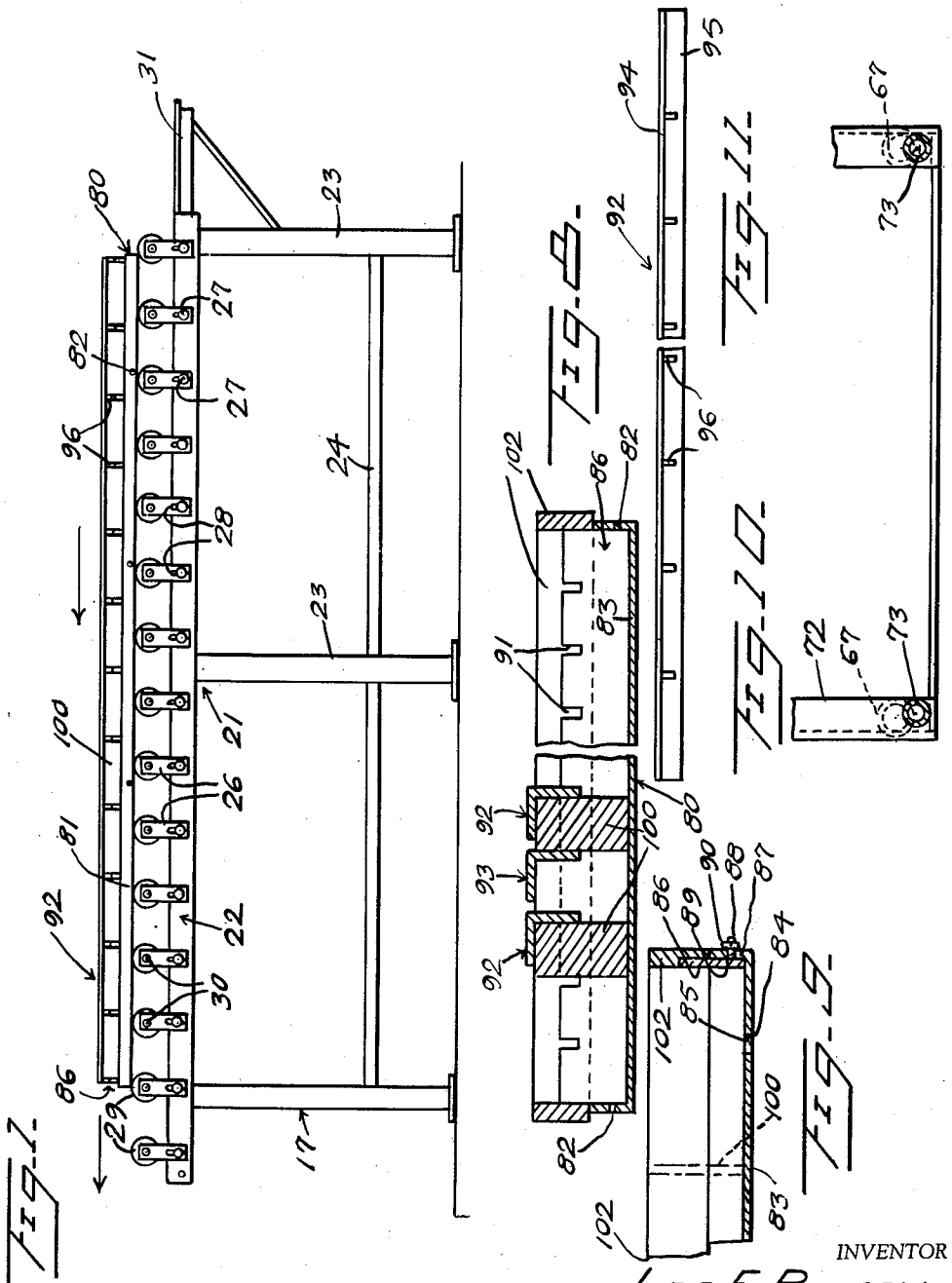
May 8, 1962 L. E. RUSSELL 3,032,850

APPARATUS FOR PREFABRICATING MASONRY WALL SECTIONS

Filed Jan. 6, 1960 5 Sheets-Sheet 1



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APPARATUS