

July 1, 1930.

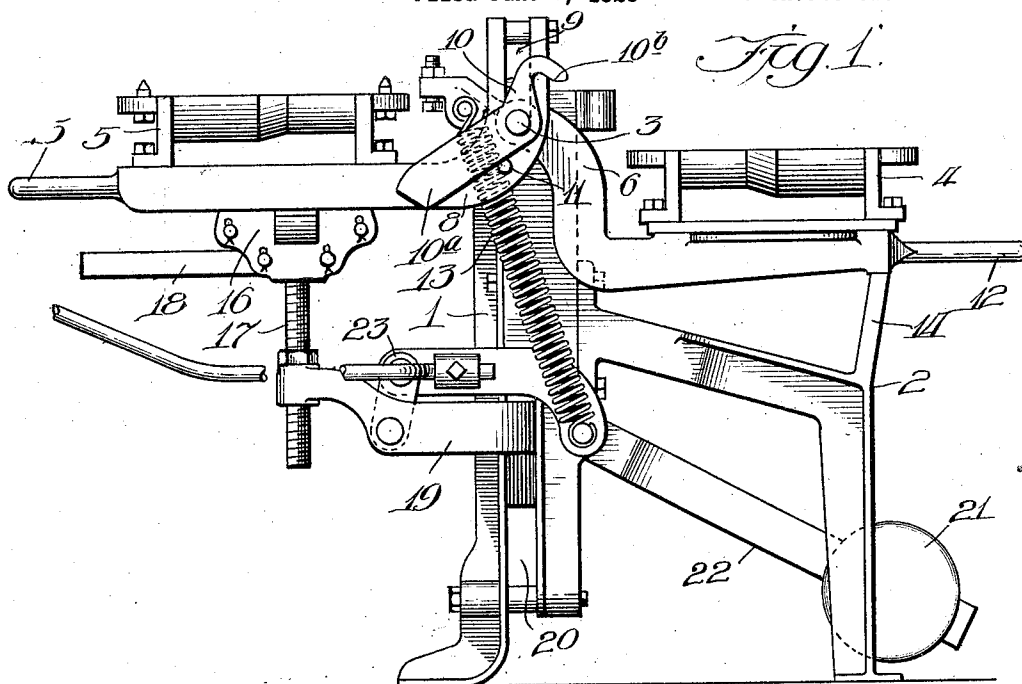
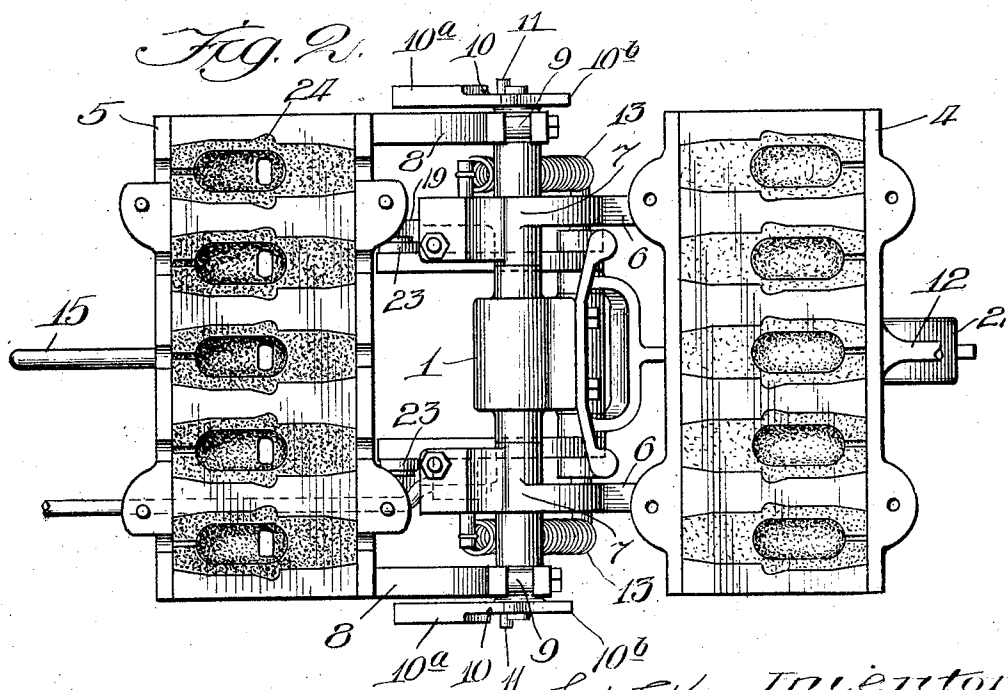
L. E. KEEN

