

A. E. HAMMER.

MACHINE FOR MAKING CORES FOR CASTING PIPE ELBOWS, &c.

No. 506,227.

Patented Oct. 10, 1893.

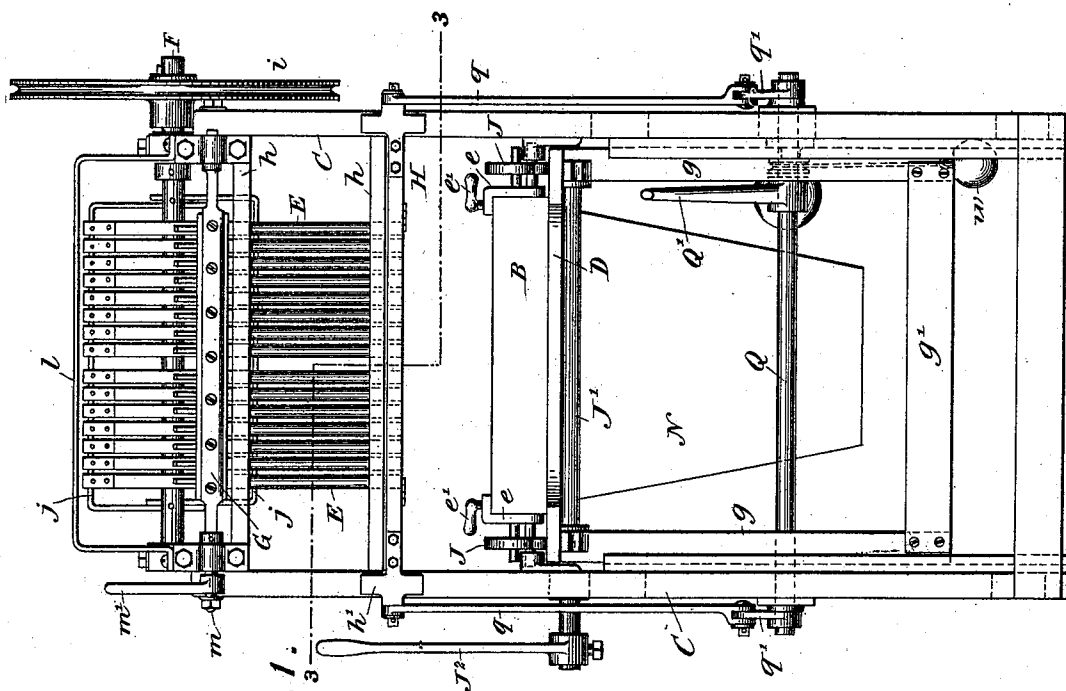


FIG. 1.

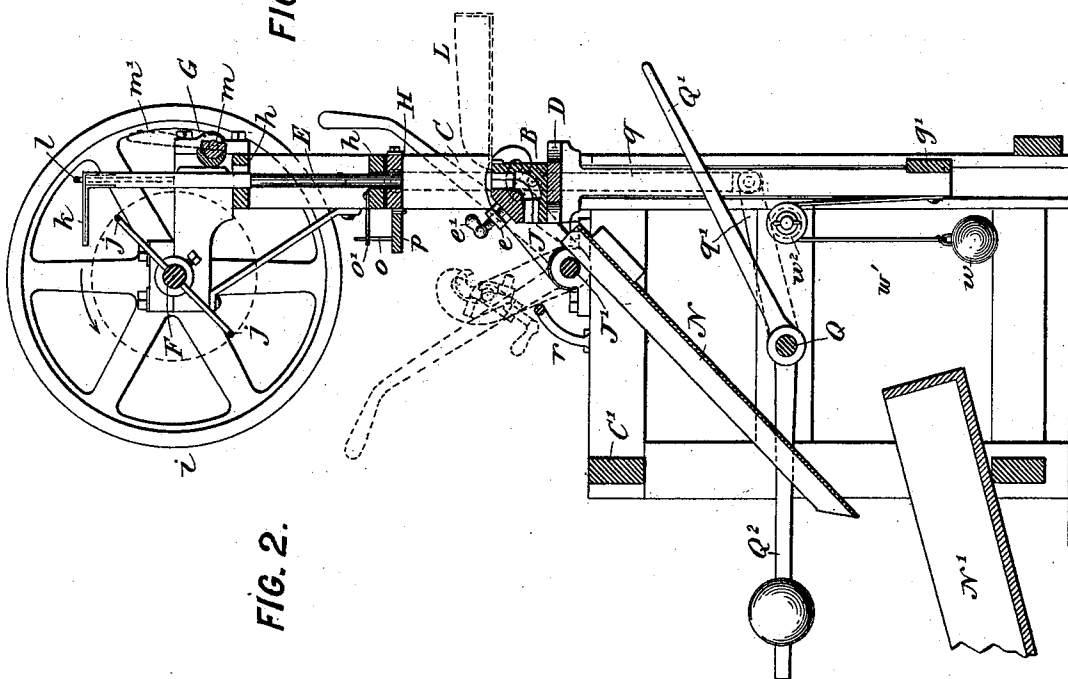


FIG. 2.

