May 24, 1966 C. J. GULDE ETAL 3,252,200

BLOCK MAKING APPARATUS

Original Filed Feb. 13, 1961 5 Sheets-Sheet 1

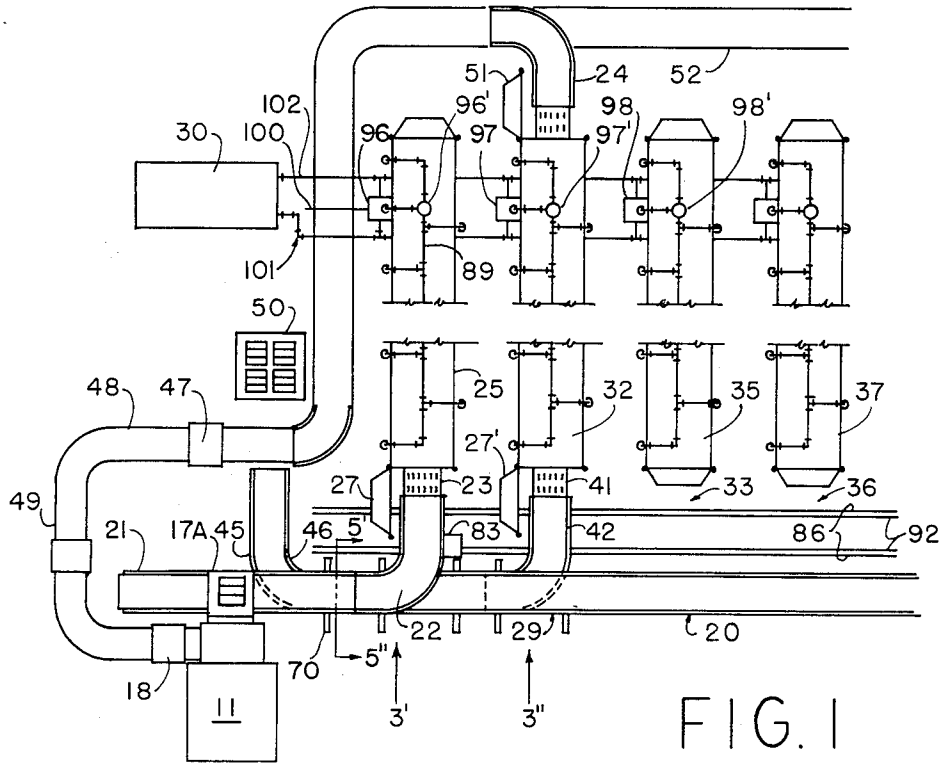


FIG. 1

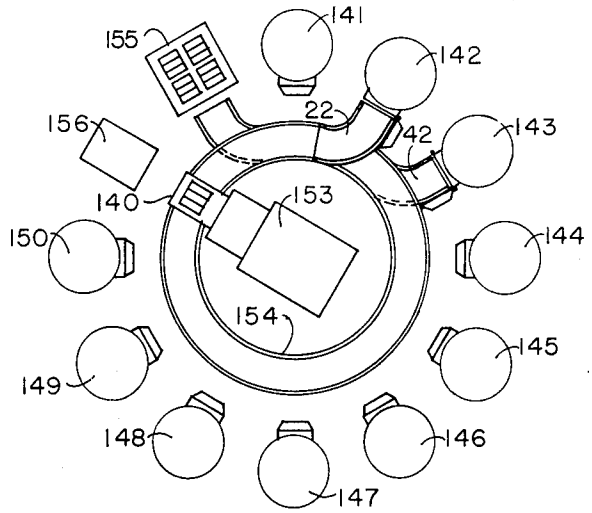


FIG. 2

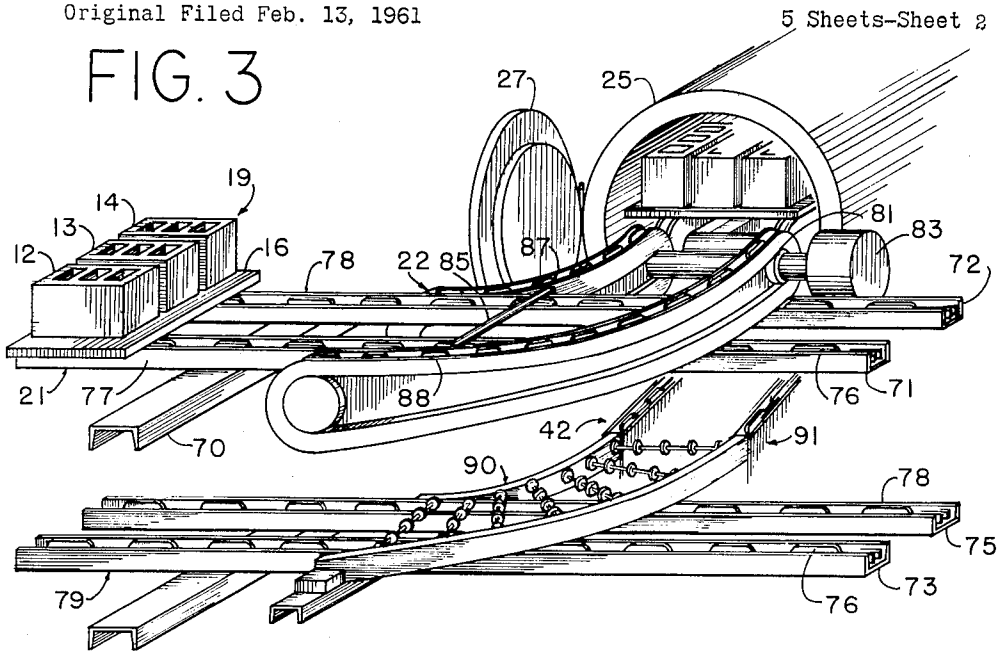
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BLOCK MAKING APPARATUS

