O. L. DOSCH.

CONTINUOUS FOUNDRY PROCESS.

APPLICATION FILED DEC. 7, 1917.

1,276,040.

Patented Aug. 20, 1918.

6 SHEETS—SHEET 1.

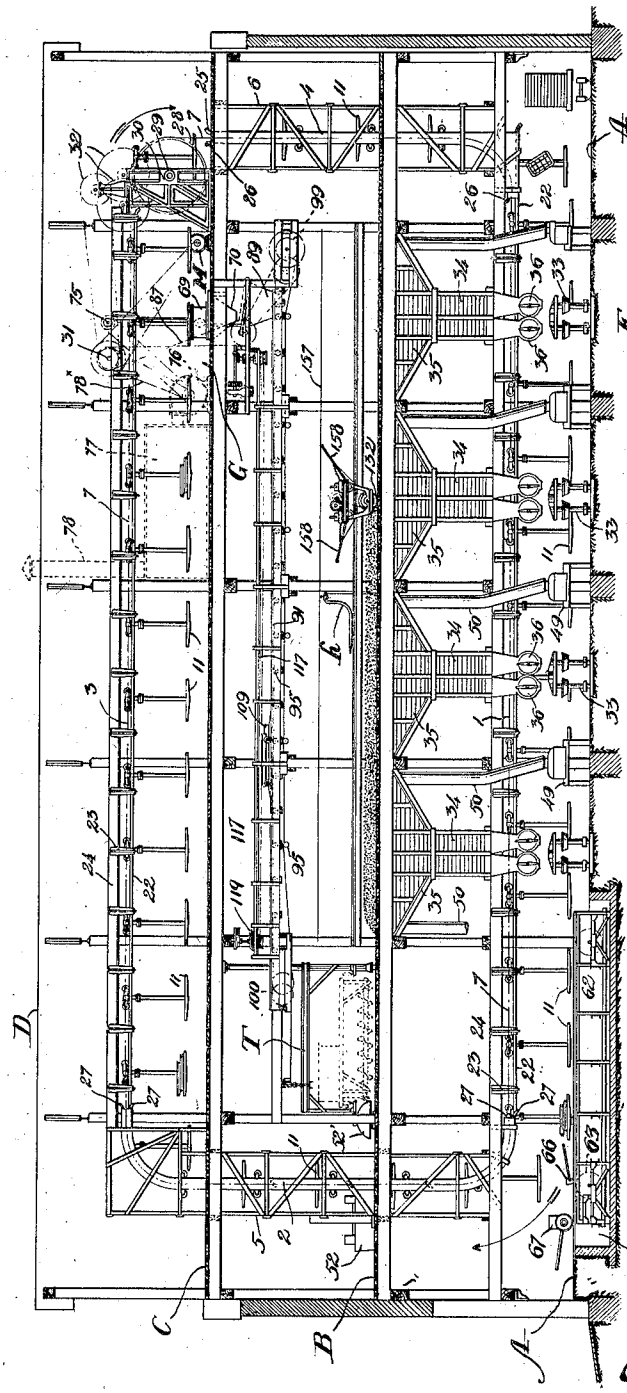


Fig. 1.

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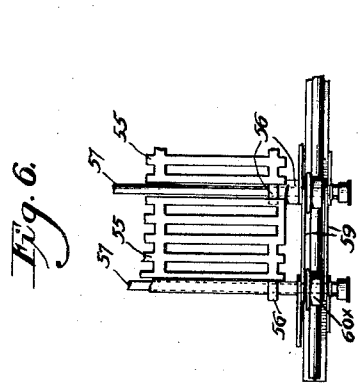


Fig. 6.

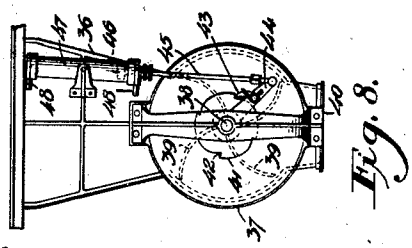


Fig. 8.

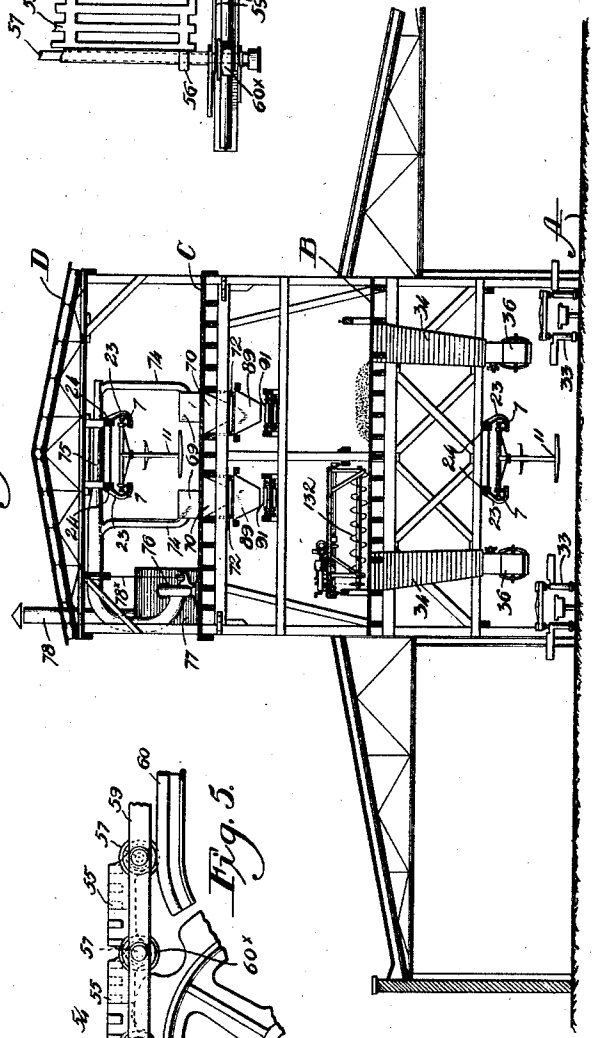


Fig. 2.

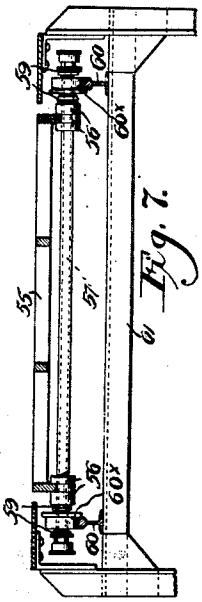


Fig. 7.

Fig. 5.

