(No Model.) 3 Sheets—Sheet 1.

A. E. HAMMER.

CORE MACHINE.

No. 506,226. Patented Oct. 10, 1893.

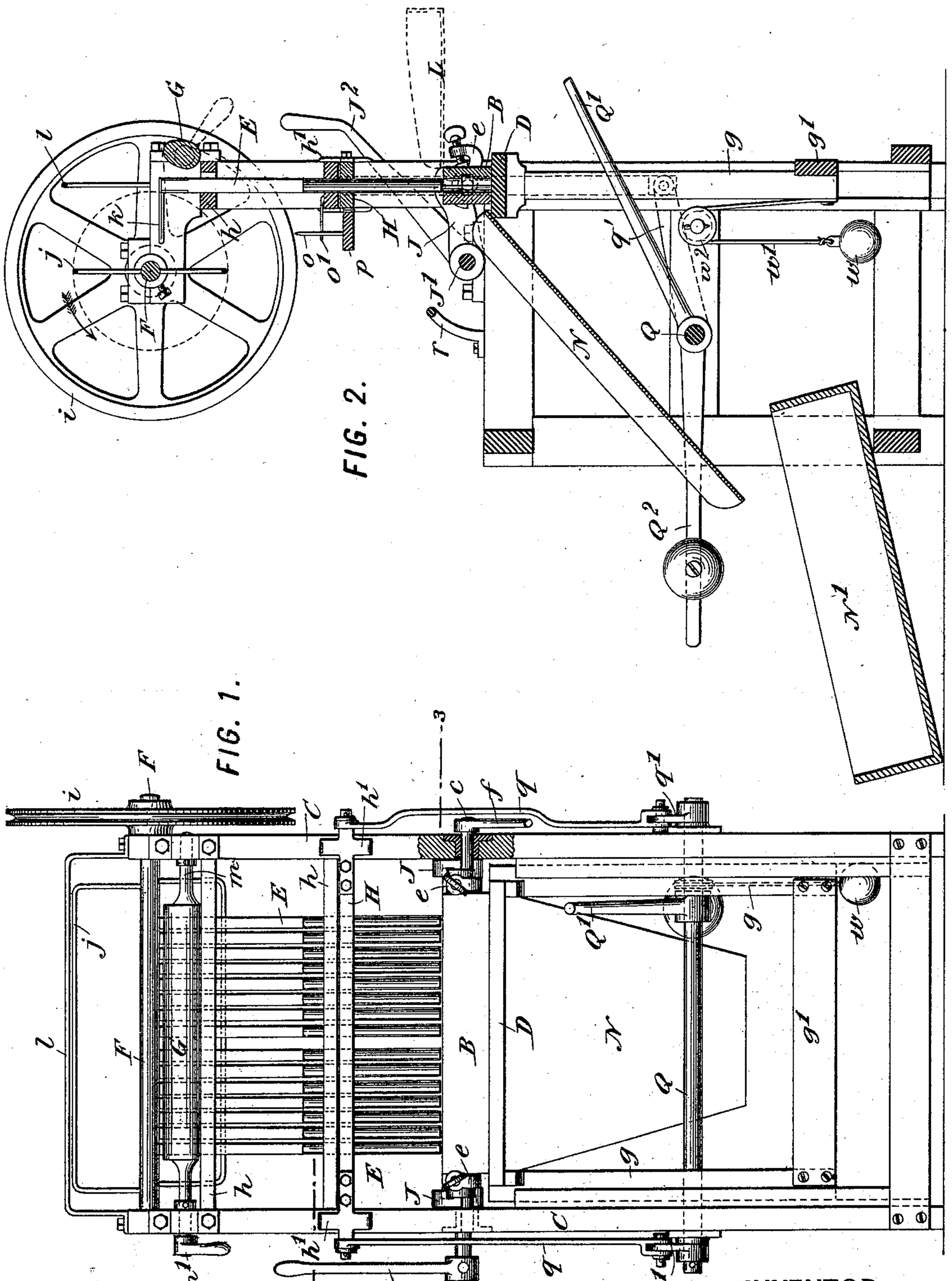

FIG. 2.

FIG. 1.

WITNESSES:

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INVENTOR:

Alfred E. Hammer,

By his Attorneys,

Arthur G. Fraser & Co.

(No Model.)

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A. E. HAMMER.

CORE MACHINE.

No. 506,226. Patented Oct. 10, 1893.

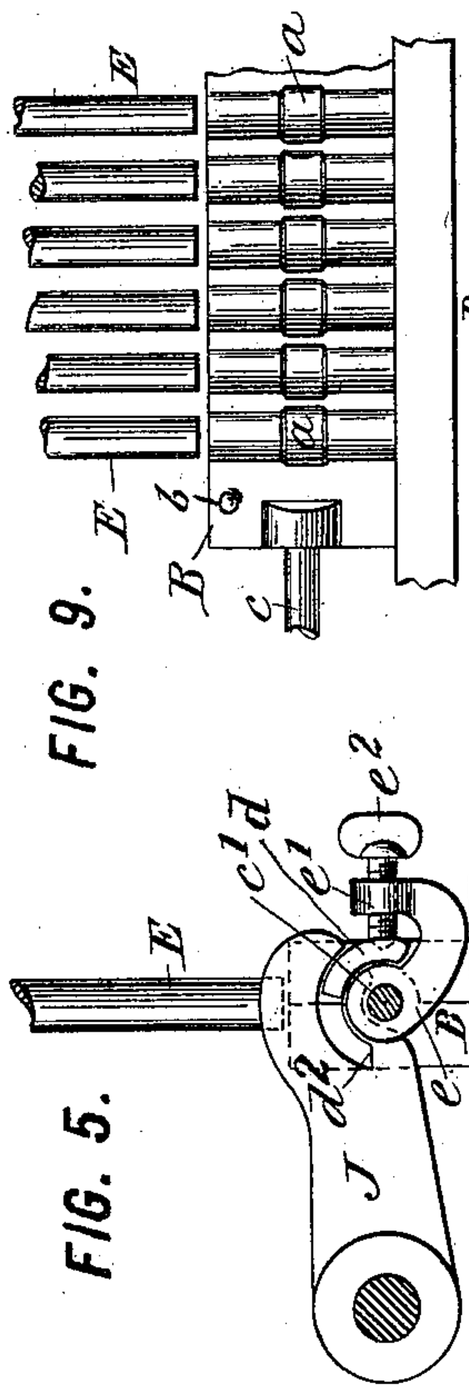

FIG. 9.

