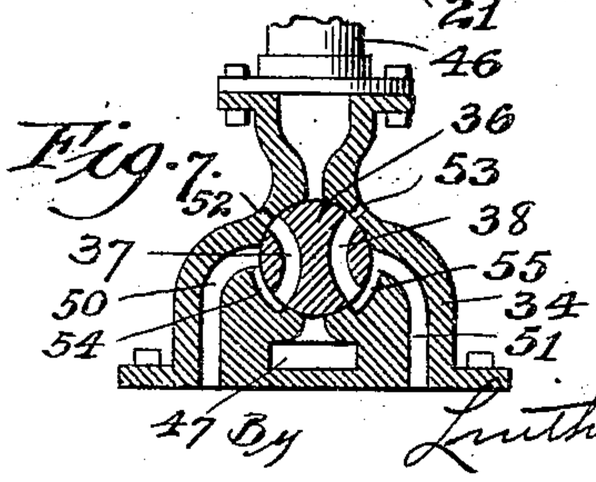


Fig. 7.



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UNITED STATES PATENT OFFICE.

HAROLD M. PLAISTED, OF GRANITE CITY, ILLINOIS.

MULTIPLE POWER-RAMMER.

979,196. Specification of Letters Patent. **Patented Dec. 20, 1910.**

Application filed September 13, 1909. Serial No. 517,442.

To all whom it may concern:

Be it known that I, HAROLD M. PLAISTED, a citizen of the United States, residing at Granite City, in the county of Madison and State of Illinois, have invented certain new and useful Improvements in Multiple Power-Rammers, of which the following is a specification.

My invention concerns improvements in power rammers adapted for employment in compacting the sand in the molds, its leading aim being the elimination of a number of objectionable features in the devices now on the market and presented for public approval.

In my new form of device, the individual rammers or stamping feet are divided into groups operated successively, whereby to secure a better compacting and ramming effect than as if the plungers were all forced down together. In my appliance, the sand has a chance to work somewhat sidewise, which results in a more uniform density in the flask and also lessens the reaction on the machine. To secure the best effect the rammers are made small and are spaced closely together in order that they may work well into the curves of the pattern. Instead of using compressed air on both sides of the pistons or plungers associated with and operating the rammers, which arrangement necessitates an air-tight connection at the lower ends of the tubes or chambers in which the plungers reciprocate, the pistons and rammers in devices embodying my invention are actuated by subjecting one side only of the pistons to the action of compressed air and suction, the other sides of such pistons being acted on by atmospheric pressure. By such means the pistons and ramming feet are forced down under suitable pressure and are raised by the action of the suction, that is, by lowering the pressure on the tops of the pistons whereby to make the same less than that of the atmosphere. These, with other features of novelty and improvement, can be fully understood from the following detailed description of a preferred embodiment of the invention which is illustrated in the accompanying drawings forming a part of this specification, and throughout the various views of which like reference characters refer to the same parts.

In these drawings,—Figure 1 is a partial elevation and partial section of my improved power rammer, illustrating the action of the same on the sand in a mold flask; Fig. 2 is a plan view of the construction shown in Fig. 1; Fig. 3 is a fragmentary elevation of that end of the device equipped with the handle for operating the valve; Fig. 4 is a vertical section on line 4—4 of Fig. 1; Fig. 5 is an enlarged view of one of the rammers or stamping members, and illustrates the chamber or casing partially broken away to more clearly show the internal construction; Fig. 6 is a horizontal section through the device on an enlarged scale, illustrating the zigzag or wave-like partition or wall between the two chambers supplied with the pair of groups or sets of plunger tubes; and Fig. 7 is a section of the valve and its casing, showing the valve in a position connecting both sets of tubes to the atmosphere.

Referring now to the drawings for an understanding of the construction illustrated therein, it will be noted that the mold flask has the pair of longitudinal walls 10, 10 cross connected at intervals by the transverse bars 11, 11, the power rammer being mounted on a pair of channel tracks 12, 12, and adapted for movement thereon so that the ramming feet or stamping shoes may be brought over all parts of the mold and its sand contents. The rammer, thus movable on the top flanges of the parallel tracks 12, 12, consists of a casting 13 supplied with four flanged wheels or rollers 14, the treads of which are adapted to roll on the top surfaces of the upper flanges of the channel tracks. To facilitate the mounting of these rollers upon this casting, the latter may be provided with a plurality of outwardly extended arms 15, on which the rollers may be suitably mounted and supported. In order that the rammer may be held fixedly in position on these tracks during the ramming operation, the casting 13 has flanges 16 at its opposite ends underlying the top flanges of the tracks and provided with set screws 17 adapted to bear against such flanges and hold the rammer immovably in position for operation on the sand 18 in the mold, in which any suitable pattern 19 may be embedded. The casting or member 13 is hollow and is divided into two chambers or compartments 20 and 21 by a thin zigzag or serpentine partition or wall 22, each compartment near the side of the casting having an upwardly extended passage 23 and 24, respectively, communicating therewith. The bottom of this main casting or member 13