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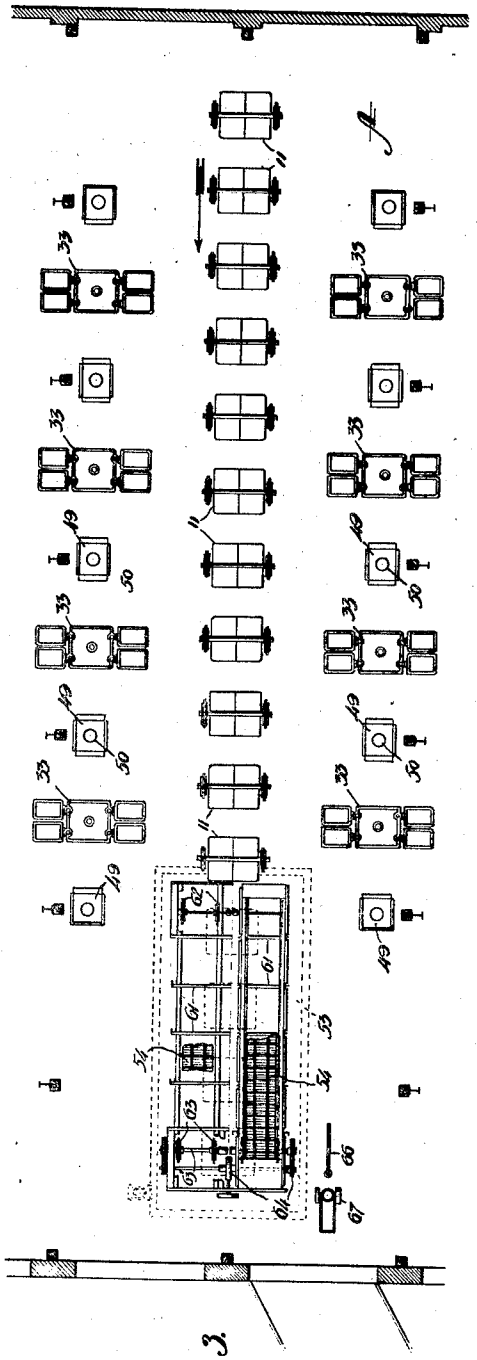


Fig. 3.

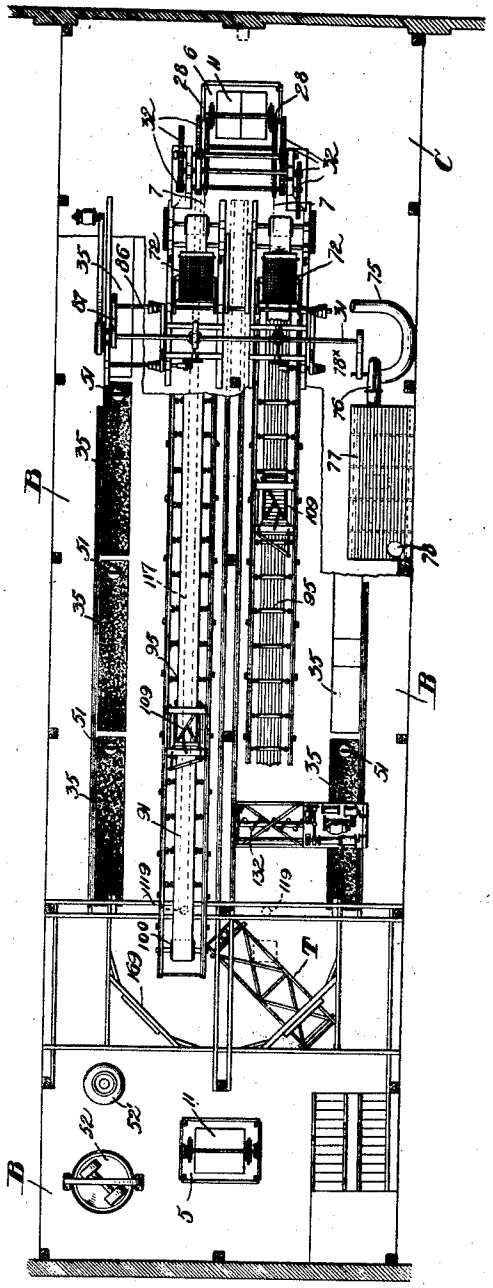


Fig. 4.

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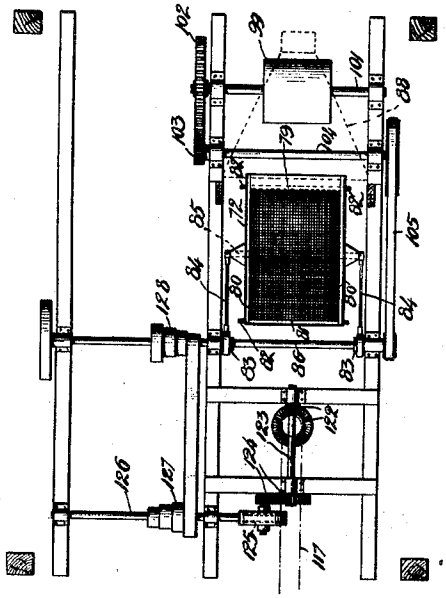
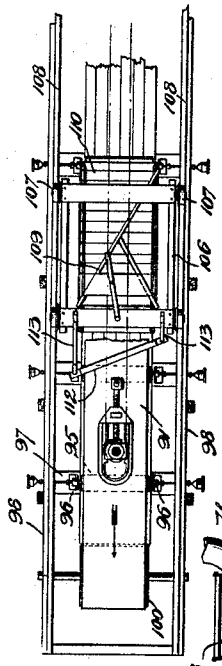


Fig. 10.



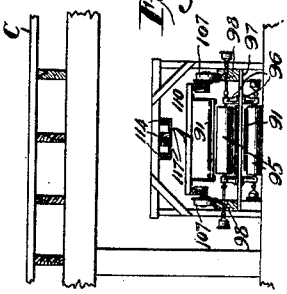


Fig. 11.

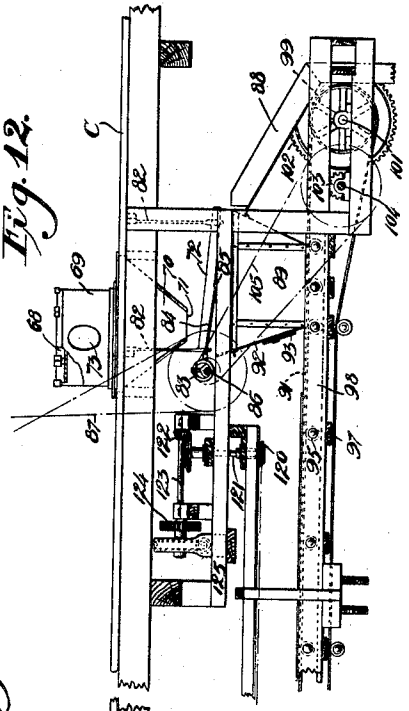


Fig. 12.