FOR PREFABRICATING MASONRY WALL SECTIONS

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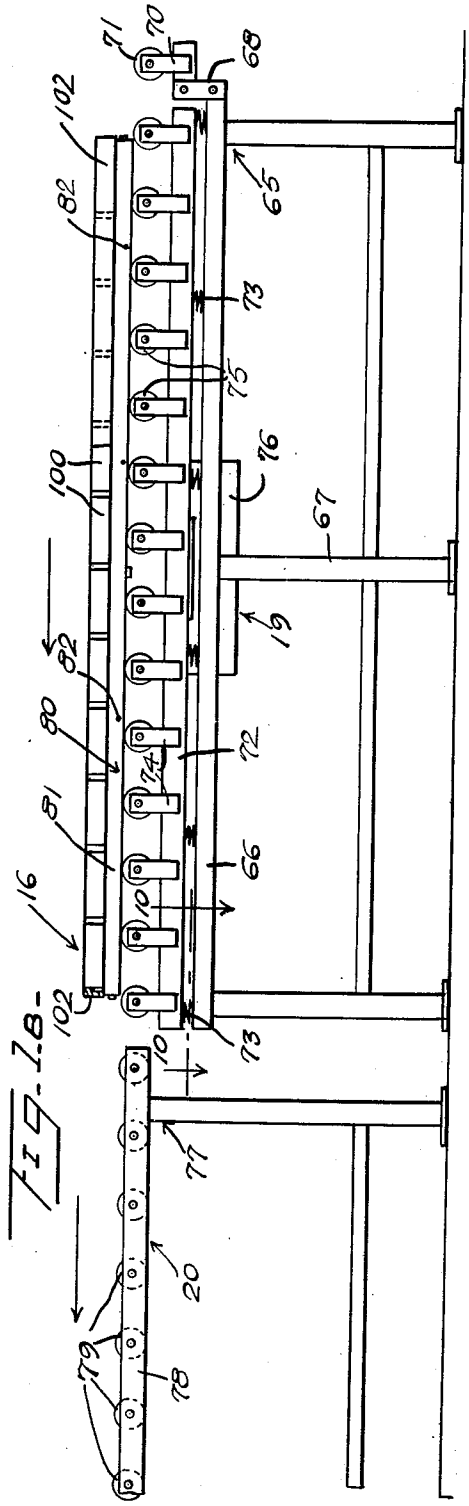


FIG. 1B.

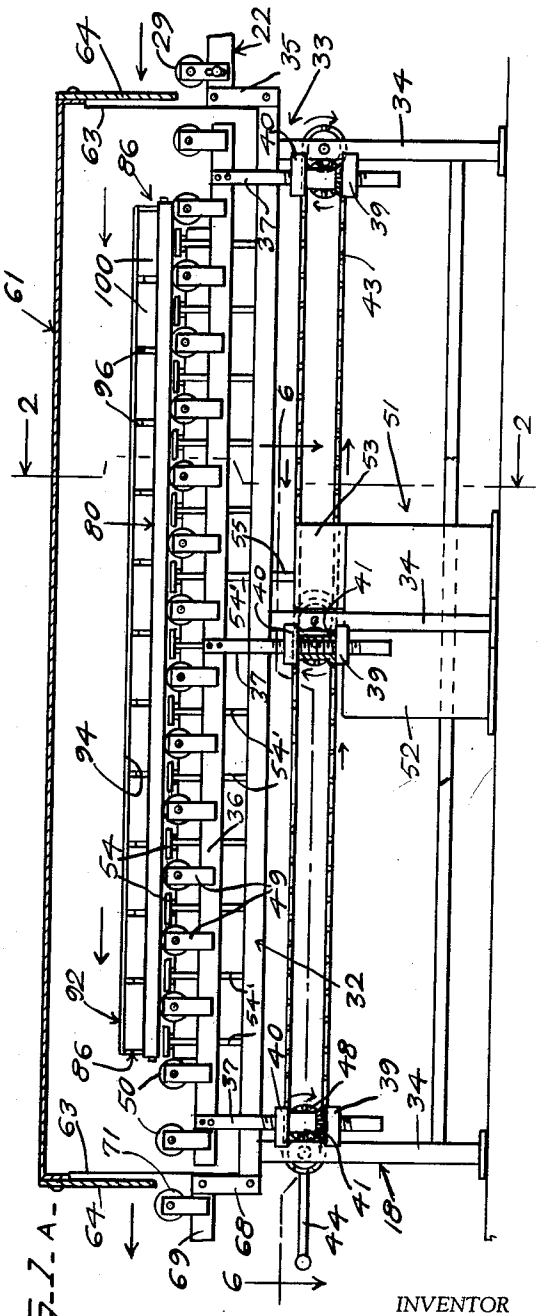


FIG. 1A.