has a considerable number of cylindrical recesses 25 extended upwardly thereinto beyond the chambers 20 and 21, such cylindrical holes receiving the upper ends of a plurality of vertical tubes 26, all of which pass through one or the other compartment 20 or 21, being apertured in its side at 27 to effect communication between the particular chamber or compartment through which it passes and the interior of the tube. The lower end of each of these tubes or casings has a bushing 28 fitted therein and axially apertured for the reception and reciprocation therein of a rod or shaft 29 having at its lower end a rammer or stamping foot 30, the upper end of each rod or shaft 29 being equipped with a pair of pistons or plungers 31 and 32 having an air-tight fit with the cylindrical inner surface of the tube or casing. Near its lower end, each of these tubes has one or more apertures 33 (Fig. 1) to obtain communication with the external atmosphere, so that the under surface of the piston 32 is at all times subjected to atmospheric pressure. The particular arrangement and disposition of these tubes and rammers with respect to the two compartments 20 and 21 is clearly indicated in Fig. 6, substantially half of the same being associated with each of such compartments.

On top of the casting 13, I bolt a valve casing 34 having a conical valve seat 35 in which is mounted and adapted to turn a conical valve 36 having extended transversely therethrough two curved passages 37 and 38 (Fig. 4), the valve being maintained in suitable association with its seat by a coiled expansion spring 39 acting on the head of the valve and mounted between the latter and a gland 40 screwed in the side of the casing. The valve stem 41 protrudes through this gland outside of the casing and has keyed thereon a mutilated gear 42, with the teeth of which mesh those of a toothed segment 43 fixed on a rotatable shaft 44 revoluble in suitable bearings and equipped with a downwardly-extended actuating handle 45. It should therefore be apparent that by swinging the handle 45 the valve 36 may be oscillated to change the connections or arrangements of passages in the valve casing. The hollow interior of the valve casing 34 is connected above the valve to a pipe 46 connected to any suitable means for creating suction or producing a pressure less than that of the external atmosphere. The cavity within this valve casing 34 has a lateral branch 47 connected to a supply pipe 48 which is in communication with a device, not shown, for compressing air or supplying steam or the like under pressure, this pipe 48 being equipped, as is indicated in Figs. 1 and 2, with a shut-off valve 49. At one side of the valve 36, the cavity or recess in the valve casing 34 has a passage 50 extended downwardly and communicating with the upper end of the passage 23, the opposite side of the casing having a similar passage 51 in communication with the passage 24. As is indicated perhaps most clearly in Figs. 4 and 7, the casing 34, near the top part of the valve 36, has two small ports 52 and 53 on opposite sides of the casing and leading to the outer air. It should also be noticed, as is shown in these same figures, that the valve seat is cut away on opposite sides at the points 54 and 55 to permit the air to pass through passages 37, 52 and 38, 53, respectively, for a purpose hereinafter indicated.

The operation of this improved rammer is practically as follows: Assuming that the flask or mold casing 10 has been supplied with the sand 18 and a pattern 19 has been embedded therein, the set screws 17 of the ramming device are loosened and the whole appliance is rolled along on the channel tracks 12 until all of the ramming feet or stamping members are above one of the spaces between a pair of the cross bars 11 connecting the opposite sides of the flask, as is indicated, for example, in Fig. 4, the number of such ramming elements being so chosen and the members so arranged that they can readily effect the entire ramming operation between a pair of such cross bars without moving the device on the tracks. When the rammer has been properly brought to position, the retaining screws 17 are turned so as to hold the appliance immovably in place during the ramming operation. It is to be understood, of course, that to facilitate and effect this travel of the rammer, the pipes 46 and 48 are either made flexible or supplied with flexible connections, as would obviously be necessary for this purpose. Assuming that the valve 49 is open, the handle 45 is swung to the full-line position shown in Fig. 4, effecting the turning of the valve 36 so as to bring about the connection of the passages as indicated in this figure. The compressed air, or other fluid under pressure, passes from the pipe 48 through the valve 49 and passage 47, through the curved port or passage 38 of the valve, and thence through the registering passages 51 and 24 to the chamber or compartment 20, such fluid entering the plurality of tubes 26 through the apertures 27 and acting upon the top surfaces of and forcibly pressing down the pistons 31, which, as will be readily understood, are directly connected with the shafts or rods 29 and the stamping feet or rammers 30. The result of this action of the compressed fluid is a forcible downward pressure of these rammers, that is, one half of the total number of rammers, on the sand in the mold, the pressure of the fluid on the top sides of the pistons 31 being somewhat greater than the atmospheric pressure act-