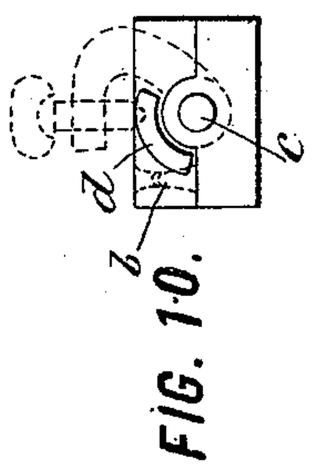

FIG. 10.

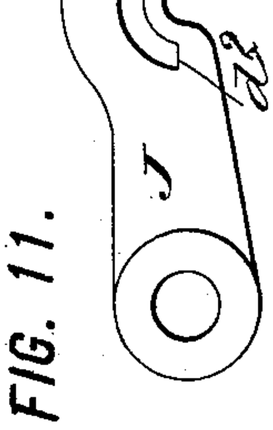

FIG. 11.

FIG. 12.

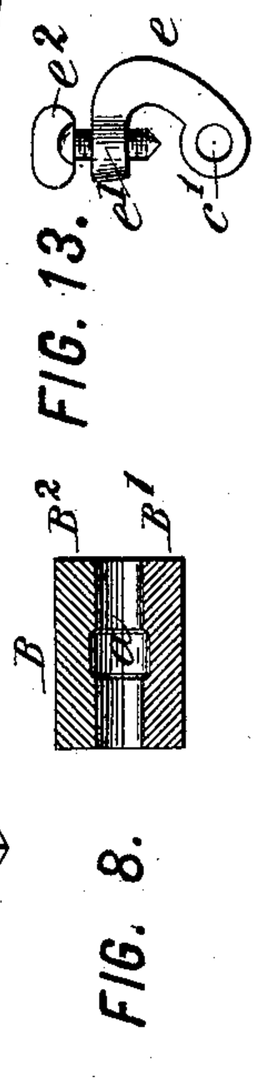

FIG. 13.

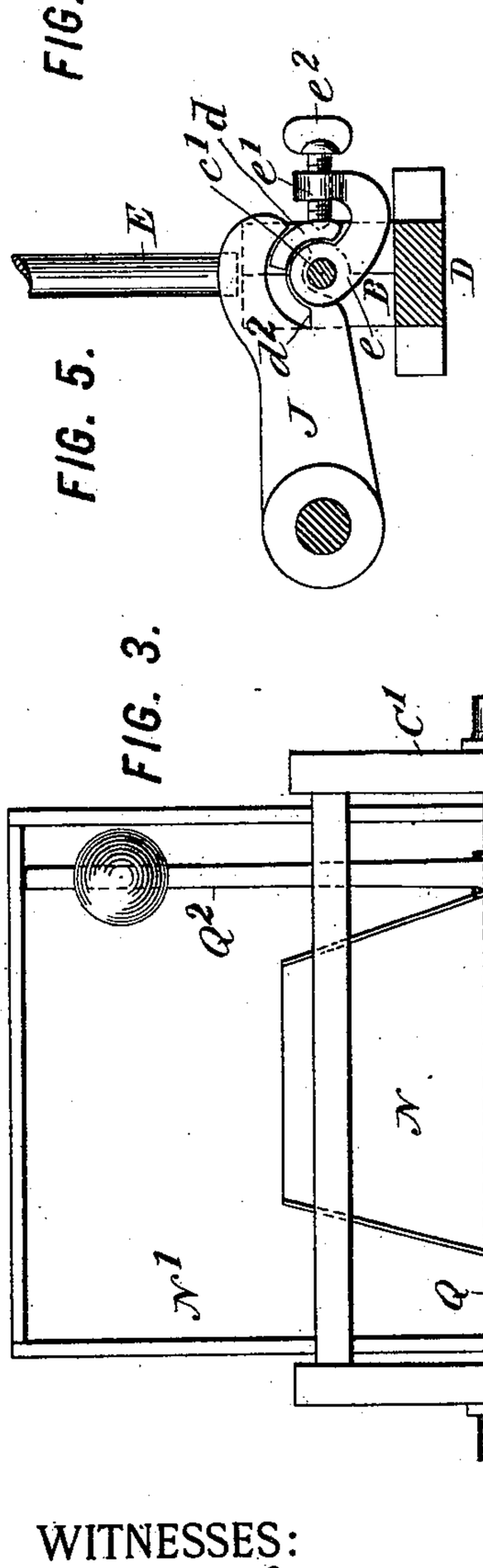

FIG. 5.

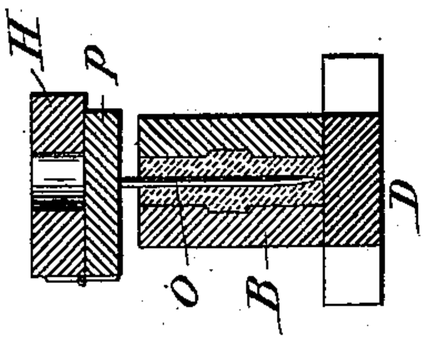

FIG. 6.