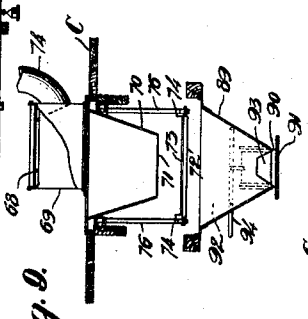
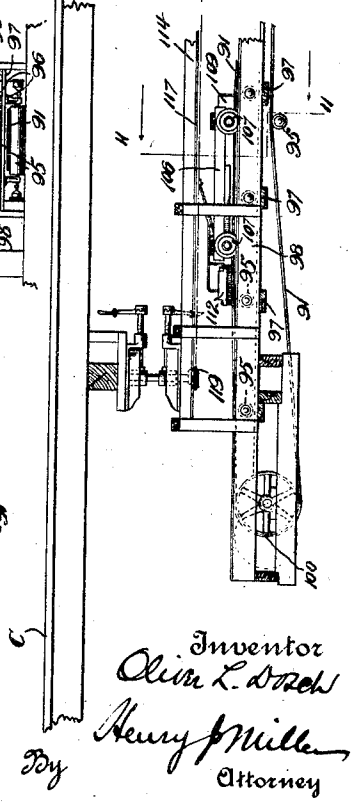


Fig. 9.



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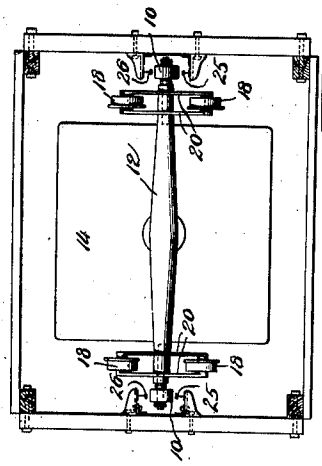


Fig. 16.

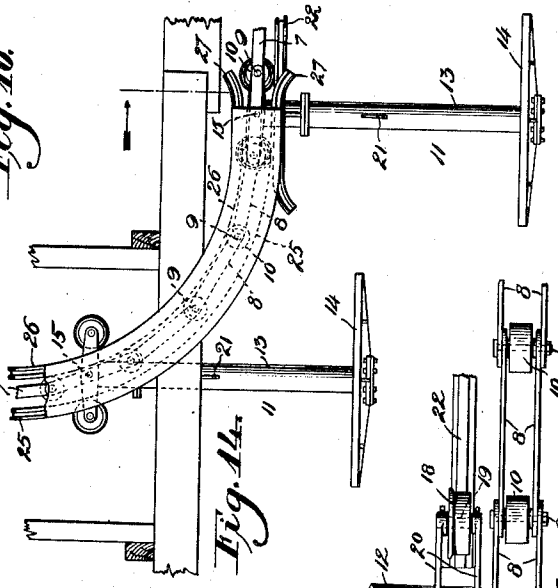


Fig. 14.

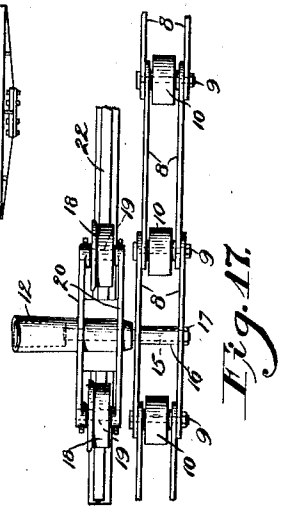


Fig. 17.

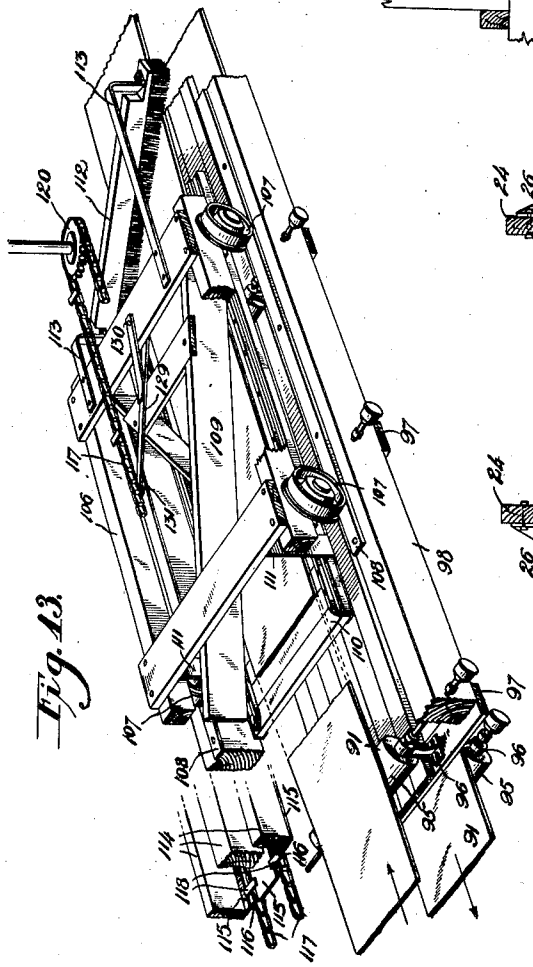


Fig. 13.

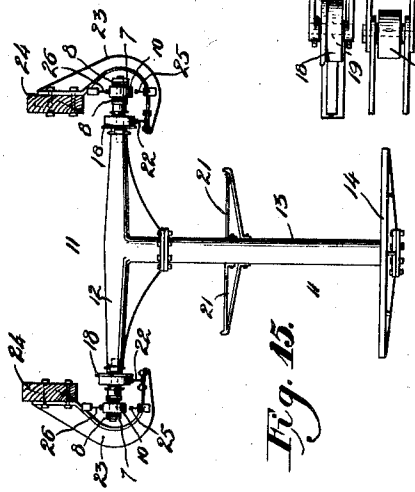


Fig. 15.

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6 SHEETS—SHEET 6.

Fig. 19.

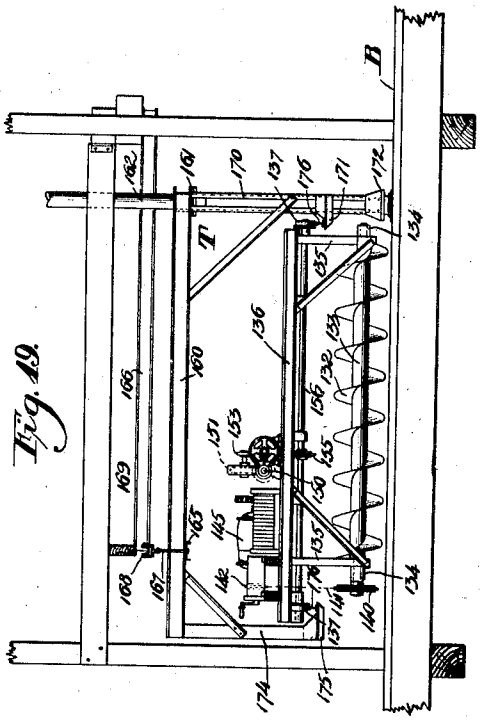


Fig. 21.