ing on the bottom surfaces of the pistons 32. At the same time that these rammers are descending, the rammers of the other group are being lifted or raised, because the suction appliance, acting through the pipe 46, valve port 37, passages 50 and 23, compartment 21 and the interior of the tube 26, operates to reduce the pressure on the top surfaces of the pistons 31 below that of the atmosphere acting on the bottom surfaces of the pistons 32. Consequently, all of the rammers associated with the chamber 20 are raised by the atmospheric pressure, as will be readily understood. The operator then swings the handle 45 to the dotted-line position shown in Fig. 4, and during such movement of the handle, the valve assumes the position indicated in Fig. 7, which, as should be obvious, establishes communication temporarily, or momentarily, between both of the chambers 20 and 21 and the outer air, permitting the escape of the compressed fluid from the chamber 21 and the entrance of the outer air into the chamber 20, while the connection with the suction and with the supply of compressed fluid is cut off by the body of the valve, as is clearly indicated. When the handle has reached the dotted-line position, however, the port 37 has moved sufficiently to establish connection or communication between the passages 47 and 50, causing the entrance of the compressed fluid into the chamber 21 and the connection of the chamber 20 with the suction appliance, causing a reversal of the operations above described, that is, compelling a forcible descent of the pistons previously raised and the elevation of the pistons and rammers previously pressed down. This operation and movement of the valve through its actuating handle can be continued until the sand in the mold flask has been sufficiently compacted and condensed, and when it is desired to elevate the entire number of rammers, it is merely necessary to close the valve 49, thereby shutting off the supply of compressed air or steam, and moving or rocking the valve 36 so as to apply the suction appliance to first one set of tubes and then the other, the atmospheric pressure thereupon causing the elevation or raising of all of the plungers and maintaining them in that position. After this has been accomplished, the rammer can be moved along on the tracks, as will be apparent, so as to bring the stamping feet over a new section of the mold.

Consideration should be paid to a number of features of this device, among which may be mentioned the fact that no air-tight connection is maintained between the bushings 28 and the rods or shafts 29, so that any cutting of the bushing or rod due to the elevation of sand on the latter in no way interferes with the satisfactory and successful operation of the appliance, the bushing 28 merely acting as a guide for the stamping feet during their reciprocations. It is further to be noted that by dividing the rammers into groups and having them act successively, the sand is permitted to move somewhat sidewise and then be struck by the other group of rammers, which results in a more efficient and satisfactory compacting or condensing of the sand in the mold flask. Attention is also directed to the fact that the air or fluid pressure on one side only of the pistons is varied or controlled to effect the sliding or reciprocating action of the rammers, and that by varying the pressure of the compressed fluid admitted to the passage 47, the stamping effect or force of the rammers may be modified without changing the action of the suction which effects their raising or elevation.

Especial attention is directed to the fact that by establishing communication with the outer air at each oscillation of the valve, that is, permitting the compressed fluid to escape from the tubes and permitting the outer air to rush in and fill the partial vacuums in the tubes, a considerable saving is effected in the work necessary for the fluid compression appliance and the suction apparatus. Owing to this peculiar construction, in which the tubes 26 are inserted in the casting 13 so that their upper ends extend beyond the chambers 20 and 21, cushions are established in these ends of the tubes so as to diminish and cushion the shocks due to the upward movements of the pistons and attached rammers.

It is one feature of this invention that the rammers ought to be small in size and considerable in number to obtain the best results, and in order to permit the rammers to work well into the curves of the various patterns which may be employed. By opening and closing the valve 36 more or less, the amount of pressure on the descending pistons may be readily controlled to obtain the best results in each particular case, although ordinarily the control of pressure may be readily effected by the valve 49 if necessary.