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FIG. 3



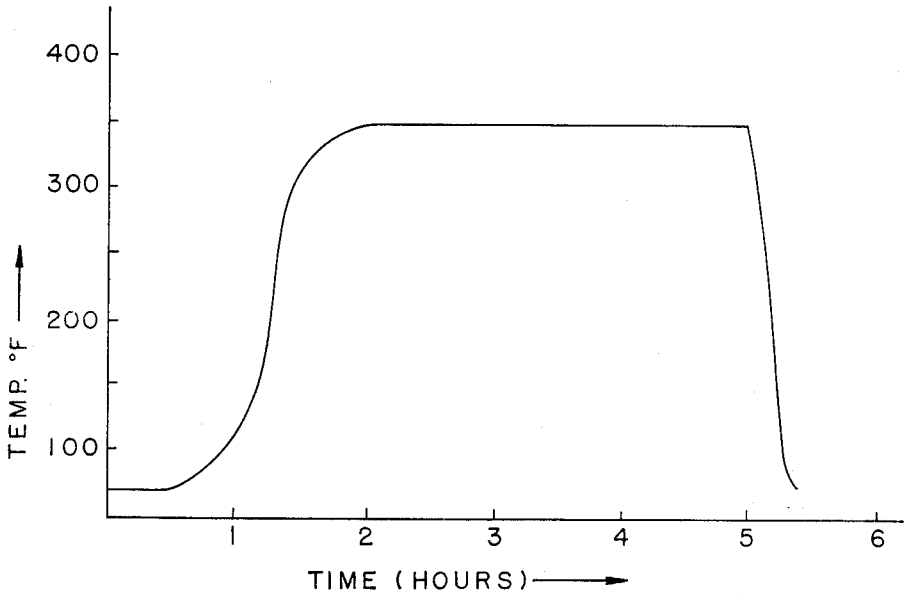


FIG. 4

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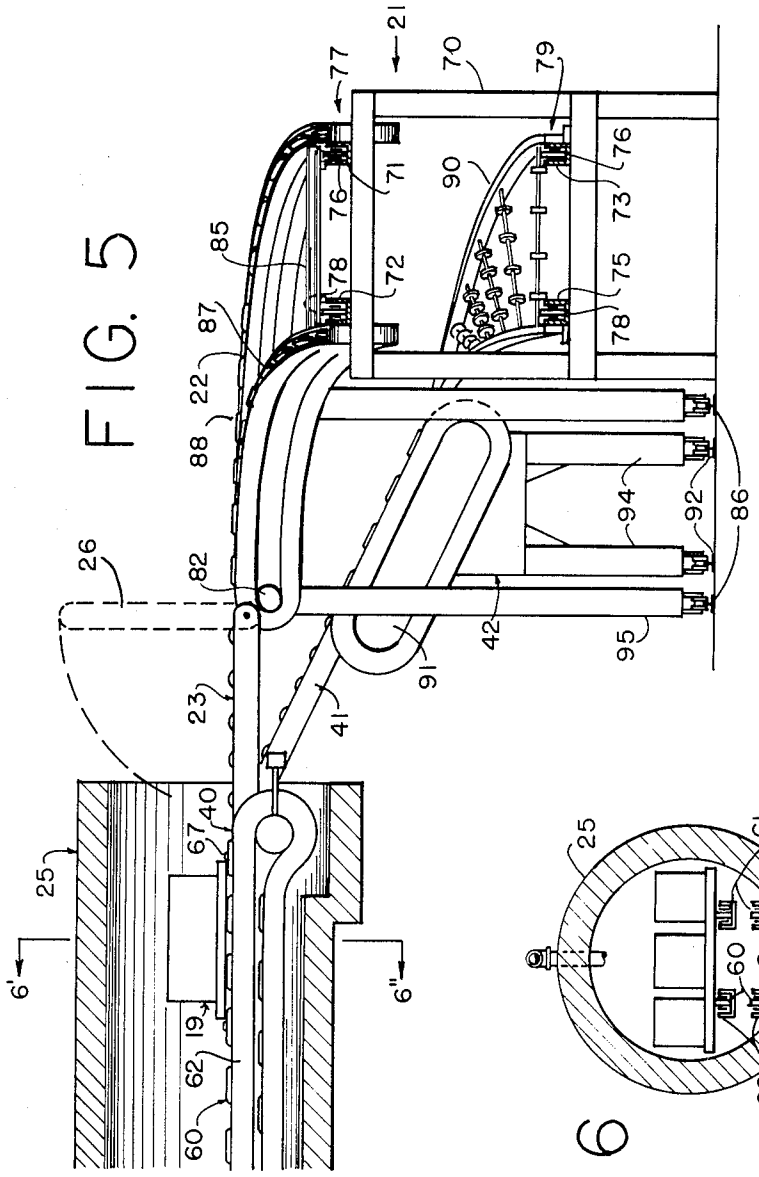