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METHOD OF AND APPARATUS FOR FORMING SECTIONAL CORES

Filed June 7, 1926

3 Sheets-Sheet 1



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Rector, Hibben, Davis & Macaulay Attys

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3 Sheets-Sheet 2

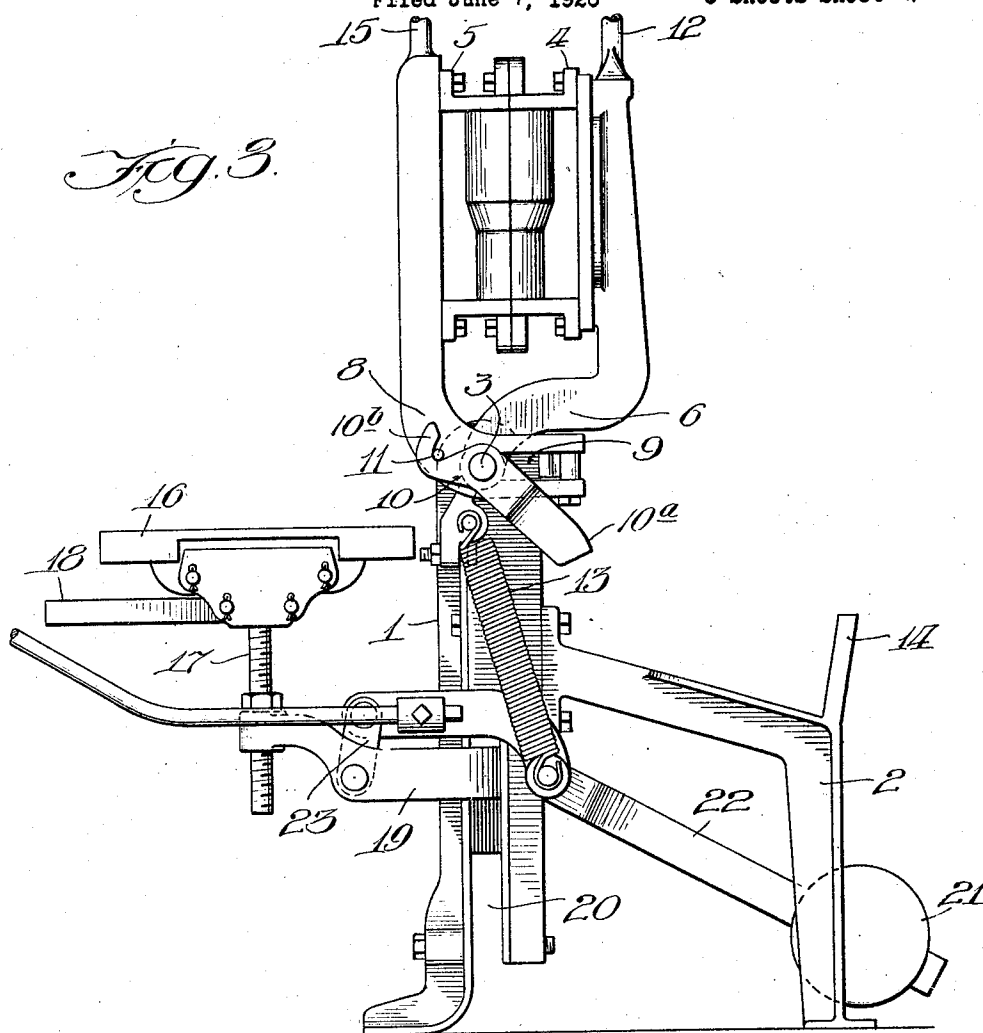
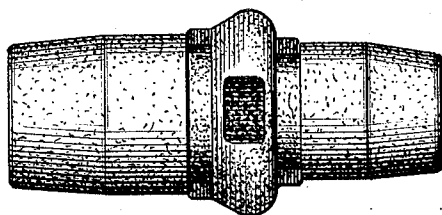


Fig. 6.