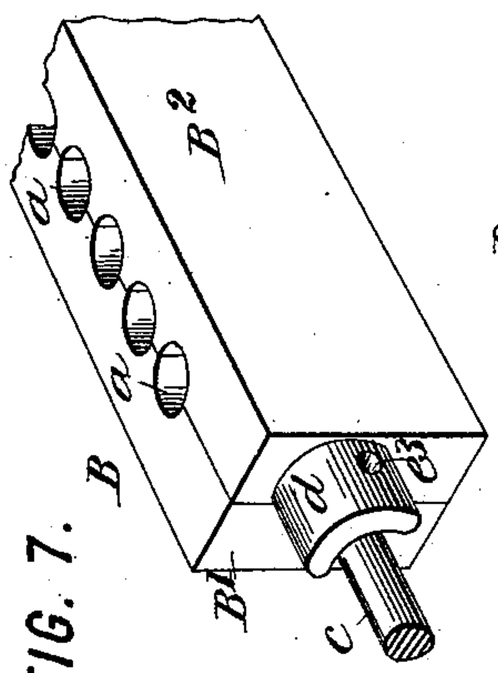

FIG. 7.

FIG. 8.

FIG. 3.

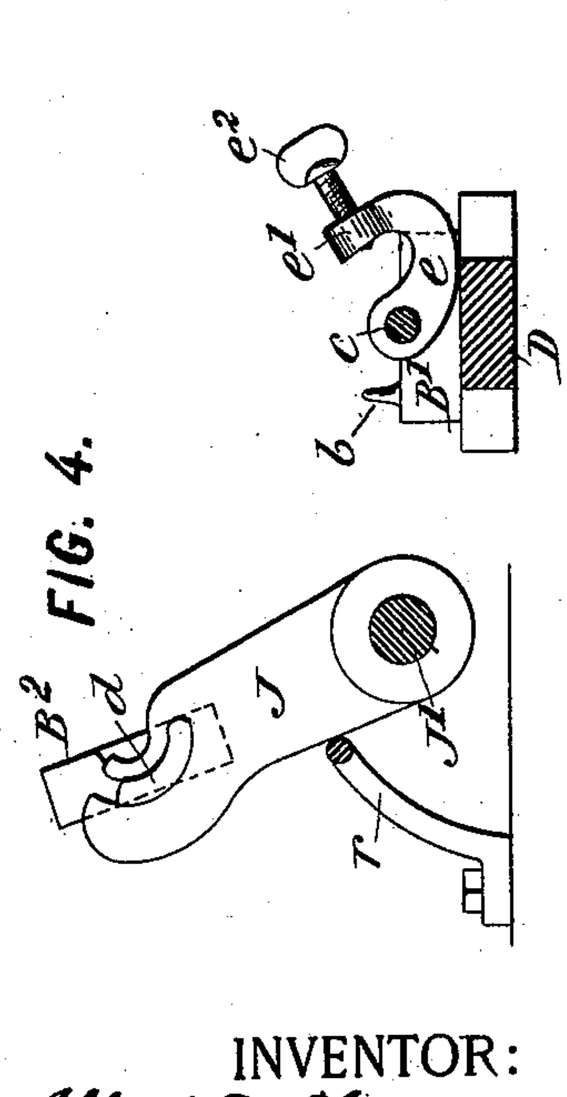

FIG. 4.

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(No Model.)

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A. E. HAMMER.

CORE MACHINE.

No. 506,226.

Patented Oct. 10, 1893.

FIG. 20.

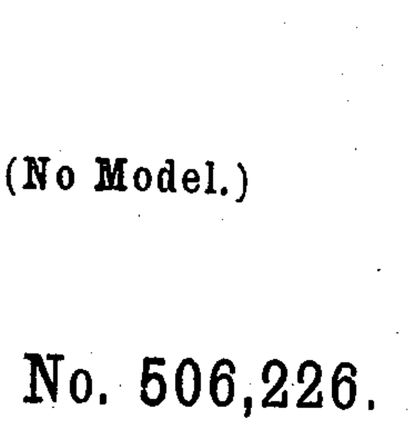


FIG. 19.

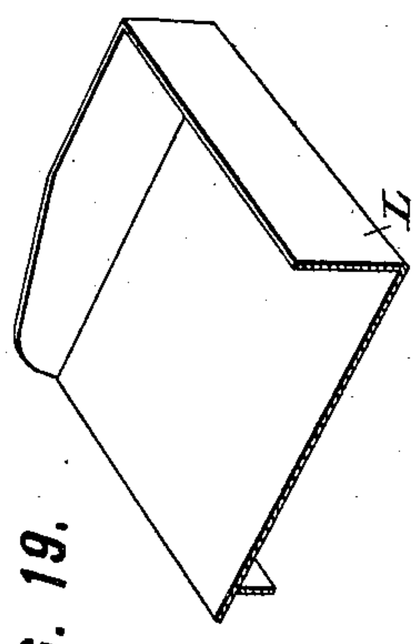


FIG. 14.

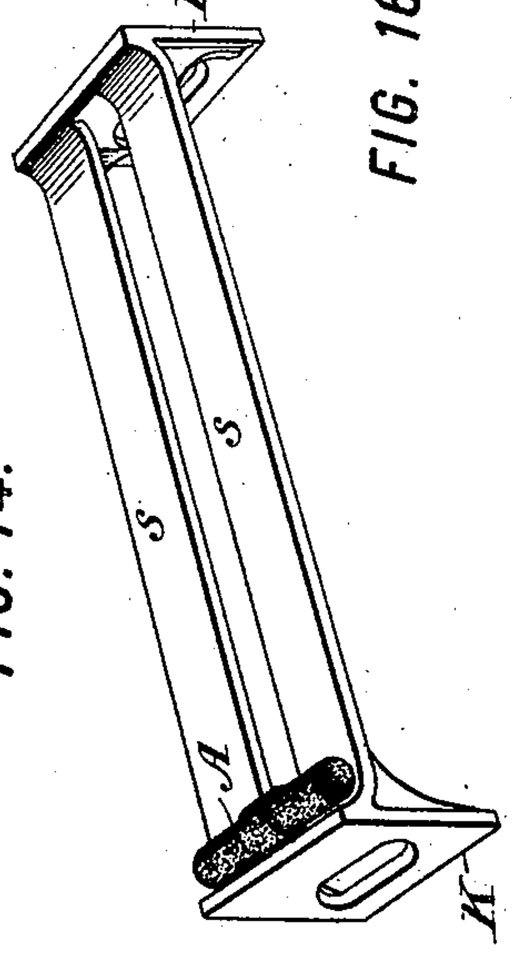


FIG. 16.