FIG. 5

FIG. 6

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BLOCK MAKING APPARATUS

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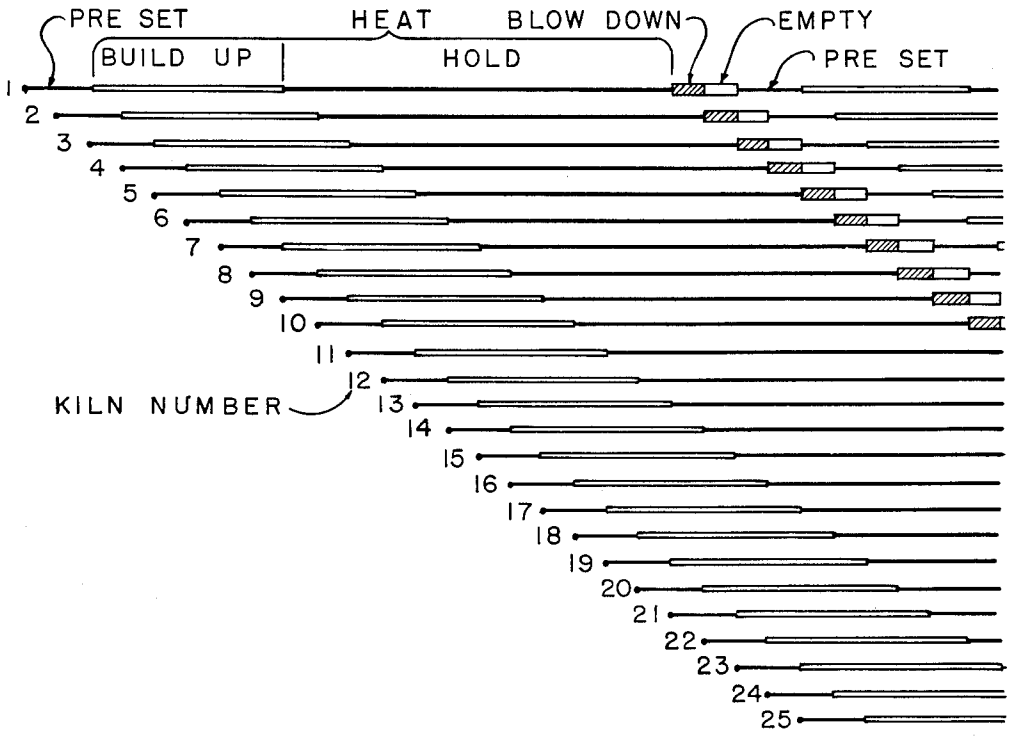
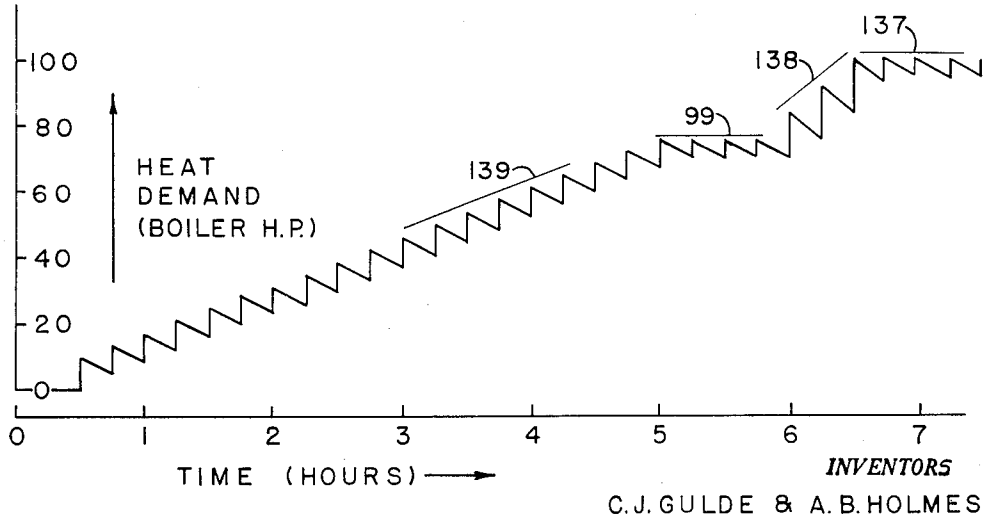


FIG. 7



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FIG. 9

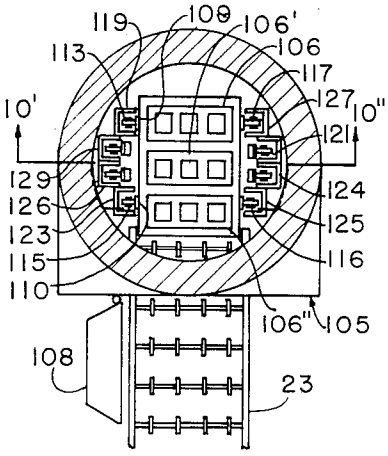
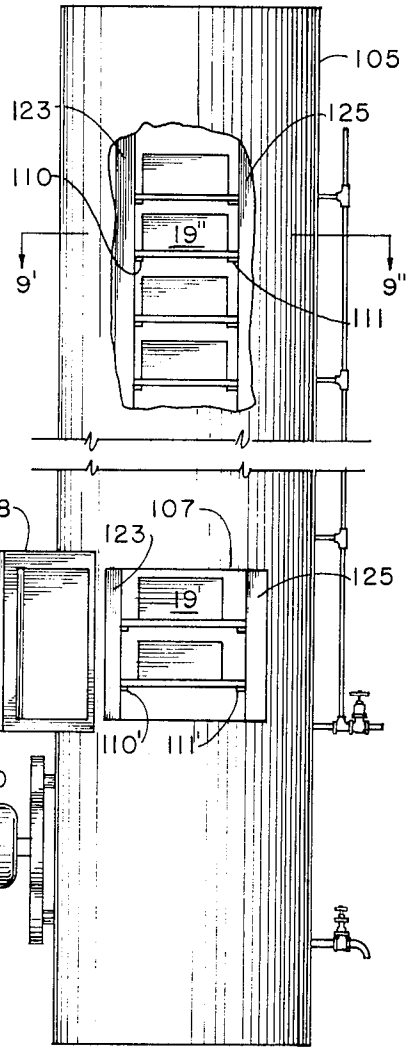