WITNESSES:

John A. Kinnic
Fred White

INVENTOR:

Alfred E. Hammer,

By his Attorneys,

Arthur C. Trauer & Co

(No Model.)

4 Sheets—Sheet 2.

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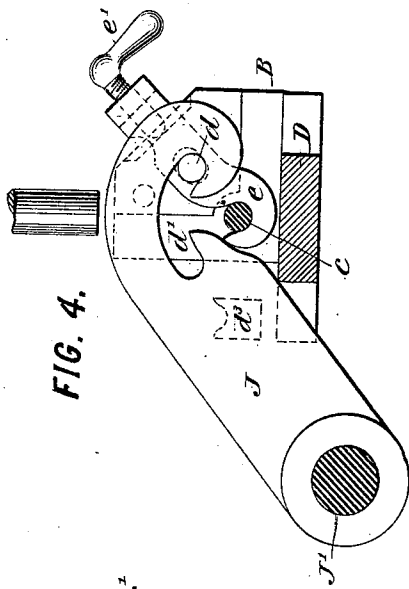


FIG. 4.

FIG. 5.

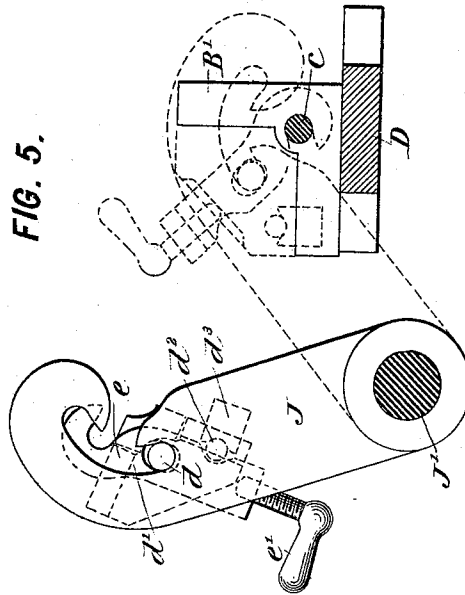


FIG. 8.

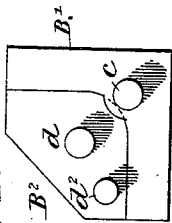


FIG. 7.

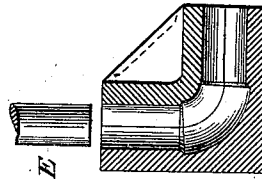


FIG. 6.

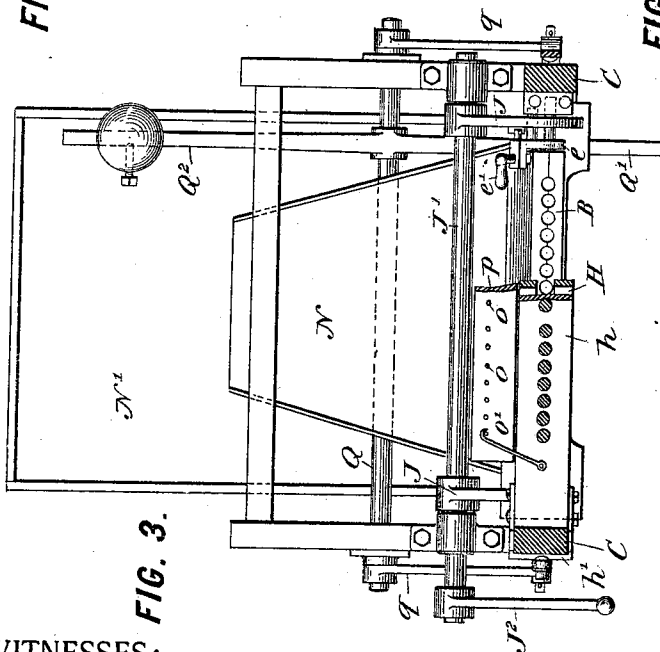
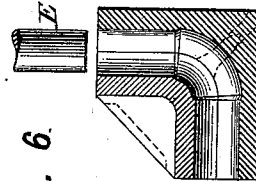


FIG. 3.

WITNESSES:

John A. Kennedy.
Fred White.

INVENTOR:

Alfred E. Hammer,

By his Attorneys,

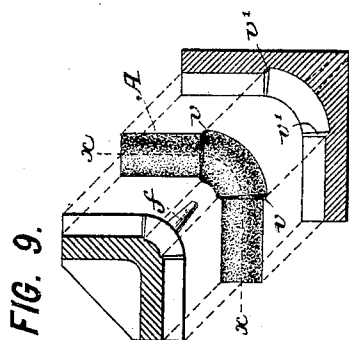
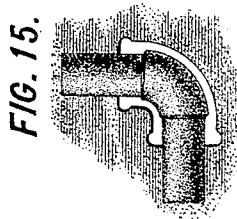
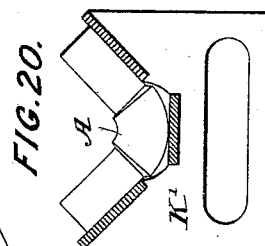
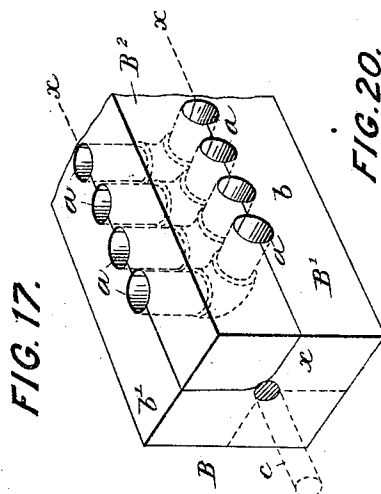
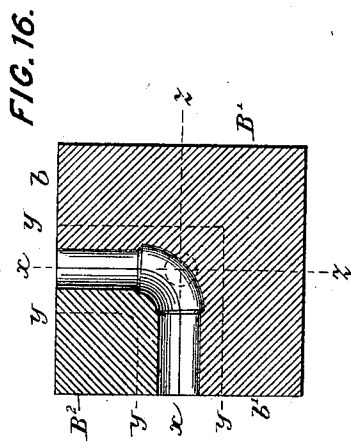
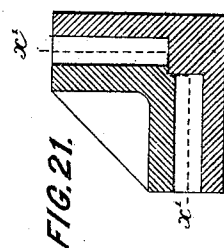
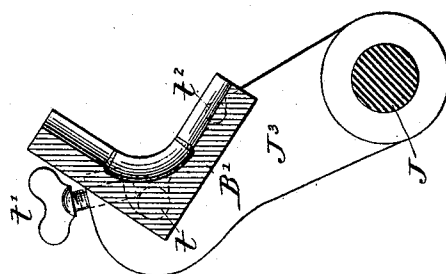
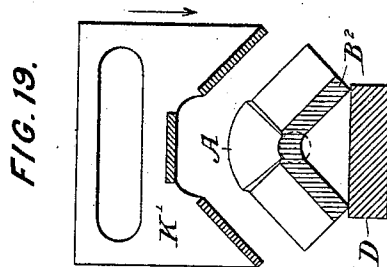
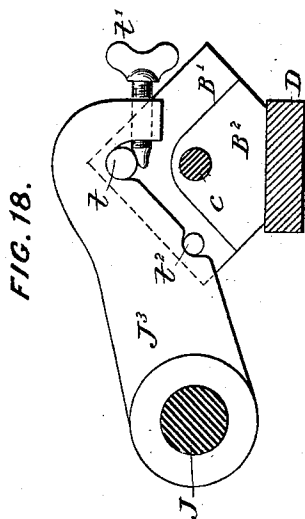
Arthur C. Braser & Co.

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WITNESSES:
John A. Rennie.
Fred White.

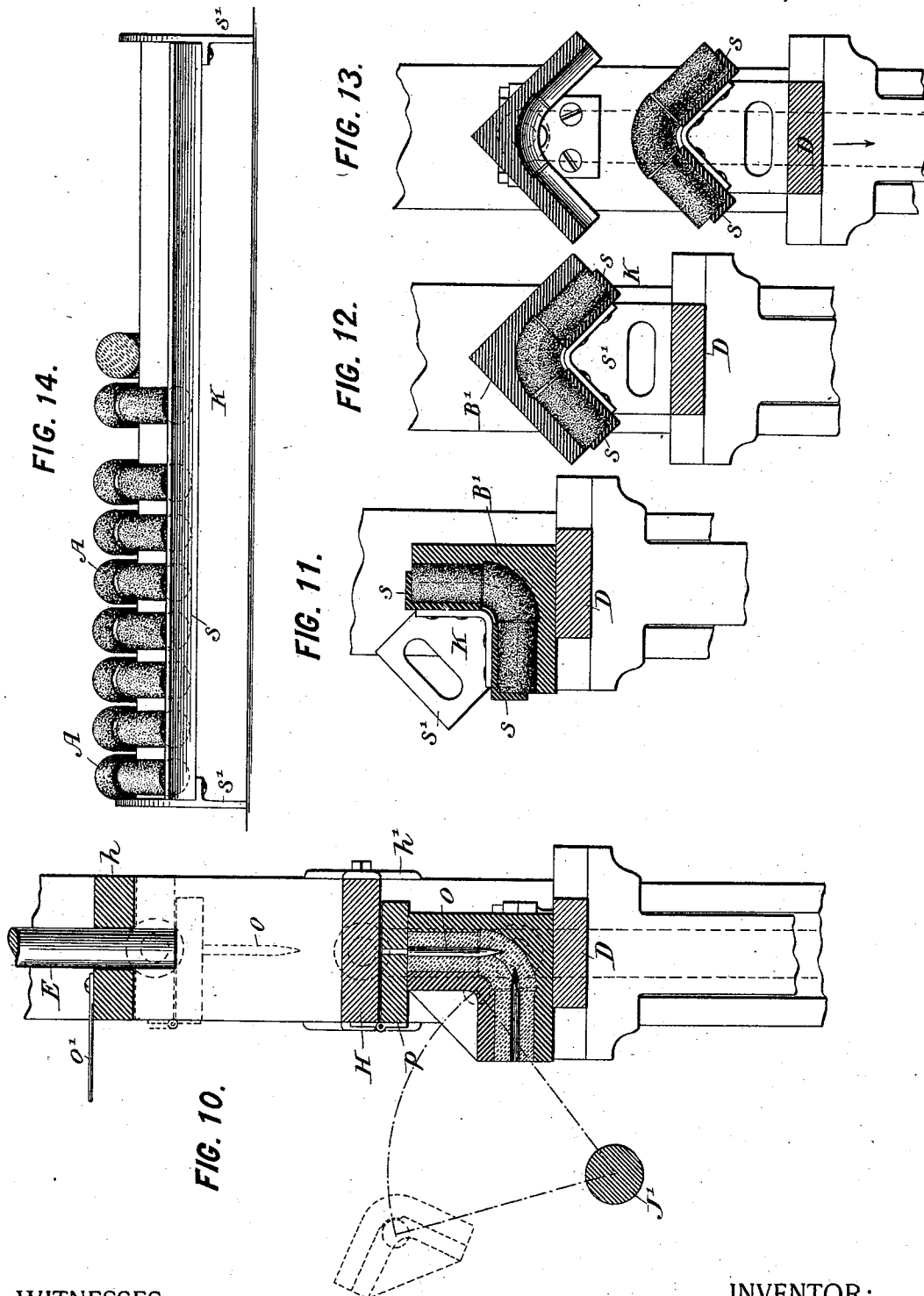
INVENTOR:
Alfred E. Hammer
By his Attorneys,
Arthur C. Graser & Co.