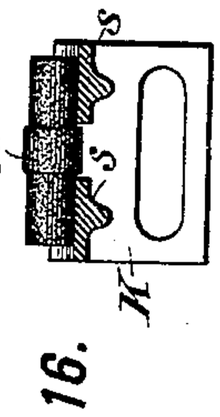


FIG. 15.

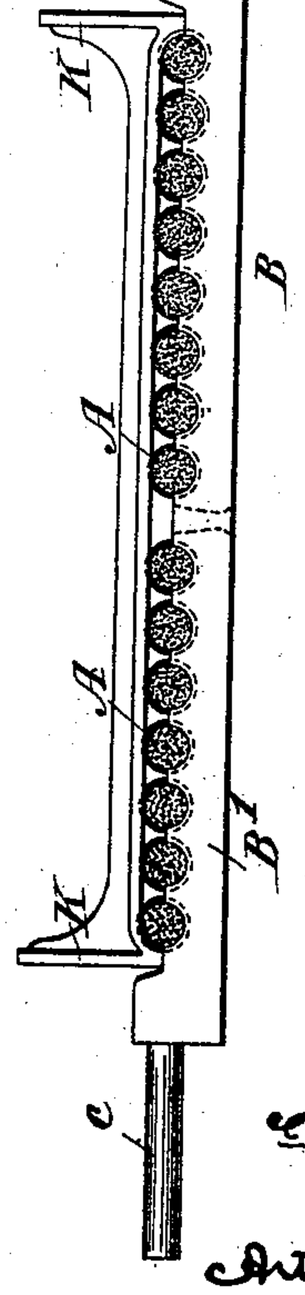


FIG. 21.

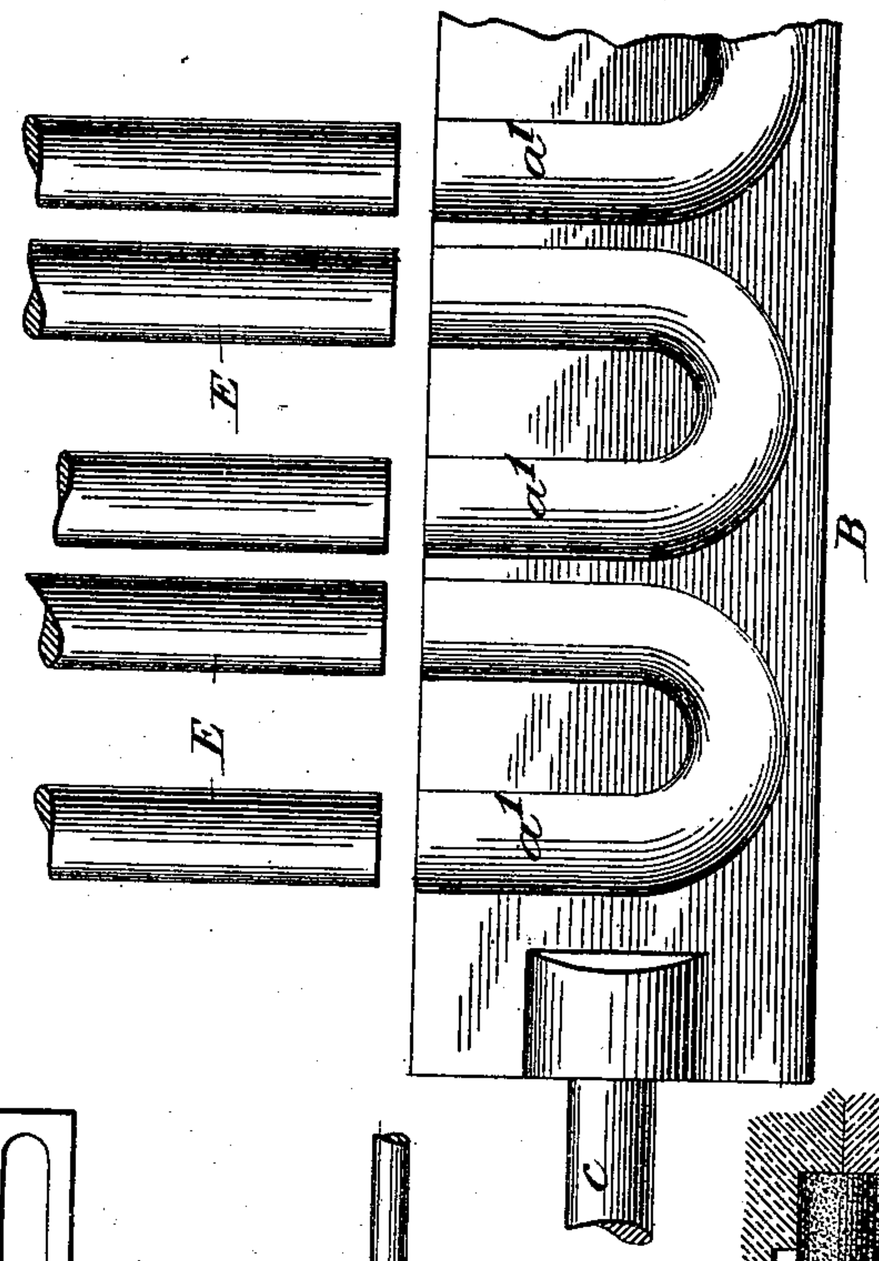


FIG. 18.