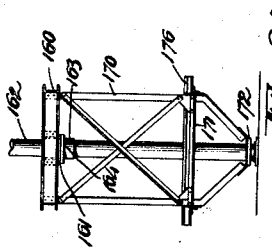


Fig. 20.

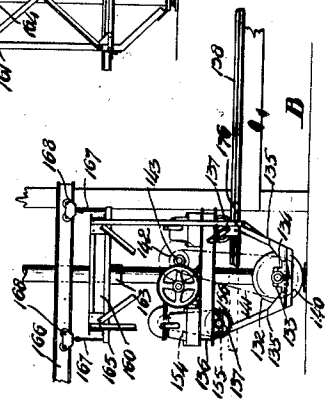
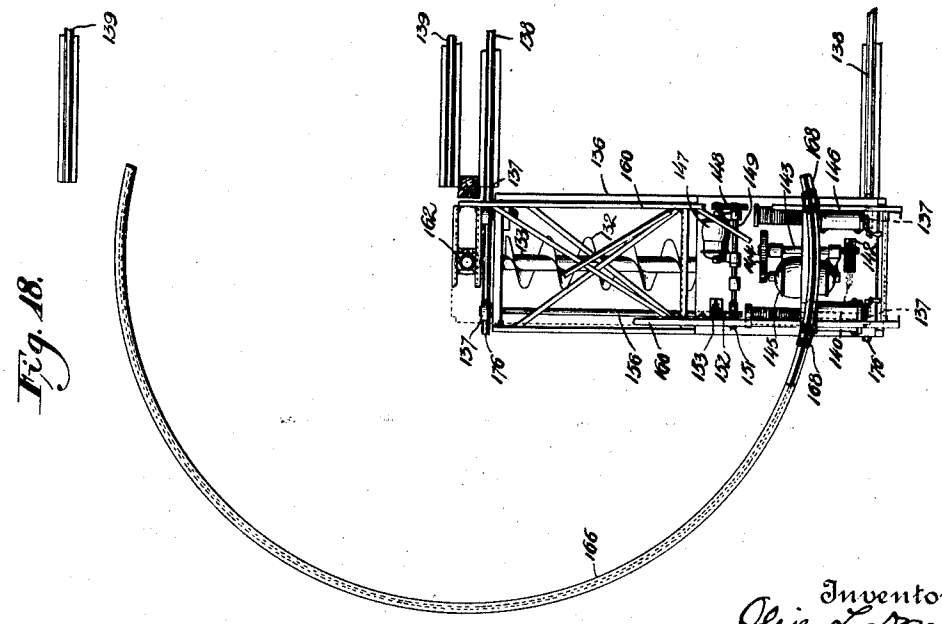


Fig. 18.



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UNITED STATES PATENT OFFICE.

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CONTINUOUS FOUNDRY PROCESS.

1,276,040. Specification of Letters Patent. Patented Aug. 20, 1918.

Original application filed December 8, 1916, Serial No. 135,752. Divided and this application filed December 7, 1917. Serial No. 205,949.

To all whom it may concern:

Be it known that I, OLIVER L. DOSCH, a citizen of the United States, residing at Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Continuous Foundry Processes, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to so-called "continuous" foundry processes, whereby the molds are formed at a molding station and placed upon an endless conveyer which first transports them to a pouring station, usually adjacent the cupola, and thence to a shake-out station where the poured molds are removed from the conveyer and broken up to release the castings; and whereby the used sand from the shake-out station is retempered and returned to the molding station.

While the use of such mold-handling processes is often desirable because of the economies resulting from increased production, specialization of labor, reduction of ground-floor space, &c., it is not feasible to utilize any of the processes heretofore known for the production of high grade castings for the reason, very largely, that in none of these processes is the used sand efficiently, economically and properly retempered prior to its return to the molding station. According to certain of these processes the sand is tumbled too much, causing it to "ball" or form into little pellets; according to others the sand is treated continuously in various mixing and tempering machines, as it is shaken from the molds, with the result that the same quantity of water is applied during a certain specified period of time, whether the sand goes through in large quantities or small quantities, whether it is largely composed of old sand or largely composed of new sand, and whether the molds which it formed contained castings of large size or small size, in which case the sand would be either too dry or too wet. It is well known by those familiar with foundry practice that to secure a uniform grade of work it is essential that the sand be tempered evenly, and specially for the work in hand; that is if the sand is too wet for one mold and too dry for another, the castings will not only be different in surface quality or finish, but will vary in hardness. If castings which are small and require machining are made in sand which is not properly tempered, some will be so hard that it will be impossible to machine them. Still other processes are expensive to carry into effect in that they require large amounts of power and floor space.

One of the main objects of this invention is to provide a continuous foundry process such that the used sand may be retempered and returned to the molding station in a simple, expeditious and economical manner, and in correct condition for high-class molding.

Another object of the invention is to provide a continuous foundry process whereby two entirely different classes of work may be handled simultaneously, each class requiring sand of a particular grade or consistency, and whereby each grade of sand may be tempered and returned to the molding station in correct condition independently of and without mixture with the other grade.

A further object of the invention is to provide a continuous foundry process, whereby the "balling" tendency of the sand may be overcome and whereby it may be thoroughly homogenized, re-vitalized, re-tempered and returned to the molding station, in an economical manner and in correct condition for high class molding.

A further object of the invention is to provide a continuous foundry process whereby a minimum of power and floor space will be required.

Further objects of the invention are the elimination of certain undesirable features characteristic of prior continuous processes; such as, the necessity of pouring molds while occupying positions above unpoured molds, and the frequent starting and stopping of the conveyer with its heavy load of poured and unpoured molds.

The present process will be readily understood in connection with a description of the apparatus by which it is preferred to carry it into effect. As set forth in my copending application, Serial No. 135,752, filed December 8, 1916, of which this application is a division; the apparatus preferably comprises an endless conveyer of rectangular

form having a lower horizontal run whereon the molds are placed and poured, an ascending run whereon the poured molds are elevated to an upper level, an upper horizontal run from which the molds are removed and shaken out and upon which the castings and mold accessories are replaced, and a descending run whereon the castings and mold accessories are lowered to the molding floor. The conveyer includes an endless link-belt to which are pivotally connected the component mold carriers or trays of a series. In the present instance means are provided for restraining the trays against tilting or swinging while they are passing along the lower and upper horizontal runs. Series of molding machines are arranged along opposite sides of the lower horizontal runs, so that the molds may be formed in sufficient numbers to keep the trays filled, and movable pouring platforms are arranged at opposite sides of the end-portion of the horizontal run which joins the ascending run, so that the molds may be poured while on a horizontal run and so that the positions of the pourers relatively to the molds may remain fixed during the pouring operation, as in ordinary floor pouring.