The structural features of this particular embodiment of this invention have been entered into in the illustration and description with some degree of particularity, but it is to be understood, and will be appreciated by those skilled in this art, that many minor mechanical changes may be made in this construction without departure from the substance of the invention and without sacrificing any of its substantial benefits or advantages. For instance, instead of a rocking valve of the type indicated, a slide valve somewhat similar to that of a steam engine may be employed if found to be desirable or feasible.

I claim:

1. In a rammer of the character described, the combination of a plurality of ramming members, and pneumatic means adapted to act successively upon the various members and on one end only of the members and in conjunction with the atmospheric pressure to alternately extend and retract said members, substantially as described.

2. In a rammer of the character described, the combination of a plurality of groups of ramming members, and pneumatic means to successively extend and retract each group, substantially as described.

3. In a multiple power rammer of the character described, the combination of a plurality of chambers, a plurality of groups of rammers, a plurality of pistons connected to and actuating said rammers and slidable in said chambers, and pneumatic means acting on one side only of said pistons to extend and retract the groups of rammers successively, substantially as described.

4. In a multiple power rammer of the character described, the combination of a plurality of chambers, a plurality of rammers, a plurality of pistons connected to and actuating said rammers and slidable in said chambers, and means to force said pistons and rammers in one direction by applying a pressure greater than atmospheric to one side of said pistons and to move said pistons and rammers in the opposite direction by making the pressure on the same side of said pistons less than atmospheric, the opposite side of said pistons being subjected to the pressure of the atmosphere, substantially as described.

5. In a multiple power rammer of the character described, the combination of a pair of sets of chambers, a pair of groups of rammers, a pair of groups of pistons connected to and actuating said rammers and slidable in said chambers, and means to force one group of said pistons and rammers in one direction by applying a pressure greater than atmospheric to one side of said pistons and to move the other groups of pistons and rammers in the opposite direction by making the pressure on the corresponding sides of their pistons less than atmospheric, the opposite sides of all of said pistons being subjected to the pressure of the atmosphere, substantially as described.

6. In a device of the character described, the combination of a pair of groups of piston chambers, a pair of sets of pistons slidable in said chambers and in communication with the atmosphere on one side, rammers operated by said pistons, a connection with a source of fluid under pressure greater than atmospheric, a connection with a suction appliance, and means between said connections and chambers adapted in one position to admit to the chambers of one group and on one side of the pistons therein a supply of said fluid to force said rammers against the sand in the mold flask, said means at the same time connecting the chambers of the other group and the corresponding sets of their pistons to said suction appliance to cause said second group of pistons and rammers to move away from the flask, said means being capable of reversing the connections specified, whereby said groups of rammers may be alternately driven into and driven from the flask, substantially as described.

7. In a device of the character described, the combination of a pair of groups of piston chambers, a pair of sets of pistons slidable in said chambers and in communication with the atmosphere on one side, rammers operated by said pistons, a connection with a source of fluid under pressure greater than atmospheric, a connection with a suction appliance, and a single valve between said connections and chambers and adapted in one position to admit to the chambers of one group and on one side of the pistons therein a supply of said fluid to force said rammers against the sand in the mold flask, said valve at the same time connecting the chambers of the other group and the corresponding sides of the pistons to said suction appliance to cause said second group of pistons and rammers to move away from the flask, said valve being capable of reversing the connections specified, whereby said groups of rammers may be alternately driven into and away from the flask, substantially as described.

8. In a device of the character described, the combination of a pair of groups of piston chambers, a pair of sets of pistons slidable in said chambers and in communication with the atmosphere on one side, rammers operated by said pistons, a connection with a source of fluid under pressure greater than atmospheric, a connection with a suction appliance, and means between said connections and chambers adapted in one position to admit to the chambers of one group and on one side of the pistons therein a supply of said fluid to force said rammers against the sand in the mold flask, said means at the same time connecting the chambers of the other group and the corresponding sides of their pistons to said suction appliance to cause said second group of pistons and rammers to move away from the flask, said means being capable of reversing the connections specified, whereby said groups of rammers may be alternately driven into and away from the flask, said means being constructed to connect the chambers of the two groups with the external atmosphere during change from one of said connections to the others, whereby to permit the compressed fluid of one set of chambers to escape to the external atmosphere and to permit the outer

air to enter the chambers previously subjected to suction, substantially as described.

9. In a power rammer of the character described, the combination of a plurality of compartments provided with fluid cushions at their upper ends, pistons reciprocable in said compartments, rammers operated by said pistons, and means to vary the fluid pressure in said compartments on one side only of said pistons above and below atmospheric pressure to cause their reciprocation, the other sides of said pistons being subjected to atmospheric pressure, substantially as described.

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