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3 Sheets-Sheet 3

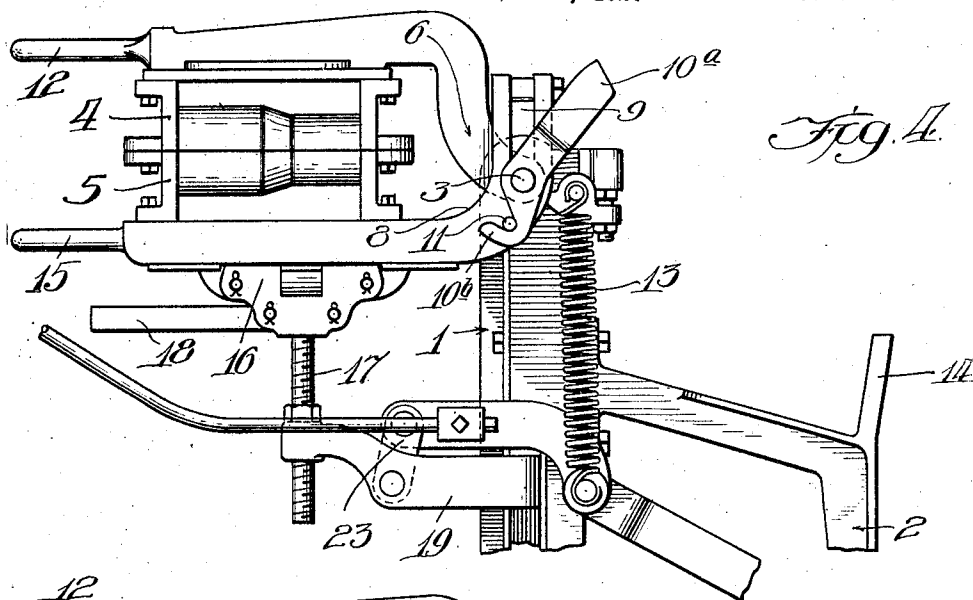


Fig. 4

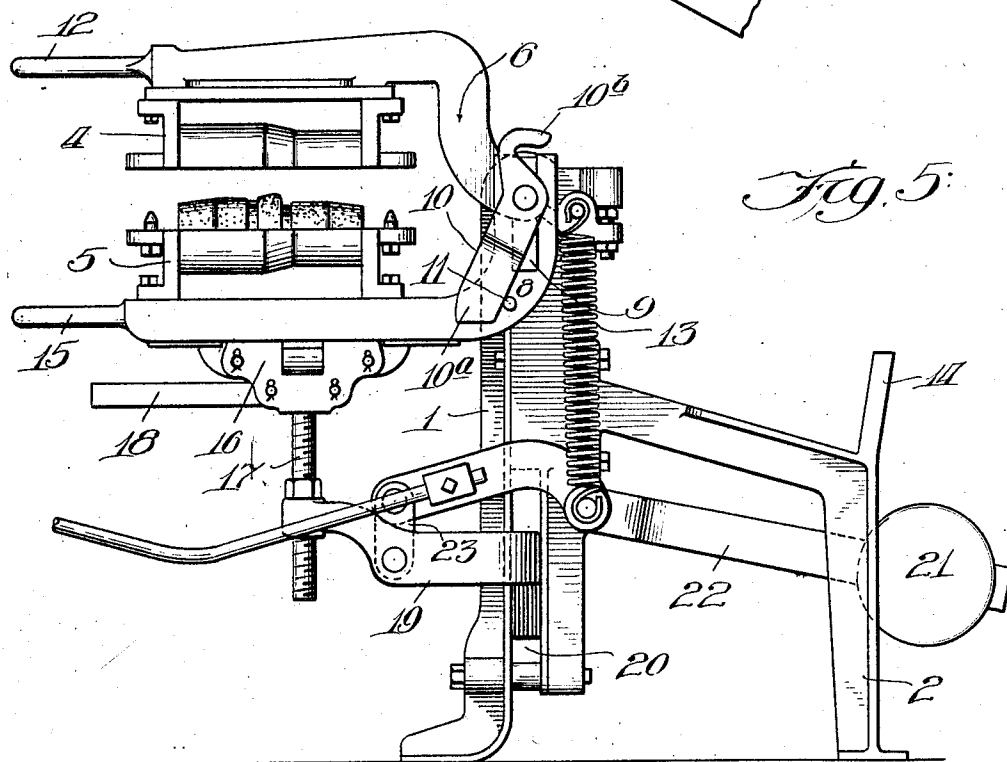


Fig. 5

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UNITED STATES PATENT OFFICE

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METHOD OF AND APPARATUS FOR FORMING SECTIONAL CORES

Application filed June 7, 1926. Serial No. 114,092.