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FIG. 2.

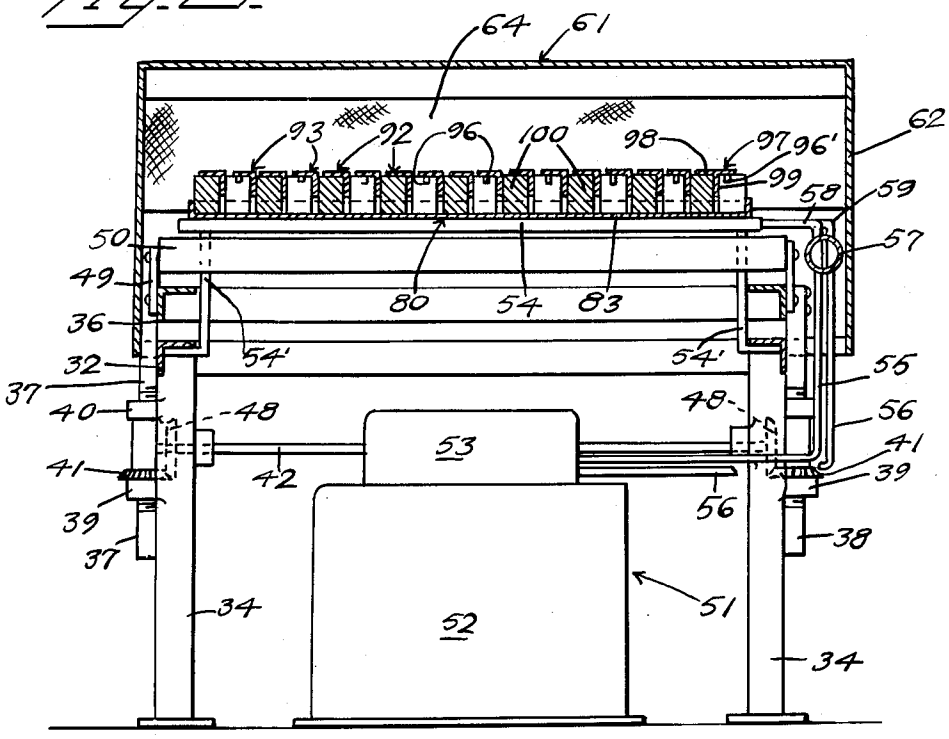
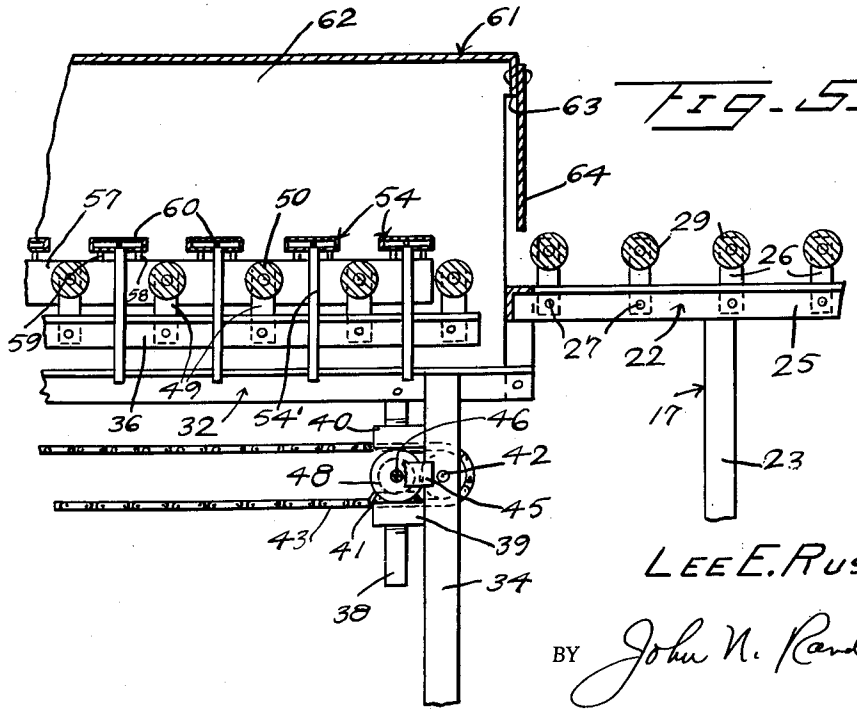


FIG. 5.