FIG. 8



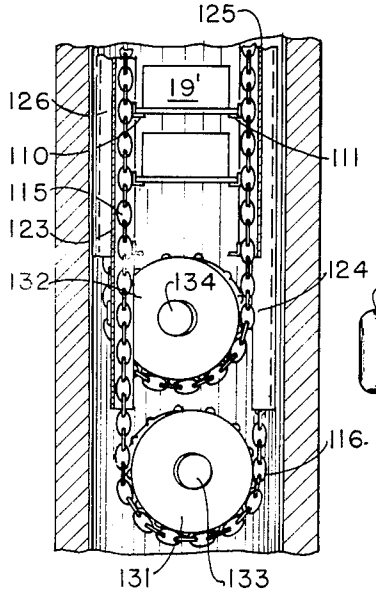


FIG. 10

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United States Patent Office

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3,252,200

BLOCK MAKING APPARATUS

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Original application Feb. 13, 1961, Ser. No. 88,701. Divided and this application Sept. 16, 1964, Ser. No. 396,987

5 Claims. (Cl. 25—142)

This is a divisional application of our co-pending U.S. patent application Serial No. 88,701, filed February 13, 1961, now abandoned. This invention relates to the art of making concrete blocks. More particularly, this invention relates to an improved apparatus for handling "green" blocks produced by conventional block making machines.

The current art of making concrete blocks is described generally in U.S. Patents 2,106,329; 2,275,676; 2,366,780; and 2,353,492. Such vibration machines, on the average, provide some 3,000 vibrations per minute, each vibration having an amplitude of about 1/16 of an inch: such machines produce three blocks at a time, each such block usually having dimensions of about 7⅝" x 7⅝" at 15⅝". These machines produce about 1,000 "green" blocks per hour in the large sizes, 500 to 800 blocks per hour on medium size machines, and 200 to 500 on the smaller machines.

Conventionally, the production of such molding machines is "cured" at 180° F. for a substantial time, usually 24 hours, before transport to a high-pressure kiln 6 to 10 feet in diameter. Following charging of the entire kiln with the blocks as produced, which charging takes from one to four hours depending on the size of the kiln, the temperature in the kiln is slowly raised in a "preset" period of one to two hours from 50° to 150° F. This is followed by a temperature "build up" period of 1½ to 4 hours, wherein the temperature is raised from about 70° F. to about 370° F. This, in turn, is followed by a "holding" period of 4 to 7 hours at about 370° F. Thereupon, the kiln is unloaded; this unloading requires from ¼ to one hour. Thus, there is a total of between 8 to 18½ hours required for the curing. This period is usually arranged to approximate 16 hours so as to be accomplished within two standard eight-hour shifts. Such an arrangement provides a large drain on the boiler or other mechanism used to heat the blocks. Additionally, a large capacity heater is required and the control of the treatment leaves much to be desired, as the capacity of the heating mechanism is, for economic reasons, kept at the minimum requisite for the heat demand thereon. Further still, this conventional treatment requires that all the blocks receive the same treatment, regardless of their shape and composition. There is also a long "hold up" time in the curing system; this allows only a limited use of the 24 hour capacity of the block making machine associated in combination with this curing system.

It is, accordingly one object of this invention to provide a process that requires less heating capacity for a given output of finished blocks than has heretofore been available.

Another object of this invention is to provide a process that requires less curing time for a given block making capacity in a plant.

It is a further object of this invention to provide a process freer of heat demand surges than has been heretofore available.

Yet another object of this invention is to provide an improved, substantially continuous process of block making whereby many small heat capacity kiln units may be operated with a substantially uniform overall heat demand to provide an economical, as well as rapid and controllable, method of curing blocks.

For economy of operation of block molding machines used in a competitive commercial manner, it is desirable to release the molds as early as possible, i.e., as soon as the produce will stand handling without undue breakage, to realize the full mechanical capacity of the automatic molding machines above-mentioned.

Conventional methods of filling these molds for the above-mentioned types of machine are known and do not form a part of this invention per se. In the process of this invention, mixes of about 200 parts by weight of cement (type 1 of ASTM, C–150), 100 parts by weight of silicon flour and 2,300 parts by weight of sand and 2,300 parts by weight of coarse aggregate are used.

By sand is meant material of the following grading:

Passing mesh screen:

No.—	
3	20–100
10	55–80
20	30–55
30	25–35
40	15–25
80	5–10
200	0–3

By coarse aggregate is meant material of the following grading:

Passing:

1"	90–100
¾"	75–90
½"	25–40
¼"	0–5

The optimum water content is chosen empirically to provide a mixture of such plastic consistency that the product of the molding machine does not slump out of shape when removed from the mold. Such amount of water in the composition above-described is about 25 parts by weight. The material fed to the mold in the preferred embodiment of this invention has such consistency that when the mixture is firmly pressed in the hand, and the hand then opened, the mass will hold together for a few seconds.