My invention relates generally to a method of and apparatus for making sand cores and, more particularly sectional cores to be used in the casting or molding of metal parts.

Heretofore, in the making of sectional sand cores, it has been the general practice to first form the core parts from the desired kind of core sand and then join such core parts together by hand to form the complete core ready for the casting or molding operation.

The joining of the core parts by hand is slow and tedious with the result that in many instances the cost of cores formed in this manner is prohibitive. Furthermore, when the core parts are joined together by hand the operation depends entirely upon the eye and skill of the individual workman with the result that the core parts are not always joined together evenly and properly mated so as to minimize the seam formed at the joined portions with the result that a defective casting is formed which may be distorted or which may have objectionable fins of metal formed thereon. Also, since the resultant casting in each instance depends upon the eye and skill of the individual workman, both of which vary in the work of different workmen, or which may vary in the work of the same workman, successive castings which are uniform in shape and dimensions are not formed all of which causes great inconvenience, at times, to the manufacturer or other person using such castings. Furthermore, regardless of the care exercised there is constant danger of fracture of the core parts when employing previous methods.

One of the objects of my invention is to eliminate the foregoing objectionable features in the formation of sand cores and at the same time to increase production and to reduce the cost of the manufacture of the same.

Another object is to provide for the formation of complete sectional cores by the use of machinery whereby successive cores may be formed, and a plurality of such cores may be formed simultaneously, which are uniform in shape and dimensions and in which the seams at the joined portions are minimized to an

unnoticeable degree thereby eliminating the formation of fins in the resultant casting.

A further object is to so weld or join the core parts together that fracture of the meeting edges of such parts does not take place.

Furthermore, in the joining of the core parts by hand it is necessary to first form all of the respective core parts from the proper kind of core sand and then subject the same to a baking process to temporarily harden them so as to permit the necessary handling. This requirement increases the cost of production to a great degree. Another of the objects of my invention is to eliminate the necessity of subjecting all of the core parts or sections to an initial baking process, that is, in carrying out my invention some of the core parts or sections, at the time of welding or joining of the same together, are formed only of so-called green or unbaked sand thereby eliminating the cost of initial baking of such parts.

Other and further objects will become apparent by reference to the following description and by reference to the attached drawings wherein,—

Figure 1 is a side elevation of a machine adapted to carry out my invention, such machine being adapted particularly, as shown, for forming sectional cores formed of two sections and which may be used in the casting of hubs for wheels.

Figure 2 is a top plan view of the machine of Figure 1 showing a plurality of core halves or sections in place in the core molds or boxes such core sections being in condition for welding or joining together of the same.

Figure 3 is a side elevation showing the machine of Figures 1 and 2 in position for the joining together of the core half sections.

Figure 4 is a side elevation showing the machine of the previous figures in position after the core sections have been joined ready for separation of the core box sections.

Figure 5 is another side elevation showing the same machine in position with the core box sections separated following the operation of Figure 4 with the completed cores contained in the lower core box section ready for removal therefrom.

Figure 6 is a side elevation of a completed core.

The machine shown in the drawings is arranged particularly for the formation of a plurality of center core sectional castings formed of two identical half sections with the exception that one half is provided with an opening which permits communication with a pocket formed in the center of the completed core. This core is adapted particularly for the formation of hub castings such as may be used for automobile wheels. Although I have shown my invention applied to the making of this form of core, it is obvious that it may be used to make various other and different sectional cores.

In carrying out my invention, I first preferably form one of the core sections from the desired kind of core sand and then subject the same to a temporary baking process to harden it sufficiently to prevent breakage with ordinary handling. A large quantity of these semi-hardened or baked sections may be made up at a time to further facilitate rapid formation of complete cores in the manner to be described.