Shake-out boxes or hoppers disposed at opposite sides of the upper horizontal run of the conveyer, serve to conduct the used sand to suitable riddles or screening devices placed directly beneath their discharge orifices. An exhaust fan connected to these hoppers acts to draw air downwardly into their mouths and carry away the heated gases, steam and dust which otherwise would tend to rise and inconvenience the workmen stationed at this point. From the fan the exhaust-matter is discharged into a moderately large settling chamber wherein the fine particles of sand are deposited. An air-discharging vent leads from the settling chamber through the roof of the building.

The sand passing through each riddle is evenly distributed upon a corresponding endless belt conveyer from which it is caused to fall to a sand tempering or homogenizing floor by a specially designed plow adapted to travel constantly back-and-forth along said belt at a relatively slow speed. The purpose of this plow is to scrape the sand from the belt in a thin layer, causing it to fall to the floor in the form of a thin sheet, thus exposing every particle of the sand to the cooling action of the air and effecting the liberation of most of the hot gases. These sand-belts are parallel and are spaced apart so that the sand which falls to the tempering floor will form separate and distinct parallel ridges along the length of the latter. The tempering floor is equipped with one or more hose connections for supplying different portions of each sand-ridge with varying amounts of water to give the entire mass of sand the temper desired for the class of work in hand.

A screw-conveyer is journaled to rotate in a traveling frame which is provided with wheels enabling it to run along suitable track-ways which extend lengthwise of the tempering floor and parallel with the sand-ridges deposited thereon. Suitable manually controlled motors carried by the frame are independently connected to drive the latter and rotate the conveyer about an axis extending crosswise of the tempering floor. The purpose of this conveyer is to scrape the sand outwardly across the tempering floor and into a series of storage bins disposed lengthwise of said floor and carrying sand-valves at their lower ends adapted to deliver the tempered sand in measured quantities to the molding machines on the molding floor. The screw-conveyer may be run over the floor at manually controlled intervals to repeatedly move the sand toward the sand-bins and permit it to rest intermittently.

In the accompanying drawings, Figure 1 is a side elevation, partly in section, of the building structure showing the various working parts in their proper relative positions. Fig. 2 is a transverse cross-sectional view of the building looking toward the left, Fig. 1. Fig. 3 is a plan view of the lower floor showing the layout of the molding and pouring stations. Fig. 4 is a plan view of the equipment at the intermediate floor showing also a portion of the upper floor. Figs. 5, 6 and 7 are detail views of the moving platform at the pouring station. Fig. 8 is a side elevation of one of the sand-valves through which the sand may be delivered in measured quantities to the molding machines. Fig. 9 is a cross-section of the mechanism at one side of the shake-out station for screening the sand and depositing it upon the belt-conveyer. Fig. 10 is a plan view showing details of construction of the sand-screening and -conveying mechanism. Fig. 11 is a transverse cross-section on line 11—11, Fig. 12. Fig. 12 is a side elevation of the parts shown in Fig. 10. Fig. 13 is a perspective view of one of the plows used for scraping the sand from the sand-belts, a portion of the parallel spaced beams being cut away. Figs. 14, 15, 16 and 17 are views showing details of construction of the mold-conveyer and -carriers. Fig. 18 is a plan view of the transfer-device for the traveling screw-conveyer showing the latter in position for transfer. Fig. 19 is a side elevation, Fig. 20 an end elevation and Fig. 21 is a reverse end-elevation of the parts shown in Fig. 18.

In the preferred embodiment of the invention, as illustrated, the various working parts are sustained by an elongated building

structure or frame-work including a lower or molding floor A, an intermediate sand tempering or homogenizing floor B, an upper or shake-out floor C, and a suitable roof D. Disposed substantially in a vertical plane, centrally of the width of the building structure, is an endless mold-conveyer traveling in a rectangular path comprising a lower horizontal run 1, Fig. 1, a vertically ascending run 2, an upper horizontal run 3, and a vertically descending run 4. The lower and upper runs of the mold-conveyer extending lengthwise of the lower and upper floors, respectively, while the ascending and descending runs extend through vertical shafts 5 and 6, respectively, located at the opposite ends of the building.

Referring to Figs. 14 and 17 inclusive, the mold-conveyer comprises two parallel endless chains or link-belts 7—7 each of which includes a series of alternately inwardly and outwardly disposed pairs of spaced links 8—8 whose end-portions are connected in overlapping relation by bolts 9 upon which are journaled the rollers 10. Depending from the conveyer-chains at intervals along the length of the latter, are a series of mold-carriers, indicated generally at 11, each of which comprises a hollow transverse beam 12 to the center of which is bolted the upper flanged end of a depending tubular member 13 which carries at its lower end a flat, horizontally disposed, mold-carrying tray 14.

Fixedly secured to and projecting from the opposite ends of the beam 12 are pivot-pins 15, each of which enters suitable bearing apertures formed midway between the ends of a corresponding pair of links 8. The portion of each pin 15 extending between a pair of links is surrounded by a sleeve 16 and the free ends of said pins are threaded to receive nuts 17. Each of the beams 12, together with its complement of pins 15, sleeves 16 and nuts 17, serves as a tie-rod to maintain the chains 7, 7 in proper laterally spaced relation. A pair of flanged supporting wheels 18 are mounted to turn on bearing pins 19 which are fixedly secured in position between the adjacent apertured ends of a pair of spaced cross-bars 20 formed at each end of the beam 12. Bolted to the standard 13 of each carrier are a pair of oppositely extending brackets 21 which may be utilized to carry certain of the mold accessories from the shake-out floor to the molding floor.

The wheels 18, which support the mold-carriers 11 while traveling at the lower and upper levels, run on the parallel overhead rails 22, 22, each of which is carried by the inwardly directed free end-portions of a series of depending L-shaped hangers 23 whose upper ends are bolted to longitudinally extending beams 24, 24, supported in any suitable manner. At the horizontal runs the chains 7, 7 merely serve to pull the mold-carriers and are supported entirely by the pins 15. Since each of the depending mold-carriers runs on four-wheels during its travel along the lower and upper runs, it will be seen that said carriers are very stable and that swinging or tilting movements of the trays 14 are prevented.

While traveling along the vertical run the mold-carriers 11 are suspended entirely from the chains 7, 7 and are free to swing about the pivot pins 15, as shown in Fig. 14. Mounted within each of the similar shafts 5, 6 surrounding the vertical runs, are two pairs of opposed vertical rails 25, 26, Fig. 16, which form guideways for the rollers 10 of the chains 7, 7. At the ascending run 2 the lower and upper end-portions of these guide rails are curved on arcs of concentric circles and terminate in short flared extensions 27, 27. At the receiving end of the ascending run 2 the rollers 10 enter between the extensions 27, 27 and are gradually drawn into rolling contact with the then upper rail 26. Near the discharging end of the ascending run 2 the rollers 10 bear against a similarly curved portion of the rail 26. Just before the rollers 10 leave the rails 25, 26, the carrier-wheels 18 ride upon the horizontal rails 22 at the upper run 3 and again resume their supporting function.