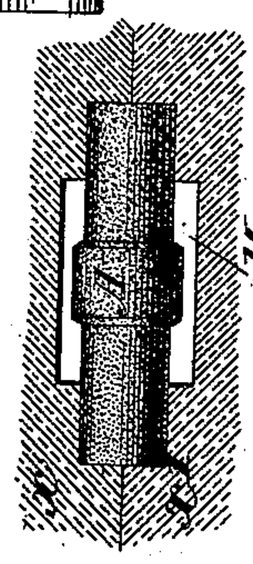
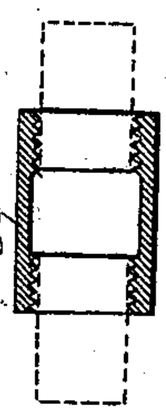


FIG. 17.



WITNESSES:

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Fred White

INVENTOR:

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UNITED STATES PATENT OFFICE.

ALFRED E. HAMMER, OF BRANFORD, CONNECTICUT.

CORE-MACHINE.

SPECIFICATION forming part of Letters Patent No. 506,226, dated October 10, 1893.

Application filed January 17, 1893. Serial No. 458,653. (No model.)

To all whom it may concern:

Be it known that I, ALFRED E. HAMMER, a citizen of the United States, residing in Branford, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Core-Machines, of which the following is a specification.

This invention provides an improved machine for making cores for use in casting, such for example as those used in casting pipe fittings. Such cores are commonly made of sand containing a slight admixture of some adhesive material, and are ordinarily molded by hand in small divided core boxes, the parts of the core-box being placed together, then filled by ramming the prepared sand into the mold or matrix, rammed firm by thrusting in a wooden plunger or rammer, and then removed by taking the core-box apart, and placed on a tray in a drying oven.

The object of my invention is to enable such cores to be made more rapidly than by hand, and of greater uniformity and perfection. To this end I have devised a machine the most important part of which is what I call a multiple core-box, that is, a core-box having numerous molds or matrices formed in it in which to simultaneously mold the numerous cores. This core-box is divided into two or more sections, and is mounted or supported in a suitable framing, whereby its molds may be subjected to the action of a series of rammers provided with driving mechanism for alternately lifting and dropping them, the rammers being arranged to strike independently of one another in order that each enters independently of the blow struck by the others, and each may consequently fall or penetrate the mold to a greater or less depth dependent upon the mass of sand that has been entered into the mold. The machine comprises also a series of vent wires or needles mounted on a frame or plunger, by moving which they are simultaneously thrust into the molds to vent them. The machine has also means for lifting off the cope or movable section of the core-box and for holding it out of the way during the removal of the cores from the drag or opposite section. The sections of the core-box are constructed to be clamped or fastened together, and are mounted on trunnions or otherwise supported, so that the core-box when united can be turned or oscillated to different positions.

The preferred form of my machine is shown in the accompanying drawings, wherein—

Figure 1 is a front elevation of the machine. Fig. 2 is a vertical section viewed from the side. Fig. 3 is a horizontal section on the line 3—3 in Fig. 1. Fig. 4 is a fragmentary elevation partly in section and on a larger scale showing the core-box opened. Fig. 5 is a similar view showing the core-box closed and the rammers at work. Fig. 6 is a fragmentary vertical section showing the vent wire entering the mold. Fig. 7 is a perspective view of the multiple core-box. Fig. 8 is a transverse section thereof. Fig. 9 is an elevation of one of the sections thereof showing the molds or matrices formed therein and the rammers corresponding thereto. Fig. 10 is an end elevation of the core-box. Fig. 11 is a side elevation of the lifting lever. Fig. 12 is an elevation of the opposite side of a slightly modified construction of lifting lever. Fig. 13 shows a fastening clamp removed. Fig. 14 is a perspective view of the drying tray. Fig. 15 is a front elevation of the drag of the core-box, the finished cores, and the drying tray inverted thereon. Fig. 16 is a transverse section of the drying tray showing one of the cores in place thereon. Fig. 17 is a longitudinal mid-section of the pipe fitting to be cast from the core made in the core-box shown in the preceding figures. Fig. 18 is a section of the sand mold showing the core in position for casting. Fig. 19 is a sectional perspective view of a sand tray. Fig. 20 is a section of another form of pipe fitting, being a return bend. Fig. 21 shows one half or section of the core-box for molding the cores for this fitting.

I will first describe the construction for making the simple core A shown in Fig. 18, for casting the pipe coupling A′ shown in Fig. 17. The shape of the core relatively to the casting is shown by dotted lines in Fig. 17, its end portions projecting beyond the casting being shown in Fig. 18 as supported in the core prints in the sand mold $x\,x'$ ready for casting the metal, the space y being left between the core and the mold to be filled by the metal. In forming these cores, I make a multiple core-box B, shown best in Figs. 7, 8

and 9. It consists of two parts or sections, a drag B′ and a cope B^2, which are fitted together and held in proper relative position by steady pins, as shown at *b* in Figs. 4, 9 and 10, or otherwise, as is usual in core-boxes. The halves of this core-box are formed with a succession of molds or matrices *a a*, in which to mold the cores A, these matrices being formed half in one section of the core-box and half in the other, as shown. The section or drag B′ is constructed preferably with a trunnion *c* projecting from each end, and preferably from the center of the core-box, while in the construction shown the cope B^2 is constructed with an arc-shaped flange *d* projecting from each end. In order to firmly fasten together the two sections, I provide some suitable fastening device, preferably a clamp, such as that shown in Fig. 13. This clamp *e* has a perforation *c′* which is slipped over the trunnion *c*, and has a hooked arm *e′* which may be turned to overhang the flange *d* of the cope, and through which screws a thumb-screw e^2, the end of which when in position enters a slight indentation e^3 in the flange *d* (see Fig. 7), so as to be free from risk of displacement. The clamp is applied in the position shown in dotted lines in Fig. 10, and serves to securely hold the two sections of the core-box together, one such clamp being applied at each end, as shown in Figs. 1 and 3.