A. E. HAMMER.

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Alfred E. Hammer,
By his Attorneys,
Arthur C. Bracer & Co.

UNITED STATES PATENT OFFICE.

ALFRED E. HAMMER, OF BRANFORD, CONNECTICUT.

MACHINE FOR MAKING CORES FOR CASTING PIPE-ELBOWS, &c.

SPECIFICATION forming part of Letters Patent No. 506,227, dated October 10, 1893.

Application filed January 17, 1893. Serial No. 458,654. (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 Machines for Making Cores for Casting Pipe-Elbows, &c., of which the following is a specification.

This invention provides improved means for molding cores for use in casting pipe elbows, and for making other cores of analogous character.

The invention includes an improved construction of core-box, and improved means for operating upon the core-box.

In another application for patent for improvements in core machines, Serial No. 458,653, filed January 17, 1893, I have described and claimed broadly a machine comprising a multiple core-box, or one with an extended row or series of matrices in which to mold the cores, hung on trunnions, and combined with a series of independent rammers for ramming or tamping the cores in said matrices, and with mechanism for punching the vent holes in the cores, and for separating or "coping off" the divided core-box to remove the cores.

In practicing my present invention I employ by preference in great part the same machine or mechanism as that described in my said application, the differences being in the main those peculiar to the molding of cores in the form of elbows. According to my present invention I provide a multiple core-box formed with a longitudinal row of parallel bore matrices for molding elbow cores and the like, these matrices opening at two adjoining sides of the box and usually at right angles to one another, the box being divided along the bent axes or lateral middles of the cores, so that one section or "drag" constitutes approximately three-fourths of the box, while the other section or "cope" constitutes approximately one-fourth thereof. This peculiar and novel arrangement of the matrices in the core-box, and this peculiar division of the core-box along the axes of the cores, enables the greatest number of core matrices to be formed in a core-box of a given size, and enables each of the branches of the several cores to be simultaneously tamped by

rammers arranged in rows in line with and entering the respective branches of the matrices.

Figure 1 of the accompanying drawings is a front elevation of a machine for making elbow cores according to my present invention. Fig. 2 is a vertical mid-section thereof viewed from one side. Fig. 3 is a plan thereof cut in horizontal section in the planes indicated by the line 3—3 in Fig. 1. Figs. 4 and 5 are fragmentary side elevations on a larger scale partly in vertical section cut just inside the frame showing the core-box and the means for coping off in two different positions. Figs. 6 and 7 are vertical transverse sections through the core-box showing it in two different positions. Fig. 8 is an end elevation of the core-box. Fig. 9 is a section thereof showing its parts separated with the molded core between them. Fig. 10 is a fragmentary vertical section on the same plane as Fig. 2 illustrating the operation of venting the cores. Figs. 11, 12 and 13 are fragmentary vertical sections in the same plane showing the core-box in different positions and illustrating the operation of removing the cores. Fig. 14 is a side elevation of the tray on which the cores are removed with the cores in place thereon. Fig. 15 is a plan of a fragment of the sand mold in which the pipe elbows are cast showing the core in place. Fig. 16 is a transverse section of a core-box; and Fig. 17 a fragmentary perspective view thereof. Fig. 18 is a side elevation answering to Fig. 4, and showing a modified construction of core-box and coping-off mechanism. Fig. 19 is a vertical mid-section through the construction of core-box shown in Fig. 18. Fig. 20 is a similar section through the drying tray illustrating the method of removing the completed cores on the tray. Fig. 21 is a transverse section through a modified construction of core-box designed for making a different kind of core.