At the end of the upper horizontal run 3 the chains 7, 7 run over the driving sprockets 28, 28 which are mounted upon the shaft 29 journaled in the framework 30 supported by the upper floor. A suitable motor M is belted to a countershaft 31 which, in turn, is belt-connected to a series of speed-reducing gears 32, 32 connected to the sprocket-shaft 29. From the sprocket-wheels the rollers 10 pass between the spaced pairs of guide-rails sustained within the shaft 6 and are guided during their descent to the lower end of the said shaft where they roll about the lower convexly curved portions of the rail 26 and leave the latter shortly after the carrier-wheels 18 ride onto the lower horizontal rails 22.

At the molding station E, Figs. 1 and 3, at each side of the lower horizontal run of the conveyer, is a series of molding machines 33 of well known construction, wherein the molds may be rapidly formed in a manner familiar to those skilled in the art. Disposed directly above each series of the molding machines is a series of sand-bins 34 whose upper or reciving ends 35 are widened out and form a practically continuous sand receiving slot extending along the outer edge-portion of the sand-tempering floor B, Fig. 4. At its lower discharge orifice each of the sand-bins carries a pair of sand-valves 36 which are disposed directly

above a corresponding one of the molding machines 33 and are adapted to measure out the correct quantity of sand for the mold and allow it to fall directly onto the pattern and flask parts supported by the machine. Referring to Fig. 8 it will be seen that each of the sand-valves comprises a hollow cylindrical drum 37 axially of which is journaled a shaft 38 to which are secured four curved radially disposed vanes 39 dividing the drum into four equal compartments. The upper side of the drum is connected with a chute leading from a sand-bin and the lower side of said drum is formed with a discharge orifice 40. Secured to the shaft 38 is a disk 41 having four peripheral notches affording shoulders or ratchet-teeth 42 adapted to be acted upon by the pawl 43 carried by a lever 44 fulcrumed on the shaft 38 and connected at its free end to a piston-rod 45 carrying the piston 46 disposed within the pneumatic cylinder 47. Suitable air-hose connections 48, at the opposite ends of the cylinder 47, permit the lever 44 to be controlled pneumatically to advance the vanes 39 a quarter of a revolution and thereby carry a measured quantity of sand to the lower side of the drum 37 from which it falls through the orifice 40 onto the molding machine below.

For high grade castings it is desirable to apply a thin layer of extra fine or facing sand to the pattern before the mold is filled with the coarser molding sands. To this end a series of stands 49 are placed in a row in alternating arrangement with the molding machines 33 so that an intermediate stand may be easily reached by the operators of adjacent molding machines. The facing sand is supplied to the stands 49 through suitable chutes 50 which extend upwardly through the sand-bins and terminate at the level of the sand tempering floor B. Suitable covers 51 are placed over the upper ends of the chutes 50 to prevent the entrance of coarser sand during the operation of the traveling screw-conveyer, to be hereinafter described. The facing sand is prepared in the usual pug-mill 52 and centrifugal mixer 52′ which are placed at one end of the sand tempering floor B, and is in the present instance manually conveyed to and deposited within the chutes 50.

After the molds have been formed and placed upon the mold-carriers 11 they are conveyed to the pouring station F, Fig. 1. The floor of the pouring station is raised slightly, in order that the pourers may not have to elevate the heavy ladles to an inordinate height, and is formed with a pit 53 within which is disposed the mechanism for supporting and driving a pair of moving platforms 54, 54 arranged one at each side of the central vertical plane of the mold-conveyer. As these platforms are precisely similar, a description of one will suffice. Referring to Figs. 3, 5, 6 and 7, the platform 54 comprises a series of similar rectangular sections or gratings 55, formed at their four corners with downwardly extending ears 56 apertured to receive the cross-shafts 57 which pivotally connect adjacent gratings. A pair of link belts 59, 59, each comprising spaced pairs of alternately inwardly and outwardly disposed overlapping links, connect the opposite extending free end-portions of the cross-shafts 57. Flanged wheels 60× are mounted upon the shafts 57 connecting the links of the belts 59 and are adapted to run on the rails 60 supported by suitable cross-beams 61 sustained within the pit 53. A pair of idler sprocket-wheels 62 for the link-belts 59 is disposed at one end of the rails 60 and serve to carry the grating from the lower to the upper lever of the moving platform. A pair of driving sprockets 63, disposed at the other end of the rails 60, are fixed to a driving shaft 63′ which is slowly rotated by means of suitable gearing 64 driven by a motor, not shown. The ratios of the gearing and speed of the motor are so chosen that the moving platform travels at substantially the same speed as the mold-carriers 11. The pouring equipment further comprises hand ladles such as 66, which may be filled with molten metal from the trucks 67.

The poured molds, while cooling, travel slowly up the ascending run 2 and along the upper run 3 to the shake-out station G. Operators stationed at this point remove the molds from the conveyer and dump them upon gratings 68, Fig. 2 and 12, supported at the mouths of the shake-out boxes or hoppers 69 which are disposed one at each side of the conveyer. The gratings permit the sand to fall into the hoppers 69 but retain the castings which are to be replaced upon the conveyer together with the mold accessories or flask parts.

Referring to Figs. 2, 9 and 12, it will be seen that each of the shake-out hoppers 69 includes a lower section 70 which tapers downwardly to a constricted discharge orifice 71 disposed above a sand-riddle or screening device 72. Projecting into each of the hoppers 69 through a side orifice 73 below the mouth thereof, is the lower end of an exhaust conduit 74 whose upper end is connected to a horizontal conduit 75 leading to the exhaust-fan 76 which discharges into the settling chamber 77. The suction created by the fan 76 causes air currents to flow downwardly into the mouths of the hoppers 69 and thence through the conduits 74, 75, into the settling chamber 77. These air currents carry away the obnoxious steam, dust and heated gases freed by the falling sand. Some of the finer particles of sand are also sucked into the conduits 74. When

the exhaust-matter enters the settling chamber its velocity drops considerably and the fine particles of sand which are heavier than air settle to the floor and may be recovered. An exhaust vent 78 connects the settling chamber with the outside air. The fan 76 may conveniently be driven from the countershaft 31 by a belt 78×.

In order that mixture of the sands used at each side of the system may be avoided two separate mechanisms are provided, one at each side of the central vertical plane of the mold-conveyer for screening the used sand and depositing it along the length of the sand-tempering floor in the form of two separate and distinct ridges. As these mechanisms are of similar construction the description will be restricted to the mechanism at one side of the system.