According to this invention, advantage is taken of the fact that in jarring machines, the concrete cannot contain enough water to produce the strongest final product, for, if sufficient water is added to the molding machine mix to produce a mixture with the optimum proportion of water for the final product, in view of the cement content of the composition, the product of the molding machine would slump out of shape when removed from the mold. Concrete that is placed in situ requires a greater degree of workability in order to permit satisfactory consolidation than is required in concrete block mixes where heavy vibration and pressure given by the block machine produces the desired compaction.

For further understanding of this invention and of the objects and advantages thereof, reference will be had to the following description and accompanying drawings of the preferred embodiment of this invention.

FIGURE 1 is a diagrammatic generalized plan view of an equipment arrangement in a block-making plant operated according to the process of this invention;

FIGURE 2 is a plan view of another system using the process of this invention;

FIGURE 3 is an enlarged composite diagrammatic view of the transfer feed and discharge mechanism for the kilns, the top half of this figure is taken along arrow 3' of FIGURE 1, the bottom half is taken along arrow 3" of FIGURE 1, to show the relative locations of the components thereof;

FIGURE 4 illustrates the time-temperature relations in one of the kilns according to one embodiment of the process of this invention;

FIGURE 5 is an enlarged longitudinal sectional view along line 5'–5" of FIGURE 1 showing the transfer feed and discharge mechanism and support therefor;

FIGURE 6 is a transverse sectional view along the line 6'–6" of FIGURE 5;

FIGURE 7 illustrates the time sequence of heat application and heat demand in a system as in FIGURE 1;

FIGURE 8 illustrates an overall view, partly broken away of an alternative embodiment of kiln within the scope of this invention;

FIGURE 9 is an enlarged cross-section view along section 9'–9" of FIGURE 8; and

FIGURE 10 is a lower longitudinal view, partly in section and partly broken away and partly along section shown by 10'–10" of FIGURE 9.

Generally, this invention comprises a process of making and curing concrete blocks and apparatus therefor. This provides excellent control as well as economy in the phase of bringing the green concrete blocks up to what is usually referred to as their holding temperature; this control provides for great uniformity in treatment and in quality of product.

More specifically, according to the process of this invention green concrete blocks are consecutively loaded into each of a series of kilns, A similar program of loading, curing and unloading is applied to each kiln in the series so that while one portion of the output of the process is being treated at one stage of the process in one of the kilns, other portions of the output are simultaneously in other stages of the process.

According to one embodiment of this invention, a conventional block making machine **11**, described generally in U.S. Patent 2,366,780 and repetitively producing three "green" blocks, as **12**, **13**, and **14**, at a time in a 20 second cycle, is used. This machine places such blocks on a steel pallet, **16** (½ x 26" x 18½" in size). A fresh pallet, as **17**–A, is moved into position to receive the blocks during the interval between discharge of the blocks from the machine. Each thus loaded pallet, as **19**, passes from the machine on conveyor distribution system indicated generally as **20**.

These loaded pallets are passed along a straight chain link power conveyor distribution trunk **21**. Therefrom, a mobile entrance power transfer feed mechanism, **22**, passes the loaded pallets over a removable bridge portion, **23**, thereof into a first kiln **25**. This kiln is one of a series of many similar kilns, below described.

On completion of the charging of that one kiln, **25**, the bridge portion **23** is moved to the position, **26**, shown in dotted lines in FIGURE 3, and the entrance kiln door **27** is closed while the power transfer feed mechanism, **22**, is moved to and temporarily fixed at position **29**. Thereupon the palleted blocks from the block machine are conveyed to the feed transfer mechanism **22** at position **29**, and therefrom, over bridge portion **23** into the next kiln **32**. The transfer mechanism **22** similarly subsequently passes to position **33** to charge third kiln **35** over its bridge portion **23**, then moves to position **36** to charge fourth kiln **37**, and so forth. On each kiln, as **25**, the kiln conveyor mechanism **40**, and discharge conveyor, **42**, discharge the contents of each kiln from the same end of the kiln as that at which it is fed, i.e., at the inlet end, prior to charging of each such kiln, as above described.

For such discharge, the kiln inlet door, **27**, is opened after the mobile chain drive discharge conveyor, **42**, is moved into position to receive the pallets loaded with cured blocks. Such pallets and blocks are moved by the kiln chain drive conveyor mechanism **40** to the discharge bridge conveyor **41**, which belt bridge is hingedly attached to the mobile unit **42** and the top of which bridge unit is co-planar with the top surface of the body of conveyor **42** and with the top level of the kiln conveyor, as **40** and **40'**, in the kilns, as **25** and **32**, respectively.

These loaded pallets of cured blocks are then transported on the lower discharge portion, **79**, of the chain drive conveyor **21** to a stripper station **45** whereat fingers **46** remove the pallets with cured blocks. Empty pallets, as **47** and **47'**, are returned via roller conveyors **48** and **49** to the point **18** from which fresh pallets are fed to the molding machine, **11**, and finished blocks are sent to storage **50** from station **45**.

In another embodiment of apparatus according to this invention, each kiln, as **25**, is provided for discharge with a discharge device **24** similar in structure to transfer mechanism **22**, such mechanism **22** being then run backwards to serve as a discharging device, **24**; such device is then used at a kiln exit door **51**, located at the discharge end of the kiln, distant from the entrance door **27'**, and feeds the products of each kiln to a separate collector conveyor **52** identical in construction to the top portion of conveyor **21** above described, and said conveyor **52** moves from one kiln to the next as above described for conveyors **22** and **42**.