I will describe my invention as applied to the making of cores for casting pipe elbows, one of these cores being shown best at A in Figs. 9 and 15. Ordinarily such cores are made by hand in a two-part core-box which is parted in a single plane coincident with the bent axis of the core, the parting following the outline of the core when viewed as in Figs. 9 and 15.

The operator puts the two halves of the core-box together, and fills the two branches thereof with sand containing a small quantity of adhesive material, compacting the sand in the matrices of the core-box by ramming it with a wooden plunger or rammer, then thrusting a wire into each branch to make vent holes, and finally lifting off one half of the core-box and removing the finished core from the other half, the core being then placed on a tray and carried to an oven to be baked. This process of hand manufacture is very tedious and costly. The object of my invention is to provide means for making elbow cores and other analogous cores in large quantities, and largely by means of automatic mechanism so as to minimize the expense for labor. To this end I provide a multiple core-box of the construction essentially as shown in Figs. 16 and 17.

This core-box B is formed in two parts, one of which, B', I shall designate the drag, and the other, B², the cope. The drag constitutes essentially approximately three-fourths of the box, and the cope the remaining one-fourth, the box being divided along the line *xx* in Figs. 16 and 17, which line coincides with the bent axes or the lateral middles of the matrices of the cores, as indicated by the line *xx* in Fig. 9. The core matrices *aa* are formed in this core-box in a row parallel with one another, with their respective branches opening on two adjoining sides *b* and *b'* of the core-box. In the case of a right-angled elbow, the core matrices are arranged with their branches at right angles to each other and parallel with the opposite sides of the core-box, assuming the latter to be square in cross-section as shown in these figures. The core-box is mounted at its opposite ends on pivots or trunnions, one of which is shown at *c* in Fig. 17, in order that the box may be turned to bring either of the branches of the matrices uppermost. These pivots or trunnions are arranged with their axes intersecting the intersection of the prolonged axes of the respective branches of the several core matrices, as indicated by the dotted lines *xz* in Fig. 16. The lines *xz* thus divide the core-box into quarters. Although this is the theoretical and primary shape of the core-box, yet in practice a core-box thus proportioned, if made as is preferable of metal, would be unduly heavy to handle, for which reason I reduce it to the outline indicated by the dotted lines *yy* in Fig. 16. The core-box thus reduced is clearly shown in Figs. 6 and 7.

In order to securely unite and hold together the two sections of the core-box, I provide by preference clamps *ee* for drawing them together at their opposite ends. Each clamp *e* consists in the construction shown of a part having a hooked end adapted to hook over the trunnion *c*, its middle portion formed with an elongated slot embracing a stud or projection *d* on the cope, while its opposite end is turned inward and has a screw-threaded hole through which screws a thumb-screw *e'*.

When the cope is put in place on the drag, each clamp is oscillated on the stud *d* so as to bring its hook into engagement with the trunnion, whereupon its screw *e'* is screwed in to bear against the outer side of the cope, thereby clamping the cope tightly against the drag. To insure that the cope and drag shall register properly in longitudinal direction, one part is formed with a pin or dowel *f*, as shown in Fig. 9, which enters a socket formed in the other part.

The core-box B is preferably mounted on a horizontal axis by pivoting its trunnions *cc* in or between opposite upright frames C C. A movable table D is mounted between these frames and constructed to slide up and down, being provided with a tension device for normally thrusting it upwardly so that it rests and presses against the under side of the core-box.

In the construction shown the table D is provided with a frame consisting of uprights *gg* at opposite sides connected by a cross-bar *g'* at the bottom, these uprights sliding in grooves or slideways formed on the frames C C, while the table frame thus constructed is pressed upwardly by a weight or weights *w* hung by a strap or chain *w'* which passes over a sheave *w²*. The cross-bar *g'* serves as a treadle which may be depressed by the foot to lower the table D. The table serves by coming against one of the flat sides of the core-box to hold the latter in either position to which it may be turned. As the flat sides of the core-box against which it comes are formed perpendicular to the respective branches of the core matrices, when the core-box is turned so that either of these flat sides rests upon the table one set of the branches of these matrices is presented vertically upward as shown in Fig. 2.

In line with the several upright branches of the matrices are arranged a corresponding series of rammers E E, which in the construction shown are mounted vertically and adapted to slide longitudinally through bearing holes formed in cross-bars *hh* extended between the frames C C. The rammers are made at the lower portions of such shape as to enter their respective matrices, being in this instance cylindrical. Each rammer acts independently of the others, a mechanism being provided for repeatedly lifting the rammers and permitting them to fall. The rammers fall either simultaneously or at different times, each one however falling freely and independently of the others, so that it enters to greater or less depth within the matrix which it rams according to the amount of sand contained therein. The cores are consequently rammed with the same firmness by all the rammers. The rammers are preferably made of hard wood or other material of similar weight, being given just sufficient weight to enable them to fall and strike the desired blow in ramming.