The sand riddle 72, Figs. 10 and 12, comprises a rectangular frame-work which supports the screen 79. The side-pieces 80, 80, and one end-piece 81 prevent spilling of the sand over the edges of the screen 79. The riddle is suspended at its four corners from the studding at the under side of the upper floor C by four flat springs 82 and is inclined to the horizontal, as shown in Fig. 12. Vibratory movements are imparted to the riddle by means of the eccentrics 83, 83, which are connected through the links 84, 84, to the opposite ends of the cross-bar 85 extending transversely of and secured beneath the framework of the riddle. The eccentrics 83 are mounted on the shaft 86 which is driven from the countershaft 31 by a belt 87. The sand in falling through the hopper 69 onto the riddle 72 usually breaks up into its original condition of fineness and passes through the screen 79. Any pieces of iron or hardened lumps of sand which remain on the screen find their way to the lower end thereof and fall into the chute 88 which leads to a scrap heap. Disposed below the riddle 72 is a second hopper 89 having its reduced lower discharge orifice 90 disposed very close to the upper surface of a horizontally disposed conveyer-belt 91. The front side wall 92 of the hopper 89, Fig. 9, is fitted with a sliding gate 93 and operating handle 94 to regulate the thickness of the layer of sand carried away by the belt 91 as it passes from under the orifice 90. The belt 91 is carried on a series of rollers 95 journaled in brackets 96, Fig. 13, secured to suitable cross-beams 97 supported by the longitudinally extending beams 98. At its opposite ends the belt runs over the driving pulley 99 and the idler pulley 100, respectively. The driving pulley 99 is secured to the shaft 101 which carries the gear-wheel 102 meshing with the pinion 103 on the counter-shaft 104 which is driven by the belt 105 from the counter-shaft 86. Referring to Figs. 1 and 2 it will be seen that the conveyer-belt extends lengthwise of the intermediate floor B and is supported some distance above the latter.

In order that the sand, which is carried away from the shake-out station by the belt-conveyer, may be deposited in the form of a ridge extending lengthwise of the floor B, a traveling plow or scraper is arranged to move slowly back-and-forth along the length of the upper or loaded side of the belt 91. As shown best in Fig. 13, this plow comprises a rectangular frame-work 106 supported at its four corners by wheels 107 running on the track 108 and fitted with a diagonally extending scraper-blade 109. A belt-supporting platform 110 is hung from the frame-work 106 by means of straps 111 and the upper surface of said platform is spaced below the lower edge of the blade 109 a distance slightly greater than the thickness of the belt 91. The platform 110 serves to hold the loaded belt 91 close to the blade 109. Without this platform the belt would sag between the rollers 95 and would not be scraped clean by said blade. A diagonally disposed brush 112 is supported at the rear of the blade 109 by suitable bars 113 secured to the frame-work 106 and serves to brush off any sand which may escape the action of said blade.

Extending above and longitudinally of the path of movement of the plow are three parallel spaced beams 114 to the lower surfaces of which are secured three flat metal strips 115 which are somewhat wider than the beams 114 and define two parallel slots 116 between them. These spaced metal strips are adapted to support the two parallel runs of an endless chain 117 which is suspended at intervals from a series of short cross-pieces 118 adapted to bridge the slots 116 and slide along the strips 115. The chain 117, Figs. 10 and 12, runs around the idler-sprocket 119 and driving sprocket 120 which latter is carried by a vertical shaft 121 connected by beveled gears 122 with a counter-shaft 123 which is driven through the spur-gears 124 and worm-gearing 125 by a counter-shaft 126 carrying the stepped pulley 127 which is belt-connected to a reversely stepped pulley 128 secured to the counter-shaft 86. A coupling bar 129, Fig. 13, pivoted to the frame-work 106 at 130 and pivotally connected to the chain 117 by a depending pin 131 serves to transmit the slow motion of the chain to the plow. During the travel of the pin 131 about either one of the sprockets 119, 120, the coupling bar 129 merely swings about the pivot 130 as the motion of the plow reverses.

It is obvious that as the sand upon the belt 91 strikes the diagonal blade 109 it will be deflected to one side and will fall over the edge of the belt in the form of a thin sheet to the floor B. The sand will thus be

aerated and cooled in very much the same manner as when tossed in a spray from one heap to another in the well known process of hand tempering with a shovel commonly employed on the foundry floor. After the sand has been deposited in a ridge on the intermediate floor, a skilled workman sprays different portions of said ridge with varying quantities of water from the hose *h;* the quantity of water supplied depending upon the observed condition of the sand and the temper desired for the class of work in hand.

The sand after lying in this condition for a sufficient length of time to complete the cooling process and allow the water to soak into and permeate the sand mass, is moved outwardly across the floor and into the open slot formed by the contiguous mouths of the sand-bins 34 by a screw-conveyer, Figs. 18, 19 and 20, comprising a spiral blade 132 secured to a shaft 133 whose reduced extremities are journaled in bearings 134 sustained by the depending hanger members 135 carried by the traveling frame 136 provided with flanged supporting wheels 137 which are adapted to run on either of the parallel track-ways 138, 139, extending lengthwise of the intermediate floor B. The shaft 133 extends crosswise of the floor and is supported so that the free edge portion of the spiral blade 132 just clears said floor. At its outer end the shaft 133 carries the sprocket 140 which is connected by a chain 141 to a driving sprocket 142 secured to a counter-shaft 143 which is connected by spur gears 144 to a suitable motor 145, the direction of rotation and speed of which may be controlled by the usual controller 146.

The supporting frame 136 of the screw-conveyer may be propelled along the track-ways 138 and 139 by means of a second independently controlled motor 147 which is connected by suitable speed-reducing spur-gears 148 to a counter-shaft 149 carrying a worm 150 meshing with a worm-wheel 151 secured to a counter-shaft 152 carrying a sprocket 153 which is connected by a chain 154 to a second sprocket 155 secured to the shaft 156 which is journaled lengthwise of the frame 136 and carries at its opposite ends a pair of the supporting wheels 137. The electric current for operating the motors 145, 147, may be supplied through two parallel trolley wires one of which is shown at 157, Fig. 1. Either of the two trolley poles 158, 158, each carrying conductors, not shown, serves to connect the trolley wires 157 to the motor circuits in the usual manner.

In the present instance, a transfer device T is installed at one end of the tracks 138, 139, in order that the single screw-conveyer shown may be shifted from one to the other side of the tempering floor. This transfer device may comprise a horizontally disposed rectangular upper frame-work 160 to one end of which is secured a bearing ring 161 surrounding the fixed pivot post 162 and supported by the stepped collar 163 which is bolted to the pivot post 162 at 164. A channel iron 165 extends transversely of and beneath the frame-work 160 at a point remote from the pivot post 162 and is suspended at its opposite ends from a semi-circular I-beam 166 by means of a pair of rods 167 depending from the trolley trucks 168. The I-beam 166 is secured to the under side of a suitably constructed frame-work 169, Figs. 4 and 19.