As the core-box being made preferably of metal is very heavy, it is preferably hung or supported in the frame of the machine, so that it will not require to be lifted by the attendant. To this end its trunnions *c c* have rotative bearings in two opposite side frames C C of the machine, as clearly shown in Fig. 1. One of the trunnions may conveniently project through the side frame and be provided with a hand-lever *f* fixed to it by which to turn the core-box from one angular position to another. Between the upright frames C C is guided the vertical frame of a table D, which is pressed up by springs or counter-weights close against the under side of the core-box. In the construction shown, this table D is fastened to uprights *g g* at the opposite sides, which uprights slide in grooves or ways formed on the inner sides of the frames, and are connected at the bottom by a cross-bar *g′*, which serves as a treadle on which the operator may put his foot to press down the table. The table is normally elevated by the tension of a weight *w* hung from a chain *w′* carried over the sheave w^2, and connected to the frame *g* so as to exert an upward thrust against it. The table D serves three functions; first, by coming against one of the flat sides of the core box it constitutes a locking device to keep the latter in place and prevent it from turning to a different position; second, in the case of a core-box having molds extending through it from side to side the table serves also as a temporary bottom to close the lower ends of the molds or matrices; and third, it serves an important purpose in the removing of the cores from the molds, as hereinafter described.

A series of independent rammers or plungers E E is provided, the rammers consisting preferably of bars of material of suitable weight, preferably hard wood, mounted above the core-box in line with the respective molds or matrices therein, and guided in holes in fixed cross-bars *h h* of the machine-frame, so that the rammers are free to slide up and down in their guides and each is independent of the others. On being lifted they fall simultaneously or practically so and enter the molds in the core-box, ramming the sand therein, and by reason of being independent each can fall a greater or less distance than the others in order to accommodate itself to the greater or less amount of sand that may at the moment have been filled into the mold which it rams. I provide a driving mechanism for repeatedly lifting the rammers and disengaging them so as to permit them to fall. This mechanism might be variously constructed, but I have adopted by preference the simple construction shown, which consists of a rotary shaft F driven by a belt pulley *i*, and having one or more longitudinal bars *j* connected to it so as to be carried around with it, two being shown in the drawings. Each of the rammers E is provided at or near its top with a laterally projecting arm *k*, which when the rammer is down intersects the circular path of travel of the rod *j*, and consequently is lifted thereby until the rod passes out from underneath it, and consequently frees the rammer and permits it to fall again. The lower ends of the rammers which enter the molds or matrices are of course shaped to conform thereto, being in this instance cylindrical, but to prevent the rotative displacement of the rammers, which would bring their arms *k* out of place, their upper portions which work through the upper cross-bar *h* are preferably made square as shown. To prevent the rammers being thrown up too high, a cross-bar *l* is arranged over their upper ends to serve as a stop.

As the rammers are only required to be in operation part of the time, some means must be provided for holding them suspended when they are not in operation. Their driving mechanism might be stopped, but I prefer to permit the shaft F to revolve continuously, stopping the operation of the rammers by fastening them up in their uppermost positions, so that the rods *j* may revolve freely beneath the arms *k*. To accomplish this, I provide by preference an eccentric grip or clamp G consisting of a suitable soft pad arranged upon a shaft *m* having suitable bearings in the frame, the pad being formed eccentrically upon the shaft, and the shaft provided with a handle *m′* by which to turn it. In one position of the shaft the eccentric pad is out of contact with the rammers, and they are consequently free to rise and fall, as shown in Figs. 1 and 2, but when the handle

m' is thrown up, the eccentric projection of the pad brings it into contact with the rammers, it being pressed against them with sufficient firmness to hold them elevated.

In making cores, it is customary to punch a small hole, called a vent, through or deeply into the core to facilitate the escape of moisture while drying the cores. For forming these vents I provide a series of pins or vent wires *o o* corresponding in number and spacing to the matrices, and mounted by preference on a hinged leaf *p* hinged to a sliding frame or cross-bar H mounted to slide up and down on the side frames C C beneath the cross-bars *h*. In the construction shown, it is formed with side plates or stirrups *h'* extended around the side frames C C, and to which are pivoted connecting rods *q q* extending downwardly and connected to arms *q' q'* fixed on a transverse shaft Q, which may be oscillated by means of a hand-lever Q' also fixed on it. By thrusting down this lever Q' the cross-bar H is given a parallel motion downward against the tension of a counterweighted arm Q^2 attached to the shaft Q and projecting rearwardly. In order to vent the molds, the vent wires *o* which are normally held in the position shown in Fig. 2, by a hook *o'* (Fig. 3), are released by unfastening this hook, the leaf *p* is then turned in under the cross-bar H, and the lever Q' is then thrust down to lower the bar H and thereby force the vent wires down into the cores, as shown in Fig. 6. Any other construction for the mounting of the vent wires *o o* whereby they are held out of the way normally and during the operation of the rammers E E, but can be brought into position in line with the rammers and thrust down into the matrices in the multiple core-box, might be substituted for the construction shown.

In order to facilitate the handling of the separable section or cope B^2 of the core-box, which by reason of its considerable weight would be inconvenient for the workman to lift by hand, I provide a construction for handling it mechanically which I will now describe. The flanges *d d* projecting from the opposite ends of the section B^2 are adapted to enter each a slot or groove *d'* in the end of a lever arm J, the two arms J J being fixed on a transverse shaft J' having suitable bearings on the frame C' of the machine. To this shaft is fixed a hand-lever J^2 by which the shaft may be oscillated in order that the arms J J shall carry the cope B^2 from its position shown in Fig. 10 back to the position shown in Fig. 4, in which latter position the arms are stopped by an abutment *r*. The lever arms J may be formed with an open slot, as shown at *d'* in Figs. 4, 5 and 11, but are preferably constructed with the closed slot or groove, as shown in Fig. 12, into which groove the end of the flange *d* projects. When the mold is turned with its cope B^2 uppermost, as shown in Fig. 10, the flanges *d* extend to and abut against the ends d^2 of the slots *d'* in the arms, so that by turning the arms back the cope is lifted without any oscillatory movement of its own, being carried first directly upward and thence backward in the arc of a circle from the center of the shaft J'. With a core-box thus centrally divided, the shaft J' should be arranged back of and on a level with the axial center of the core-box. In turning the core-box from the position shown in Fig. 10 to that shown in Fig. 5, the flange *d* turns away from and partly passes out of the slots in the arms and remains in this position during the ramming.