The mechanism shown for operating the

rammers consists of a rotary shaft *F* driven by a pulley *i* and carrying rods *j j* extending parallel with it, which as they revolve in the direction of the arrow (Fig. 2) encounter arms *k* projecting rearwardly from the rammers, lifting these arms and then passing beyond them so as to free the arms and permit the rammers to fall. To prevent the rammers being thrown up too high, a stop-bar *l* is carried across over their tops. To keep the arms *k* parallel with one another, the upper parts of the rammers are preferably made square and slide in square holes in the upper cross-bar *h*.

It is desirable to provide some means for holding the rammers elevated and out of action at times, and for this purpose I provide an eccentric bar or shaft *G* pivoted on trunnions *m m* and having an arm or handle *m'* by which to oscillate it. In one position of this eccentric bar the rammers fall freely, but when turned to the position shown, its eccentric side bears against the rammers and wedges them fast in their elevated positions.

As the cope *B*² of the core-box is too heavy to be conveniently lifted off by hand, I provide a coping-off mechanism, the preferred construction of which I will now describe. On an oscillatory shaft *J'* are fixed two arms *J J* adapted when turned forward to engage the opposite ends of the core-box. Each arm has a slot *d'* extending through an arc of a circle struck from the center of the trunnions *c*, as shown in Fig. 4, in which slot the stud *d* on the cope may travel as the core-box is turned from one to the other of its two positions shown in Figs. 6 and 7. When turned to the position shown in Fig. 6, this stud is at the rear end of the slot shown in dotted lines in Fig. 5. Thereupon if the clamps *e e* be disconnected and the arms *J J* thrown back to the position shown in full lines in Fig. 5, the cope will be carried back with them in the arc of a circle, being supported by its stud *d* in the slots *d'* of the arms, while at the same time it is prevented from oscillating on its studs by means of stop-pins *d*³ striking stop projections or shoulders *d*³ formed on the inner sides of the arms *J J*, as best shown in Fig. 5. When the arms are thrown back they are arrested by a stop *r*. For conveniently operating the arms I provide a hand-lever *J*² fixed to the shaft *J'*.

For forming the vent holes in the cores, I provide a series of vent wires or pins *o o* corresponding in number and position to the matrices and mounted preferably on a swinging bar or leaf *p* hinged to a movable cross-bar *H*, as shown in Fig. 2. This cross-bar has openings through which the rammers *E* may freely move, and during the operation of the rammers the hinged bar *p* is turned to the position shown in Fig. 2, and fastened there by a hook *o'* (Fig. 3) engaging one of the vent wires. The cross-bar *H* is mounted to slide up and down between the vertical frames *C C*, being provided with stirrup

plates *h'* extending around these vertical frames and connected by link-bars *q q* on the opposite sides, with the arms *q'* fixed to a rock-shaft *Q*, to which is fixed an operating lever *Q'*. A counterweighted arm *Q*² projects backwardly from this shaft, so that its thrust serves to hold the bar *H* normally elevated to the position shown in Figs. 1 and 2. In order to vent the cores, the hinged bar *p* is turned under the sliding bar *H*, and the operator then by pressing down the lever *Q'* causes the bar *H* to travel downward and thrusts the wires into the cores, as shown in Fig. 10. After thus venting both branches of the cores the handle is released and the bar *p* swung backward and refastened.

I will now describe the operation of making elbow cores by means of this machine. At starting, the two sections of the core-box are separated as shown in full lines in Fig. 5. The operator first wipes off the respective sections, then by pulling down hand-lever *J*² brings the cope down upon the drag, and then by adjusting the clamps *e e* he clamps the two firmly together. The core-box is thus left in the position shown in Figs. 2 and 6. He then takes the tray *L* containing a sufficient quantity of the prepared core-sand, and resting it on the edge of the core-box, as shown in Fig. 2, he pushes the sand with his hand or any suitable tool from this tray onto the top of the core-box, so that it enters and partly fills the matrices therein. When these are sufficiently filled with sand, he turns the handle *m'*, thereby oscillating the eccentric bar *G* and releasing the rammers *E*, which thereupon commence their operation, being repeatedly lifted by the lifting mechanism, and liberated and falling so that they ram the sand into the matrices. As the sand is driven in the operator pushes over fresh sand, which in turn is driven in until all the matrices are filled to or above the upper surface of the core-box, whereupon the operator arrests the rammers and with his hand or a suitable tool sweeps off the sand from the upper surface of the core-box, so as to finish the ends of the cores flush therewith, the surplus sand being either swept back into the tray *L* or pushed over the core-box so as to fall down a chute *N* into a box *N'*. The operator then temporarily lifts off the tray *L*, and with his foot on the treadle *g'* presses down the table *D* sufficiently to free the core-box *B*, whereupon he turns it with his hand to the position shown in Fig. 7. He then replaces the tray *L* and pushes over more sand therefrom to fill the other branches of the matrices, and again sets the rammers in operation. When these branches are thoroughly filled and rammed, he again arrests the rammers, sweeps off the surplus sand to leave the ends of the cores flush, and removes the tray *L*. He then swings forward the hinged bar *p*, and holding it in place against the under side of the cross-bar *H* with one hand, with the other he presses down the lever *Q'*, thereby thrusting the vent wires