Depending from the end of the frame 160 adjacent the post 162 is a vertically disposed end frame-work 170 formed with a rail-supporting ledge 171 and carrying at its lower end a guide-ring 172 which surrounds the post 162. Depending from the opposite end of the upper frame-work 160 is an outer end frame-work 174 carrying at its lower edge an inwardly projecting rail-supporting ledge 175. Supported by the ledges 171 and 175 are two short rails 176, 176, which are adapted to register with the track-ways 138, 138 or 139, 139 as shown best in Fig. 18. The screw-conveyer may thus be run onto the transfer device T and radially swung around from one to the other of the adjacent track-ways.

In the operation of the above described system, the mold-conveyer is driven at a uniform slow speed by the sprockets 28, 28. The molds are formed in the various molding machines 33, in the usual manner, and are carried to and carefully deposited upon the trays 14 of the mold-carriers 11. As the molds are usually quite heavy the workmen may frequently find it convenient to steady themselves by leaning against the carriers 11 while placing the molds thereon. If the carriers were free to swing it would be a difficult matter to place a heavy mold thereon without subjecting it to destructive jarring. As the carriers 11 of the present construction are rigidly held in a horizontal plane, while traveling along the horizontal runs, this difficulty is overcome. As is natural, the molds formed at one side of the system are deposited upon the same side of the mold-conveyer.

As the filled trays 14 slowly pass the pouring station F the ladlers, standing upon the moving platform 54, pour the molds from hand ladles which may be refilled with molten metal from the trucks or buggy ladles 67. Since the platforms 54 travel at the same speed as the rigidly supported mold-carriers the positions of the pourers relative to the mold-carriers remain fixed. The molds may therefore be poured with the same ease and precision as when resting

upon the floor. If the carriers were free to swing while passing the pouring station the pouring operation would become extremely difficult and uncertain. Much metal would be spilled as the pourers attempted to direct the streams of molten metal from the ladles into the sprue holes of the swinging molds. With the present arrangement, a pourer, if he so desires, may place one foot upon the tray 14 and steady the heavy ladle by resting the handle thereof upon his knee.

While the poured molds are traveling up the ascending run 2 and along the upper horizontal run 3 the metal cools sufficiently to solidify. When the molds reach the shake-out station G they are removed from the conveyer by workmen stationed at this point and dumped onto the gratings 68 of the shake-out hoppers 69. The sand falls through the gratings leaving the flask parts and castings behind to be replaced upon the conveyer for transit to the lower floor. As is natural, the molds at one side of the conveyer are dumped onto the grating 68 at the same side. There is, therefore, no tendency for the sand used at one side of the system to be diverted to the other side at this point. While the castings and mold accessories, usual in foundry practice, are traveling down the descending run 4 of the mold-conveyer, they form a counterpoise for the like parts traveling up the ascending run at the opposite end of the building. As a result, the driving motor M is drawn upon to supply merely enough power to overcome the friction of the system and elevate the sand in the molds from the lower to the upper floor.

Having thus set forth the nature of the invention, what I claim herein is:—

1. The process of handling molds and their accessories which consists, in placing and pouring the molds on a horizontal run of an endless conveyer, in elevating the poured molds to a higher floor on a vertical upward run of said conveyer, in removing the molds from a second horizontal run, in shaking out said molds, and in lowering the mold accessories and castings on a vertical downward run of said conveyer.

2. The process of handling molds and their accessories which consists, in forming the molds, in placing the molds and their accessories on the lower horizontal run of an endless conveyer disposed in a vertical plane, in pouring the molds while they are moving horizontally, in elevating the poured molds by said conveyer to an upper horizontal run, in removing the poured molds from said conveyer, in shaking out said molds and in retempering the sand and returning it to the molding station.

3. The process of handling molds and their accessories which consists, in forming the molds, in placing the molds and their accessories on the lower horizontal run of an endless conveyer disposed in a vertical plane, in pouring the molds while they are moving horizontally, in elevating the poured molds to an upper horizontal run, in removing the poured molds from said conveyer at the upper horizontal run, in breaking up said molds, and in replacing the mold accessories and castings on the upper horizontal run, whereby they are returned to the lower floor and form a counterpoise to the flasks and castings on the upward run.

4. The process of handling molds and their accessories which consists, in forming the molds, in placing the molds and their accessories on the lower horizontal run of a continuously moving endless conveyer, in pouring the molds while they are moving horizontally, in conveying the poured molds to an upper floor by a vertical upward run of said conveyer, in removing the molds from an upper horizontal run of said conveyer, in shaking out said molds, in replacing the mold accessories and castings on said conveyer, and in conveying said accessories and castings to the lower floor by a vertical downward run of said conveyer, whereby said accessories and castings form a counterpoise to the flasks and castings on the upward run.

5. The continuous foundry process which consists, in forming the molds at a lower molding station, in placing the molds and their accessories on the lower horizontal run of a rectangular, vertically disposed endless conveyer, in pouring the molds while traveling along said lower horizontal run, in removing the poured molds from the upper horizontal run of said conveyer, in breaking up said molds, in replacing the castings and mold accessories upon said conveyer, and in retempering the used sand and returning it to the molding station.

6. The continuous foundry process which consists in forming the molds at a lower station, in pouring the molds, in elevating the poured molds to a shake-out station, in breaking up the molds, in depositing the used sand upon a conveyer, in dislodging the sand from said conveyer and permitting it to fall to a tempering floor in the form of a thin sheet, in wetting different portions of the distributed sand in varying amounts as required by its condition, and in conveying the sand across said floor and into a storage space adjacent the molding station.

7. The continuous foundry process which consists in forming the molds at a lower station, in pouring the molds, in elevating the poured molds to a shake-out station, in breaking up the molds, in riddling the sand and depositing it in a relatively thin sheet upon a belt conveyer, in scraping the sand from the belt and permitting it to fall to a tempering floor in a thin sheet and form a ridge lengthwise of said floor, in wetting

the sand as required by its condition, in allowing the sand to rest, exhale, cool and absorb the supplied moisture, and in conveying the sand across said floor and into a storage space adjacent the molding station.

8. The continuous foundry process which consists in forming the molds at opposite sides of the horizontal run of a rectangular endless conveyer disposed in a vertical plane, in placing the molds upon said conveyer, in pouring the molds, in elevating the poured molds to a shake-out station, in breaking up each mold at the respective side of the conveyer upon which said mold was formed, in retempering the used sand and returning it to the molding station at the side of the conveyer from which it originally came.

In testimony whereof, I have singed my name to this specification.

OLIVER L. DOSCH.