For removing the completed cores from the core-box and carrying them to the drying oven, I provide a tray K shown best in Fig. 14. The exact shape of this tray will depend upon the shape of the particular cores being made, but for cores of the shape shown it is preferably constructed with two upper longitudinal bars *s s* on which the prolonged ends of the cores may rest, and having a space between them into which the enlarged middle portion of the cores may drop, as shown in Fig. 14, so that the core shoulders engage the sides of the bars and prevent any longitudinal displacement of the cores. The tray is preferably made by bending a sheet or plate of metal to the shape shown. It is approximately as long as the core-box, and in order to receive the cores is inverted and laid upon the drag B' of the core-box, as shown in Fig. 15, being held in contact therewith while the drag is turned upside down so that the cores rest upon the tray, whereupon it is lowered carrying them away with it.

The operation of making cores by my improved machine is as follows:—At starting, the sections of the core-box are in the positions shown in Fig. 4. The operator first wipes their inner faces clean and then lowers the arms J to bring the cope B^2 down upon the drag. He then swings up the clamps *e* from the position shown in Fig. 4 to that shown in dotted lines in Fig. 10, and screws these clamps down tight. He then with his foot on the cross-bar *g'* slightly lowers the table D, while with his hands he turns the core-box to the position shown in Fig. 5, either by grasping it or by means of the handle *f*, so as to bring the matrices *a a* into vertical position. He then places against the core-box a sheet metal tray L, shown in Fig. 19, resting it on the core-box in the position shown in dotted lines in Fig. 2. This tray contains the core sand which the operator then proceeds to push from the tray with his hands into the matrices of the core-box. Having partly filled the matrix, he pulls down the lever *m'* so as to free the rammers E E, which consequently are lifted and fall in rapid succession, ramming the sand into the several matrices. While the ramming is in progress, he keeps pushing more sand over the top of the core-box until the matrices are entirely filled, whereupon he arrests the rammers by

thrusting up the lever m', and with his hand sweeps the surplus sand from the top of the core-box, brushing it either back into the tray L or over the top of the core-box so that it shall fall past it and onto the chute N, by which the surplus sand is carried down into a trough or chute N'. Removing the tray L, he then disengages the hook o' and turns in the hinged leaf p, whereupon by thrusting down the lever Q' he causes the vent wires to penetrate the molds, and then immediately restores the vent wires to their normal position. Then, lowering the table D, he turns the core-box back to its original position (see Fig. 10) and disconnects the clamps e e. Then rapping the cope B^2 gently to disengage it from the molded cores, he thrusts back the lever J^2 and thereby lifts up the cope and carries it back out of the way, as shown in Fig. 4. He then lays the tray K inverted upon the row of cores resting on the drag, as shown in Fig. 15, and then again lowering the table D, and while holding the tray and drag together with his hands, he turns them upside down, and by releasing the table D permits it to reascend until the feet of the tray rest upon it. Then tapping the drag to release it from the cores, he carefully lowers the table, carrying down the tray with the cores resting upon it. He then lifts off the tray, which is carried to the drying oven. He finally turns the drag B' back to the position shown in Fig. 4, having the table D come up beneath it to hold it in this position. The parts are then ready for the next operation. These several operations may after a little practice be performed in very rapid succession, so that the cores are turned out in great numbers and with the utmost economy of labor.

For making other shapes of cores, the core-box will naturally require some alteration. As one example thereof I have shown in Fig. 21 one section or drag of the core-box for molding the cores used in casting return bends, as shown in Fig. 20, where the core is indicated in dotted lines. The core matrices a' do not here extend through the core-box, but are formed of U-shape, two rammers E being required for each core. The operation is the same as that already described, the only difference being in the construction of the core-box, and preferably also of the tray, although the tray shown in Fig. 16 might be used with cores of this shape.

It must not be inferred from the circumstantiality of detail with which I have described my improved machine that my invention is necessarily limited to the details shown and described. The purely mechanical features of the machine may be greatly varied. For example, the means for alternately lifting and releasing the rammers might be substituted by other mechanical means for performing this function. Other means might be employed for lifting off the cope of the core-box, and other means for causing the lifting off device to engage the cope. Some other means might also be employed to similar effect for clamping or fastening together the two sections of the core-box. Essentially the table D is movable only with reference to the core-box, it being indifferent whether the core-box is mounted on a stationary axis and the table D is movable toward and from it, or whether the contrary arrangement is adopted, but for convenience I prefer to make the table the vertically movable part. The several rammers E E are essentially independent in the sense of the depth to which each enters its matrix in the core-box, depending upon the amount and compactness of the sand therein, and is not dependent upon the depth to which the other rammers enter their matrices, as would be the case were all fixed to a common cross-bar. The force by which each rammer is thrust into its matrix is preferably and most simply the weight of the rammer falling freely from a given elevation, but other means well known in mechanics might be substituted for exerting the thrust by which the rammer is forced into the matrix, it not being essential that the rammers shall be arranged vertically to fall from above, as they might be arranged in other positions and so that their weight would not be effective, in which case some other force must be applied as the equivalent of their weight to cause them to enter the matrices with the requisite pressure to properly ram the cores. Nor is it essential that the vent wires o o shall enter the molds from above, nor that they shall move in line with the rammers, as they might be arranged in other positions to equivalent effect.

Those features of my invention which are believed to be essential are hereinafter defined in the claims.

I claim as my invention the following, defined novel features, substantially as hereinbefore specified, namely:

1. In a core machine, the combination of a multiple core-box, a series of independently movable rammers, adapted each to enter the corresponding matrix of the core box and mechanism for operating the rammers to cause them to repeatedly withdraw from and forcibly enter the matrices of the core-box, whereby they serve to ram the several cores independently of one another.