When it is desired to make the complete cores, the semi-baked core sections are placed in a core box section which may contain any desired number of pockets or mold cavities of the identical shape of the core sections placed therein. The other core sections which is to be welded or joined to the semi-baked core section is then formed from green sand in a core box section having a number of pockets or core section molds of the proper shape and size, and corresponding in number to the core section molds in the first mentioned core box section. The green sand core sections are shaped by use of the proper tools in the ordinary manner. Upon the completion of this operation, the exposed surfaces of the core sections which are to be joined are covered or partially covered with suitable core paste and the two core box sections carrying the above described core sections are brought together, each core box section being in a vertical position to form a complete core box. The core box sections are brought together in such a manner that they finally approach each other in parallel positions and meet in that manner so as to bring all portions of the meeting surfaces of the core sections together simultaneously. This action positively prevents any crumbling of the meeting core surface and assists in making possible the joining of the core sections so as to minimize and smoothly form the seam resulting from the meeting core surfaces. As the core box sections are brought together as above described, the core sections are firmly welded or joined together. The core box sections are next moved as a unit to a position to permit one section thereof to be lowered away from the other section, the lowered section at

the same time carrying the completed core. The core is then removed from that core box section, the semi-baked portion of the core permitting the core to be readily handled without danger of fracture of the completed core. After this the core may be thoroughly dried and baked ready for use in the casting operation.

Referring particularly to the drawings the numeral 1 designates the supporting standard of a machine adapted to carry out my invention, this standard having a supporting leg 2 at each side. A shaft 3 is suitably mounted at the top of the standard 1 and is adapted to carry the core box sections 4 and 5 so as to permit them to take a rotary motion.

The core box section 4 is provided with supporting arms 6, one at each side, these arms having one end attached to or preferably formed integral with, the core box section while the other end is mounted on the shaft 3 by the provision of the bearing members 7 whereby the arms 6 and core box section 4 are free to rotate about the shaft 3. The other core box section 5 is also provided with supporting arms 8, one end of each of which is secured to, or preferably formed integral with, that core box section while the other end has a slot formation 9 to permit that portion to straddle the shaft 3. The slot formation 9 not only permits of rotation of the core box section about the shaft 3 but also permits of a reciprocatory motion of the same relative to the shaft 3 for the purpose and in the manner hereinafter set forth.

Mounted at each end of the shaft 3, and preferably outside the arms 8 of the core box section 5, there is a latch 10. Each latch is carried by the shaft 3 so as to take a rotary motion relative thereto and is so shaped as to have a handle portion 10^a and a socket 10^b. The latch handles are to facilitate operation of the latches while the sockets 10^b are adapted to engage laterally projecting pins 11 which are carried and project from the arms 8 of the core section 5. The purpose of this latch and pin arrangement is to lock the core box section 5 in position on the shaft 3 to permit it to be rotated about such shaft during the movement of the core box sections together to form the complete core, while with this arrangement the latch 10 can be disengaged from the pin 11 to permit reciprocation of the core box section 5 relative to the other section 4 as shown in Figure 5. More particularly, with the pins 11 engaged in the slots 10^b of the latches 10, the core box section 5 is held rigidly in position on the shaft 3 in the same manner as if it were carried similarly to the core box section 4, at the same time permitting the desired rotary motion, while the advantage of the reciprocatory motion described is attained.

As shown particularly in Figure 3, the core

box sections meet in a vertical position which is slightly off center relative to the shaft 3 about which they rotate. This factor in addition to the length and shape of the supporting arms 6 and 8 causes the faces of the core box sections to finally approach each other and meet in parallelism. This action insures that the sand core parts carried by the core box sections will meet at all points simultaneously thereby insuring smoothly welded or formed joints and the possibility of danger of fracture of the edges of the meeting core parts is eliminated.

Each core box section contains an equal number of core section molds or pockets, each mold or pocket being of the proper size and shape for forming the particular core part desired. Movement of the core box section 4 to and from its vertical position is accomplished manually by the use of the handle 12, movement of this section away from its vertical position being cushioned or balanced by the use of the springs 13, one at each side of the machine, which have one end removably secured to the respective arm 6 and the other end removably secured to the standard 1 as shown in Figures 1, 3, 4 and 5. This core box section 4 is supported in its horizontal or full open position by the extension 14 of the legs 2.