The main distribution conveyor, **21**, comprises a frame, **70**, supporting an upper set of channels, **71** and **72**, and a lower set of channels **73** and **75**. These channels support the link belt chains **76** and **78** that provide locomotion for the pallets. The upper level **77** provides for feed to the kilns from the block making machine. The lower discharge level **79** transports the pallets loaded with with the cured blocks in the opposite direction. A conventional sprocket drive is provided at the end of the frame **70** for chains **76** and **78**, which are continuous chains.

The power feed transfer conveyor, **22**, is mobily supported on a pair of rails, **86**, between conveyor, **21**, and the line of kilns. These rails run for the length of the area covered by the kilns and a little bit further to provide for the repair, dismantling, etc. therefor. The load of the transfer mechanism is also borne in part, as at **85**, by the frame **70**. The sprockets **81'** and **82'** driving the chains, **87** and **88**, of the conveyor, **22**, are driven by an electrical motor **83** attached to and movable with the conveyor **22**.

Sprockets **81'** and **82'** of conveyor **22** are of unequal diameter so that notwithstanding that both sprockets are attached to the same drive shaft and inner chain **87** moves more slowly than outer chain **88**, these chains cooperate to maintain the orientation of the axis of the pallets thereon near conveyor **77** asymptotic with the direction of the flow along conveyor **77** and so avoid sudden movement of these blocks in the green condition, and so deliver said blocks smoothly to the kiln. Chains **81** and **82** are continuous.

The terminal section **90** of the discharge conveyor **42** is rotatably and detachably attached to the main portion thereof **91**; it provides a passage of the pallets with cured blocks asymptotic to conveyor **79** and so provides a smooth gravity transfer of the load of cured blocks from discharge conveyor **42** to lower level **79** of conveyor **21**. Such discharge conveyor is mobile; it runs on its own pair of rails **92**; the body **93** of this conveyor is also rotatable about a vertical axis on a horizontal plane on its support **94** so that the discharge conveyor **42** may pass below the support **95** of the feed conveyor **22** as well as to facilitate the positioning of the terminal section of the discharge conveyor **42** asymptotic to the line of conveyor **79** between the vertical members of the frame, **70**.

Each kiln as **25**, **32**, **37**, etc. has a 130 foot length and a 30 inch internal diameter. A pair of endless drive chains, **60** and **61**, are provided in each kiln. Each such chain operates in a channel therefor, **62** and **63**, respectively. The channels are removably supported in the kiln by a frame, **65**, therefor. The chains are driven by sprocket drive, as **66**, at the end of such kiln. The chain links are provided with lugs **67**, spaced 19 inches apart which positively guide the loaded pallets as **19'** through the kiln and position the pallets positively therein. Antifriction bearings **69**, assist in supporting the weight of the pallets. The kiln is thus arranged to receive 15 minutes of the output of the block machine **11**, when such

machine operates at the rate of 540 blocks per hour. The apparatus thus provides for the loading of the entire series of kilns to approach a continuous process by use of a series of continual 15-minute loading increments.

Following the completion of the loading of any one kiln, the bridge **23** is withdrawn from the entrance to the kiln, the entrance door **27** is closed, and the curing cycle below described is applied to the contents of the kiln.

After the blocks are placed in the kiln as above described, heat is applied to such blocks by use of steam, controlled by conventional plumbing. Using, first, a preset time of only ½ hour and venting to remove air, followed by a build-up time of 1½ hours with 150 p.s.i.g. saturated steam and, thereafter, a holding time of 3 hours at 365° F., for a total cycle time of 5¼ hours and a formula of 200 pounds cement (ASTM type 1), 100 pounds silica, 2,300 pounds sand, 2,300 pounds of rock, and 33 gallons water, concrete block of 1415 p.s.i. strength (ASTM Test No. C 90–52) result from the process as above described.

FIGURE 7 illustrates the relations of the several steps in the cycle for one kiln and the relation of the corresponding and similar steps in the other kilns when, e.g., 22 kilns are used in the process above described. As shown in the lower part of FIGURE 7, it will be noted there is a relatively gradual increase in the heat demand until a stable level is reached (as shown by plateau **99**) at which time when one kiln operation is closed, another kiln is brought into operation. A relatively steady state is then obtained with the blocks being discharged from the kilns and being fed to other kilns at a constant rate over any 15 minute period. Using this procedure, a boiler, as **30** in FIGURE 1, of only 75 boiler horse power is required while conventional processes using conventional equipment require a boiler with a rating of 225 boiler horse power to effect the production accomplished by the process above described.

The several kilns as **25**, **32**, **35**, **37**, etc. are operated in a sequence as above described by standard programmers or automatic instruments such as **96**, **97**, and **98** for each of kilns **25**, **32**, and **35**, respectively, in FIGURE 1 and, also, one for each of the other kilns, as **37**. The programmers control valves as **96'**, **97'**, and **98'**, respectively, for kilns **25**, **32**, and **35** for the headers for each of these kilns, as **89** in kiln **25**; such valves control the passage of air, low pressure steam, high pressure steam, and for venting via appropriate piping therefor, as pipes **100**, **101**, **102**, and **103**, respectively. The feature of using only a single rack of "green" concrete blocks to be cured in each kiln permits a very close control and treatment of all the contents of each kiln. Thus, FIGURE 7 illustrates the time sequence of heat application and overall heat demand in a system as above described for FIGURE 1 using, for each kiln in the series, a program of, first, one-half hour preset, then ½ hour of one p.s.i.g. saturated steam, followed by 1¼ hour build-up to 365° F., and then a 3-hour holding period followed by a blow down of ¼ hour (for a total cycle time of 5½ hours) with the above-mentioned concrete mix for a concrete block, and produces blocks testing at 1425 to 1450 p.s.i. (tested as above noted). The illustrated method of passing steam from the header to the kilns (illustrated in the drawings) wherein relatively even distribution of the heating medium is obtained by spacing the inlet valves at six feet longitudinal intervals along the lengths of the kiln (6 feet longitudinal distance between valves), with alternative valves entering into the interior of the kiln at the top and at the bottom of the kiln as shown in FIGURE 6, is a preferred embodiment of this invention but the invention is not limited thereto.