o into the cores to form the vents. Releasing this lever he then again thrusts down the table D and turns the core-box back to its original position, whereupon after releasing the table so as to hold the core-box, he again thrusts down the vent wires so as to punch the vent holes in the other branches of the cores, as shown in Fig. 10. He then restores the vent wires to their normal positions, as shown in Fig. 2. He then disconnects the clamps *e e* and gently raps the cope to detach it from the cores, whereupon he carefully throws back the lever *J*² so as to lift off the cope and carry it back to the position shown in Fig. 5. This leaves the cores resting on the drag *B'*. The operator then carefully places against the cores a drying tray *K*, shown in Figs. 11 to 14. In cross-section this tray consists of two angle plates *s s* extending at right angles to each other so as to come against the sides and ends of the respective branches of the cores, as shown in Fig. 11. The tray also has end plates *s'* forming feet for the tray. After placing this tray against the cores, as shown in Fig. 11, the operator lowers the table D and, holding the tray against the cores with his hands, he carefully turns the drag *B'* and tray together to the position shown in Fig. 12, and permits the table D to rise until it comes against the lower side of the end plate or foot *s'* of the tray, as shown. He then gently raps the drag *B'* to disengage it from the cores, and carefully lowers the table D, as shown in Fig. 13, so that the tray is carried down with the cores on it. The tray is then lifted off and carried to the drying oven. The tray carrying the cores is shown in Fig. 14. The operator then turns the drag back to the initial position, as shown in Fig. 5, whereupon the machine is ready for the next operation. The several operations thus described are very simple, and after a little practice the operator becomes so expert that he can turn out the cores in great numbers and very rapidly.

Fig. 9 shows clearly the direction in which the parting of the core-box occurs. When the elbow core is shouldered as shown, the shoulders *v v* are beveled or rounded off at an angle of about forty-five degrees so as to draw easily from the drag *B'*, the matrix in the drag being formed with corresponding beveled shoulders, as shown at *v'*.

Instead of separating the core-box by lifting off the cope, it might be turned oppositely and the drag be lifted off. This modification is shown in Figs. 18, 19 and 20. In these figures the trunnions *c* are shown as applied to the cope *B*², while lugs corresponding to the lugs *d d*² in Fig. 8 are applied to the drag *B'*, these lugs being lettered respectively *t* and *t*² in Fig. 18. The sections *B' B*² may be connected together in any suitable way, as for example by the same clamps as shown in Fig. 4, in which case the table D should be recessed at its ends to make room for the projecting portions of the clamps to turn in. The

coping off arms *J*, here lettered *J*³, engage the lugs *t* by being clamped therewith in any suitable manner, as for example by thumb-screws *t'*. During the operations of molding the cores, the arms *J*³ are kept swung back out of the way so as not to impede the turning of the core-box, but after the cores are molded the core-box is turned to the position shown in Fig. 18, the arms *J*³ brought down so as to engage the lugs *t t*², and their screws *t'* screwed in tightly against the lugs *t*. The arms *J*³ are then swung back so that the drag is lifted off and thrown back to the position shown in Fig. 19. The drying tray, lettered *K'*, is then applied as shown in Fig. 19, and the cope and tray inverted together, after which the table is lowered with the tray on it, as shown in Fig. 20, the cores being carried off on the tray. This construction is, however, inferior in several respects to that first described, and is here referred to only to serve as an example of one way in which my invention may be modified.

My invention is not limited in its application to elbow cores, but may be applied to the making of some other kinds of cores which admit of a similar division of the core-boxes. For example, I have shown in Fig. 21 a cross-section of a core-box adapted for making cylindrical cores such as are used in casting pipe couplings, thimbles or unions. The division of the core-box is along the line *x' x'*. If the cores are shouldered, their shoulders must be beveled off at an angle of forty-five degrees or more to enable the cores to draw properly. Many other shapes may be made in a core-box of my improved construction.

I make no claim in this application to the general features of the machine shown in Figs. 1, 2 and 3, these features being claimed in my before mentioned application. My present invention is directed to the construction of the core-box to adapt it to make elbow cores and other analogous cores, to the coping-off mechanism, and to the construction of drying tray adapted to co-operate with the form of core-box used.

The coping-off mechanism may be considerably modified without departing from my present invention. For example, instead of lifting off the cope the drag may be lifted off, as shown in Figs. 18 to 20. Instead of lifting off the movable section and starting it at an angle of forty-five degrees, as shown in the figures first described, it may be lifted off by starting it vertically, as shown in Figs. 18 and 19. Furthermore, it is not essential that the arms or other devices for engaging and lifting off the movable section of the core-box shall be divided so as to swing in the arc of a circle, as the coping-off devices might move in a straight line either vertically upward or at an angle by being provided with suitable sliding guides. The construction of the coping-off devices as arms projecting from an oscillating shaft is, however, practically preferable to any other arrangement, as thereby

not only do I avoid all difficulty incident to the use of sliding bearings (which in such a machine are liable to give trouble by sand getting into them) but the advantage is gained that the movable section of the core-box is partly turned over so as to expose its meeting faces in such position as to be most conveniently reached for cleaning them.