Movement of the other core box section 5 in its rotary path to and from its vertical position (of Figure 3) is facilitated by the handle 15. This section is supported in its horizontal or open position by a member 16 which is carried by the vertically adjustable screw support 17. The connection between the member 16 and its support 17 may take any desired form providing for tilting adjustment of the member 16. An object of these adjustments is to positively assure the core box section being supported in a true horizontal position. The screw support 17 is mounted upon the arm 19 which slidably engages the standard 1 in the slotted portion 20 whereby such arm is caused to take and is limited to a vertical reciprocatory movement thereby bodily moving the support member 16 vertically. This reciprocatory movement may be limited by the length of the slot 20 or by any desired adjustable stop device which may be located in or associated with such slot. The support 16 and arm 19 are held normally in their uppermost position by the weight 21 which is carried at the outer end of a lever 22 which lever may be pivoted to the standard 1. This lever 22 is also operatively connected to the arm 19 by means of the link 23 whereby, as the lever 22 is swung about its pivot, the arm 19 and support 16 are caused to reciprocate. This action permits lowering of the core box section 5 to the position shown in Figure 5 and its movement back to the position of Figure 1.

In operation, the core box sections 4 and 5

are moved to the position shown in Figure 1. Semi-baked core parts such as the core parts 24, shown in Figure 2 for example, are placed in the molds or pockets of that section. The molds or pockets in the other core box section 4 are then filled with green sand and prepared, by the use of the proper tools, to be joined to the core parts in the section 5. A suitable core paste is then applied to the exposed surfaces of the core parts which are to be joined together. Upon the completion of this operation, the core box sections are brought together in a vertical position in the manner shown in Figure 3, the core parts of one core box section meeting the corresponding core parts of the other section in such a manner that all meeting surfaces contact simultaneously and are joined together in such a way that the meeting parts are not fractured and smooth and even joints are formed. The core box sections are pressed firmly together in this position and the entire core box unit is rotated to the position shown in Figure 4. During the foregoing operations the latches 10 are in engagement with the pins 11 so that the core box section 5 is maintained in the proper rotatable position relative to the section 4.

Following the foregoing, the operator moves the handles 10^a of the latches 10 to release such latches from the pins 11 whereupon the core box section 5 may be and is moved vertically downward away from the section 4. This movement is such, as hereinbefore explained, that all parts of the completed core which is in contact with the section 4 are separated therefrom simultaneously whereby danger of fracture to the completed core is eliminated. The core is next removed and placed in the proper environment for baking and final treatment for use in the casting operation.

After the completed core has been removed as just stated, the core box section 5 is swung back to the position of Figure 1 and the latches 10 are again placed in engagement with the pins 11. The core box section 4 is also moved to its normal position (Figure 1) and the machine is ready for another cycle of operations similar to that just explained.

From the foregoing it will be readily seen that I have provided a method of and apparatus for forming sectional cores whereby production is very greatly increased and the cost of production is reduced; the cores may be formed rapidly without danger of fracture; the seams characteristic of this form of core are formed smoothly and evenly so as to eliminate the possibility of formation of fins and other defects in the casting formed therewith; uniformity as to shape and size in successively formed cores or sets of cores is effected; completely formed cores may be made partly from green sand; and all of the ob-

jectionable characteristics of the so-called hand method are eliminated.

Having thus described my invention, what I claim is:

1. The method of forming sectional sand cores which comprises forming a semi-baked core section, forming a mating green core section in a mold, applying core paste to the meeting faces of said core sections, and mechanically bringing said core sections together without further individual core section treatment or preparation in such a manner that all meeting surfaces thereof contact simultaneously to prevent fracture of the meeting edges, the semi-baked core section serving as a carrier for the green core section.
2. The method of forming sectional sand cores which comprises disposing a semi-baked core section in a core box section, forming a mating green sand core section in an opposing core box section, applying core paste to the exposed surfaces of said core sections, causing said core box sections without further handling of said core sections to approach each other and meet in parallel formation so as to cause the mated core sections to contact at all points simultaneously, and causing one of said core box sections to move away from the other so as to simultaneously separate all parts of the core formed from the other core box section and to leave the complete core supported by the semi-baked part thereof, and removing the complete core from that core box section and baking the same.
3. The method of forming sectional sand cores which comprises disposing a semi-baked core section in a core box section, forming a mating green sand core section in an opposing core box section, applying core paste to the exposed surfaces of said core sections, causing said core box sections without further handling of said core sections to approach each other and meet in parallel formation in an upright vertical position so as to cause the mated core sections to contact at all points simultaneously, causing said core box sections to move as a unit to a horizontal position, and dropping the lower core box section away from the other one in such a manner that the completed core is supported by its harder portion in said lower core box section and all parts of said core are separated from said upper core box section simultaneously, and removing the complete core and baking same.
4. The method of forming sectional sand cores which comprises forming a core section from green sand in a mold, applying paste thereto while it is in the mold, and, without further individual core section treatment and preparation, joining the same to a mating semi-baked core section to form the completed core, and thereafter baking the same.
5. The method of forming sectional sand cores which comprises forming a core section