It will thus be seen that, according to this invention, there is provided a flow pattern utilizing a plurality of small volume kilns, and that the flow of the material through these kilns is such that while one portion of the plant output is being treated at one stage of the process in one of the kilns other portions of the output are simultaneously in other stages of process. This treatment thus allows continuous plant operations at substantially steady heat demand for any number of hours of 6 to 24 hours per day as above shown. The material arrangement also permits gravity flow of the major portion of the feed along the conveyor distribution system with positively driven conveyors **21**, **22**, **40**, **42**, **48** (and **52** if present) providing for direct control of the position of the blocks being treated. Only a minor portion of the blocks are lifted up and down at any one instant. This material flow arrangement allows delicate control treatment of any particular batch as well as variation in treatment of each of the rather small increments of capacity provided for by the apparatus of this invention. By the use of this apparatus the capital cost on the boiler, insulation on transmission line, etc., also, is dramatically reduced. Additionally, there is a much more efficient use of the plant operation time and labor.

In an alternative form of this invention, a vertical kiln as **105** in FIGURE 8 may be used in place of horizontal kilns such as **25**, etc. in the arrangement of FIGURES 1 and 2. Such vertical kilns are fed as above-described for the horizontal kilns. In the vertical kiln the interior volume is more efficiently used than in the arrangement shown in FIGURES 3, 5, and 6 because of the denser spacing of the blocks permissible by the vertical arrangement. In this vertical kiln arrangement the feed and discharge devices used would be those shown in FIGURES 1, 3, and 5. The loaded pallets, as **19'**, carrying blocks as **106**, **106'** and **106''**, passing into entrance **107** past the open kiln door **108** are supported on lateral lugs as **109**, **110**, **111**, and **112** and are lifted thereby. These lugs are supported by chains as **113**, **115**, **116**, and **117**, respectively. Chain **113** is located in a relatively centrally located channel **119** on its upward travel and in an opposite peripheral channel **121** when traveling downward; chain **115** is also located in a relatively central channel **123** while traveling upward and in a peripheral channel **124** when traveling downward; chain **116** is similarly located in channel **125** when traveling upwards and in channel **126** when traveling downward; chain **117** is similarly in channel **127** when traveling upward and in channel **129** when traveling downward. This arrangement provides that the lugs will be urged by their channels to be close to the pallets supported thereby during the upward travel of the chain, while the lugs are peripherally located and do not contact or interfere with downward motion of the pallets. A motor **130** serves to drive sprocket wheels as **131** and **132** through their shafts **133** and **134**, respectively. Piping, valves, headers, inlets, control and programming are the same as above described for the embodiment of FIGURES 1–4. Internal diameter is 34 inches; overall height is 75 feet for such kilns.

The temperature and pressure as above described (150 p.s.i.g., 365° F.) are illustrative of this invention rather than limiting. The invention encompasses the use of pressures up to 300 p.s.i.g., which pressure result in a reduction, to of about ½, of the time of cure above-disclosed for satisfactory (over 1,000 p.s.i. tests) results. A saturated steam pressure of about 225 p.s.i.g (temperature of present economic factors considered.) It is, thus, clearly within the scope of this invention to operate on a 4-hour cycle as well as on the 5-hour cycle of FIGURE 7 above discussed as an illustrative example. Further, the particular time sequence above disclosed is one chosen to match the particular output of the above described molding machine (**11**); when higher output molding machines are used more kilns of the given size or same number of kilns of a larger size are used. However, when more kilns are used or available so that more than one kiln is turned on in any 15 minute period—or other time increment between when cycles for successive kilns in a series begins—the use of such additional kilns, as 23 to 25 shown in FIGURE 7, according to the process of this invention only results—for a cycle period as shown in

FIGURE 7—in a somewhat higher plateau (137) than at 99 (when one kiln turns on as another turns off) following a gradual increase in the heat demand/time slope indicated by 138 in FIGURE 7. The heat demand/time slope 138 is steeper than corresponding slope 139 because of the greater rate of additional heat demand put on the system; this still is, overall, only a gradual rather than a sudden rate of increase. The size of the kilns may also be increased in pursuance of the above described practice. However, as shown in FIGURE 7, the process of this invention permits a gradual increase in block curing capacity with the same degree of control over each phase of the heating cycle for each batch treated with only a corresponding gradual increase in heat capacity.

In the sequence above described of addition of the heat to the kiln contents the air is first vented prior to the addition of steam. Also, water may be added to the vessel when loading it in order to equalize the initial temperatures for successive cycles in the same kiln. Water may also be added for any period of time at which the high pressure steam is turned on in order to provide a uniform, saturated, atmosphere for similar repetitive treatment of all material in the same kiln.