The mechanical auxiliaries employed in connection with my present invention may be greatly varied. For example, the rammers need not necessarily operate vertically, but may move in any other direction, and instead of striking the blow by the inertia due to their weight, may be forced into the matrices by any other force adapted to give the requisite pressure for properly ramming the cores.

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

1. A multiple core-box for molding pipe elbow cores, &c., formed with a longitudinal row of parallel core matrices, opening at two adjoining sides, and the box divided coincidentally with the bent axes of the cores, so that one section contains the parts of the matrices forming the outer or convex sides of the cores, and the other section those forming the inner or concave sides thereof.

2. A multiple core-box for molding pipe elbow cores, &c., formed with a longitudinal row of parallel core matrices, opening at two adjoining sides, at right angles, and the box consisting of a drag and a cope divided coincidentally with the bent axes of the cores, the drag constituting approximately three-fourths of the complete box, and the cope one-fourth thereof.

3. A multiple core-box for molding pipe elbow cores, &c., formed with a longitudinal row of parallel core matrices, opening at two adjoining sides, in combination with multiple rammers, adapted to enter the respective matrix openings to ram both branches of the cores.

4. A multiple core-box for molding pipe elbow cores, &c., formed with a longitudinal row of parallel core matrices, opening at two adjoining sides, and the box mounted on trunnions so that it may be oscillated, in combination with a series of rammers, adapted to enter the matrices, whereby the core-box may be turned to two positions to bring first one row of openings, and then the other row, in line with the rammers.

5. A multiple core-box formed with a longitudinal row of parallel core-matrices opening at two adjoining sides, and having its sides opposite said openings parallel therewith so that when either of said opposite sides is supported on a level surface the matrices opening on the upper side will stand vertically, and the core-box pivotally mounted so that it may be oscillated, combined with a series of vertically-moving rammers adapted to enter the respective matrix openings, and a

supporting table beneath said core-box and adapted to engage its lower side and hold it in place during the action of the rammers.

6. The combination with a multiple core-box formed with a longitudinal row of parallel core-matrices opening at two adjoining sides, and the core-box pivotally mounted so that it may be oscillated, of a series of vertically-moving rammers adapted to enter the respective matrix openings, and a vertically movable table beneath said core-box having an upward tension adapted to hold the core-box in place and adapted to be thrust downward to release the core-box and permit it to be oscillated.

7. A multiple core-box formed with a longitudinal row of parallel elbow core-matrices, and consisting of two sections divided coincidentally with the bent axes of the elbow cores, combined with a coping-off mechanism consisting of movable parts adapted to engage the opposite ends of one section of the core-box to move it away from the opposite section.

8. A multiple core-box formed with a longitudinal row of parallel elbow core-matrices, and consisting of two sections divided coincidentally with the bent axes of the elbow cores, combined with a coping-off mechanism consisting of two swinging arms adapted to engage the opposite ends of the movable section of the core-box to lift it off the opposite section and swing it back.

9. A multiple core-box formed with a longitudinal row of parallel elbow core-matrices, and consisting of two sections divided coincidentally with the bent axes of the elbow cores, and the core-box pivotally mounted so that it may be oscillated, combined with a series of vertically-moving rammers adapted to enter the respective matrix openings, and a coping-off mechanism consisting of moving parts adapted to engage the movable section of the core-box, while the latter stands in one of its ramming positions, and movable in such direction as to lift off the movable section of the core-box obliquely.

10. A multiple core-box formed with a longitudinal row of parallel elbow core-matrices, and consisting of two sections divided coincidentally with the bent axes of the cores, combined with a coping-off mechanism consisting of arms adapted to engage the opposite ends of the movable section of the core-box, and fixed on an oscillatory shaft arranged on a pivotal axis laterally of and beneath the core-box in such position that in swinging the arms backwardly the movable section is lifted off obliquely at an angle of approximately forty-five degrees.

11. A multiple core-box formed with a longitudinal row of parallel elbow core-matrices, and consisting of two sections divided coincidentally with the bent axes of the elbow cores, combined with a coping-off mechanism consisting of two swinging arms formed with

open arc-shaped slots engaging lugs projecting from the opposite ends of the movable section of the core-box.

12. The combination of a multiple core-box B formed in sections B' B², pivoted on trunnions *c c*, its movable section having lugs *d d*², with a coping-off mechanism consisting of pivoted arms J J having slots *d'* adapted to engage and lift the lugs *d*, and rests *d*³ adapted to engage the lugs *d*² and thereby prevent the turning of the movable section while coping off.

13. A multiple core-box B consisting of a drag B' and cope B², the drag formed with trunnions *c c* and the cope with lugs *d d*², combined with clamps *e e* for clamping together the two sections of the core-box, said clamps carried by one section, having hooks for engaging the opposite section, and screws ar-

ranged to bind against the section by which they are carried to force the two together.

14. The combination with a multiple core-box having parallel elbow core-matrices and parted coincidently with the bent axes of the matrices, of a tray constructed with longitudinal side-plates at an angle to one another and adapted to fit against a row of cores resting on one section of said core-box, whereby by inverting the core box section and tray together the cores may be transferred from the former to the latter.

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

ALFRED E. HAMMER.

Witnesses:

VALDEMAR HAMMER,
FRED WHITE.