2. In a core machine, the combination of a multiple core-box, a series of independent rammers, each entering a separate matrix of the core-box and mechanism for repeatedly lifting and releasing the rammers, whereby they fall and ram the several cores independently of one another.

3. In a core machine, the combination of a multiple core-box, a series of independent rammers consisting each of a vertically sliding bar, each entering a separate matrix of the core box a frame constituting guides in which the rammers may slide, and mechanism for repeatedly lifting and releasing the

rammers consisting of a revolving shaft having projections engaging projections on the rammers.

4. In a core machine, the combination with a multiple core-box B, of a series of independent rammers E E consisting each of a vertically sliding bar having a projecting arm *k*, and a driving mechanism therefor consisting of a revolving shaft F carrying a projecting arm *j* adapted in its rotation to enter under and lift the arms *k* to elevate the rammers, and in its further rotation to pass from under said arms *k* to release the rammers and permit them to fall.

5. The combination with a multiple core-box, a series of rammers therefor and mechanism for repeatedly lifting and releasing the rammers, of a device movable at will to engage the entire series of rammers and hold them elevated.

6. The combination with multiple core-box B, series of rammers E E and mechanism for repeatedly lifting and releasing the rammers, of a device for holding the rammers elevated consisting of an oscillatory shaft having an eccentric face adapted when turned to engage the rammers and wedge them fast.

7. In a core machine, a divided multiple core-box formed with a row of core matrices, one section thereof having trunnions at its opposite ends on which it is pivoted, and another section thereof constructed to be clamped or attached to the pivoted section so as to turn therewith on said trunnions, and to be removable therefrom.

8. In a core machine, an elongated multiple core-box formed with a row of core matrices and divided into two sections one section of which is removable, combined with clamps for engaging the sections at their opposite ends and fastening them together.

9. In a core machine, a divided core-box one section of which has projecting pivots or trunnions *c* and the other section a projecting flange *d*, combined with clamps *e* pivoted on said trunnions and having adjusting screws e^2 adapted to engage said flanges to clamp the two sections together.

10. In a core machine, the combination of a divided core-box one section of which is hung on trunnions on a horizontal axis and the other section of which is removable, with a mechanism for lifting off said removable section consisting of supporting arms pivoted on a horizontal rotative axis, adapted to engage the opposite ends of the removable section and connected to each other to move together.

11. In a core machine, the combination of a divided core-box one section of which is hung on trunnions on a horizontal axis and the other section of which is removable, and supporting arms engaging said removable section mounted on a horizontal shaft parallel with the axis of said trunnions and adapted to be turned to lift it off and swing it back out of the way to enable the cores to be removed, and thereby to partially invert said removable section to expose its core matrices.

12. In a core machine, the combination of a divided core-box B, with a mechanism for lifting off the cope thereof consisting of arms J J engaging the opposite ends of the cope, rock-shaft J′ on which said arms are fixed, and an operating lever J^2 on said shaft.

13. In a core machine, the combination of a divided core-box pivoted upon trunnions, the cope thereof formed with concentric cylindrical flanges projecting from its opposite ends, with a mechanism for lifting off the cope consisting of pivoted arms at opposite ends of the core-box formed with arc-shaped slots adapted to receive said flanges.

14. In a core machine, the combination of a multiple core-box constructed in sections to be taken apart to remove the cores, and pivoted upon trunnions at its opposite ends, so that it may be turned to different positions, with a series of independent rammers arranged to enter the matrices in the core-box when the latter is turned to the position wherein the matrices are in line therewith.

15. In a core machine, an elongated multiple core-box pivoted upon trunnions at its opposite ends so that it may be turned to different positions, and formed with a series of core matrices having openings at different sides or faces, combined with a series of rammers adapted to enter the matrices from one side, and with a movable locking device engaging the core-box, said core-box and locking device being relatively constructed to hold the table immovably in either position with the openings of its core matrices on the side of and in line with said rammers, whereby to hold the core-box in position during the ramming of the cores through either openings of the matrices.

16. In a core machine, an elongated multiple core-box pivoted upon trunnions at opposite ends so that it may be turned to different positions, and formed with a parallel row or series of core matrices opening at one or more sides or faces, and formed with its sides or faces opposite to the matrix openings terminating in planes perpendicular to the axes of the matrices at their openings, combined with a series of rammers adapted to enter the matrices from above, and with a table beneath the core-box, said table and core-box being vertically movable relatively to one another, whereby the table serves by engaging the under side of the core-box to hold its matrix openings turned toward and in line with the rammers.

17. In a core machine, the combination of an elongated multiple core-box formed with a row of core matrices, a series of rammers adapted to enter its matrices, and a distinct series of vent wires movable independently of the rammers and mounted to be advanced simultaneously to penetrate the cores.

18. In a core machine, the combination of a multiple core-box, a series of rammers

adapted to enter its matrices, a movable cross-bar through which said rammers work, a bar hinged to said cross-bar, and a series of vent wires carried by said hinged bar and adapted thereby to be turned backward out of the way of the rammers or to be swung under and moved by said cross-bar to cause the vent wires to penetrate the cores.

19. In a core machine, the combination of a multiple core-box constructed in sections to be taken apart to remove the cores, with a drying tray adapted on the removal of one section to be placed against the cores remaining on the other section, and by the inversion of the latter to receive the cores therefrom.

20. In a core machine, the combination of a multiple core-box constructed in sections to be taken apart to remove the cores and pivoted on trunnions at its opposite ends, with a table beneath said core-box movable vertically relatively thereto, and a drying tray adapted upon the separation of the core-box to be placed upon the cores resting on the lower section thereof, whereby by lowering the table and inverting said section and tray simultaneously and restoring the table, the tray is left resting upon the table and the cores may be separated from said section by lowering the table and tray together.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

ALFRED E. HAMMER.

Witnesses:

VALDEMAR HAMMER,

FRED WHITE.