from green sand in one core box section, and joining said green core section to a mating semi-baked core section in another core box section without further handling of said green sand section and without removing the same from the core box section where formed, the semi-baked part of the complete core serving to support the same during final baking to prevent fracture of the green core part.

6. Apparatus for forming sectional sand cores comprising a core box section rotatably mounted on a shaft, another core box section slidably mounted on said shaft, and means for locking said latter core box section in a rotative position on said shaft relative to said first named section, and for unlocking said slidable section to permit sliding movement of the same relative to said other section.

7. Apparatus for forming sectional sand cores comprising a core box section rotatably mounted on a shaft, another core box section slidably mounted on said shaft, and means carried by said shaft adapted to engage said latter core box section for locking the same in a rotative position on said shaft relative to said first named section and for unlocking said slidable section to permit sliding movement of the same relative to said other section.

8. Apparatus for forming sectional cores comprising a core box section rotatably mounted on a shaft, another core box section slidably mounted on said shaft, and a latch rotatably mounted on said shaft and having a socket therein adapted to engage the said latter core box section for locking the same in a rotative position on said shaft relative to said first named section and for unlocking said slidable section to permit sliding movement of the same relative to said other section.

9. In an apparatus for forming sectional cores having a pair of core box sections, means for rotating each of said sections separately upon a common axis to a vertical position and as a unit to a horizontal position, and means for breaking the rotative engagement of one of said sections from said shaft, and means for effecting reciprocatory movement of the disengaged section relative to said other section and shaft.

10. In an apparatus for forming sectional cores having a pair of core box sections, means for rotating each of said sections separately upon a common axis to a vertical position and as a unit to a horizontal position, and a latch rotatably carried by said shaft and engageable with one of said sections for effecting its rotary movement, and disengageable from said same section to permit a reciprocatory movement of the same relative to the other section.

11. Apparatus for forming sectional cores comprising a core box section having a portion thereof rotatably engaging a stationary shaft

and movable only in a rotary direction, another core box section mating said first named core box section and having a plurality of supporting arms, slots in each of said arms effecting slidable engagement of the same with said shaft, means carried by said shaft and adapted to be operatively connected to said slotted arms to lock said latter core box section rotatably on said shaft, said means in its unlocked position permitting a slidable movement of said section relative to said shaft to separate the core box sections.

12. An apparatus for forming sectional cores which comprises a plurality of core box sections, one of said sections having a plurality of arms rotatably engaging a shaft and the other section having a plurality of arms slidably engaging said same shaft, means for locking said latter section in rotative position on said shaft to cause the same to rotate relative to said first named section and for unlocking said slidable section to permit the same to slide over said shaft and to reciprocate relatively to said other core box section.

13. Apparatus for forming sectional cores which comprises a plurality of core box sections each having a plurality of mated core section pockets therein, and rotatable towards each other to a vertical position to join the core sections together and rotatable together as a single unit to a horizontal position, means for locking one of said core box sections in rotatable position relative to said other core box section, said locking means being disengageable in the horizontal position of said core box unit to permit said locked box section to be moved away from said other section to remove the completed core therefrom.

14. The method of making sand cores from sectional core elements which consists in forming a core element dried and hardened to a predetermined degree, forming a complementary core element of green sand, supporting and uniting said elements together to complete the core, and removing the completed core from the support for further handling, the dried core element operating as a carrier for the whole core.

In testimony whereof, I have subscribed my name.

LOUIS E. KEEN.