Another arrangement embodying the process of this invention is illustrated in FIGURE 2. In this embodiment several kilns, as 141–150, of either the vertical type of FIGURE 8 or the horizontal type of FIGURE 1 are arranged to surround a centrally located block machine, 153; a conveyor 154 has a two-level structure as in conveyor 21 but is arranged in circular continuous form. The feed and discharge conveyors 22 and 42 above-described would be used in this arrangement as above described for the arrangement of FIGURE 1. Cured blocks would be discharged to storage at 155 and pallets as 140 gathered at 156 for continual feeding to the block making machine 153 in the same manner as above described for machine 11.

The time/heat demands requirements would generally be the same as in FIGURE 7 for the arrangement of FIGURE 1 as the only difference between the arrangement of FIGURE 1 (using the kiln of FIGURE 8) and FIGURE 2 using the same type size and capacity of kiln is that the kiln feed distribution trunk 21 in FIGURE 1 is rectilinear, while that of FIGURE 2, item 154, is a closed loop. The number of kilns 141–150 about the loop conveyor 154 may be increased as desired, as may those about conveyor 21, in order to provide the relatively steady heat demand—as at plateau 99 or 137 of FIGURE 7—during that steady state and relatively gradual increase of heat demand—as at slope 139—during the initial period of the process for the series of kilns so used.

Through we have shown and described certain embodiments of our invention, we do not wish to be limited thereto, but desire to include in the scope of our invention the constructions, combinations and arrangements substantially as set forth in the appended claims.

We claim:

1. Apparatus for making concrete blocks comprising a block making machine producing a plurality of green concrete blocks per cycle thereof, and placing said blocks on a pallet,

a plurality of concrete curing kilns, each having a capacity for curing only a fraction of the total output of said block making machine for the period of time required for the curing of blocks produced by said block making machine, each of said kilns comprising a kiln chamber within which is a conveyor extending the length of said chamber, a series of similar pallets supported on said conveyor, and space between each said pallet and roof of said kiln chamber, said space being adequate to accommodate only one layer of blocks on each said pallet on said conveyor within said kiln, drive means for said conveyor means operatively connected thereto,

a conveyor distribution system located between said block making machine and said kilns, said distribution conveyor system comprising a main distribution conveyor line subassembly between the block making machine and the kilns operable to transfer blocks from the block making machine to the kilns and from the kilns to a storage station, the main distribution line comprising a feed distribution conveyor on one tier and a support frame therefor and a discharge distribution conveyor on a second tier and a support frame therefor, a mobile charge conveyor between the feed distribution conveyor and the kilns connecting that conveyor with any of the kilns and operable to charge the kilns, a mobile discharge conveyor between the discharge distribution conveyor and the kilns connecting the discharge distribution conveyor with any of the kilns and operable to discharge the kilns, said mobile charge and discharge conveyors being movable parallel to the length of said feed distribution conveyor and discharge distribution conveyors, respectively, said feed distributor conveyor being in part located adjacent to said block machine and adapted to operate continuously to receive the output of said block making machine, said feed distribution conveyor and discharge distribution conveyor being free of intersection therebetween,

means for automatically applying to each of the kilns a separate program of heating, curing and discharging of the contents of each of the said kilns and each of said kilns being operatively connected to said means for automatically and consecutively applying to each of said kilns a separate program of heating, curing and discharge of the contents of each of said kilns,

said mobile charge conveyor having an inlet portion extending over one edge of said feed distribution conveyor near to the kiln to the edge of other side thereof and said portion extending in a direction asymptotic to the line of movement of said feed distribution conveyor and opposite to the direction of movement thereof, said inlet portion resting on the frame of said feed distribution conveyor, and having an upper surface which is substantially asymptotic to and intersects the upper surface of said feed distribution conveyor in a line at right angles to the path of movement of said conveyor, and a discharge portion at the level of said conveyor in said kiln, and a smooth curved conveyor means between said inlet and discharge portions, said mobile discharge conveyor has an outlet portion extending over one edge of said discharge distribution conveyor nearest to a kiln to the edge of the other side of that conveyor, said outlet portion extending in a direction asymptotic to the line of movement of said discharge distribution conveyor and in a direction parallel to said direction of movement, said outlet portion having an upper surface which is substantially asymptotic to and intersects the plane of movement along said discharge distribution conveyor in a line at right angle to the path of movement of said conveyor, and an inlet portion of said discharge conveyor extending to the top surface of the conveyor in said kiln, and a smoothly curved conveyor means extends between and operatively connects said inlet portion of said mobile discharge conveyor and said outlet portion of said mobile discharge conveyor.

2. Apparatus as in claim 1 wherein said feed distribution conveyor is above said discharge distribution conveyor.

3. Apparatus as in claim 2 the second portion of the mobile charge conveyor comprises a powered conveying means.

4. An apparatus as in claim 1 wherein said mobile discharge conveyor comprises a body portion and a bridge portion, said body portion being located in part between said main distribution conveyor and said kilns, a first por-

tion of said body portion straddling the moving conveying element of said main distribution line, and extending only a part of the distance between said discharge distribution conveyor and said kiln, said bridge portion hingedly attached to an end of said body portion opposite to said first portion and extending from the end of said body portion nearest to the kiln to the top surface of the conveyor for moving pallets in said kiln.

5. An apparatus as in claim 4 wherein said mobile discharge conveyor is composed of a body portion and a bridge portion, said body portion being rotatable about a support therefor located between said kilns and said main conveyor, and having, in its operative position, a portion which extends over the discharge portion of said main conveyor.

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