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FIG. 3

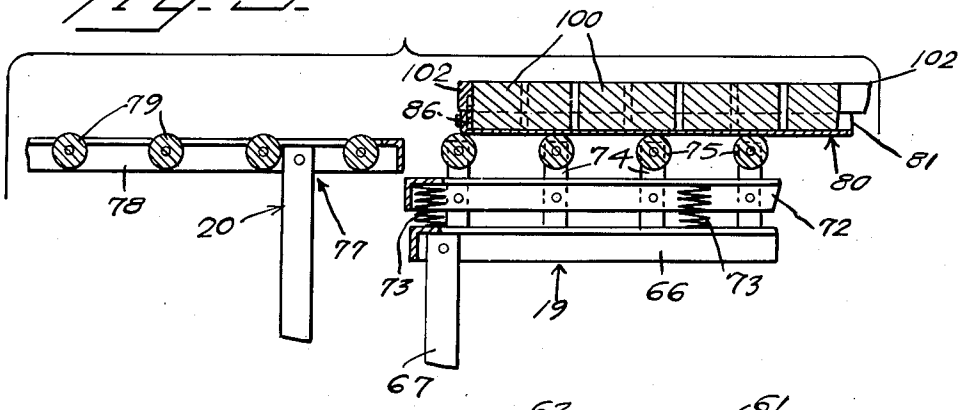
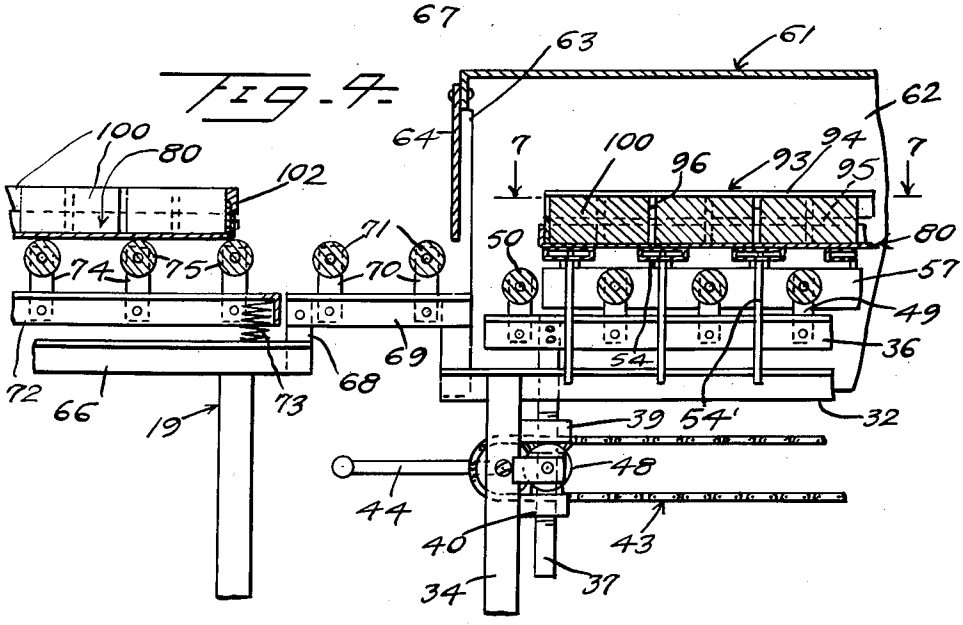


FIG. 4



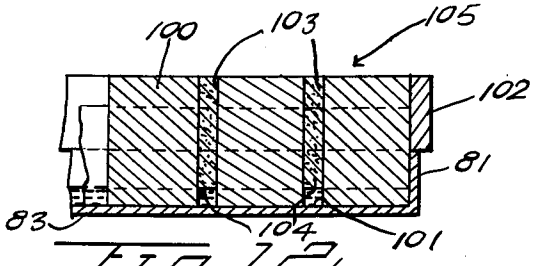


FIG. 12

FIG. 14

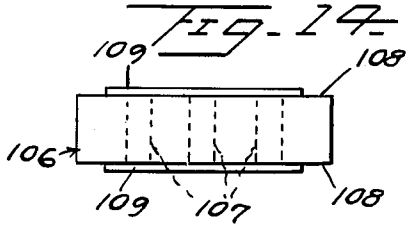
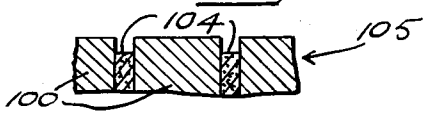


FIG. 13



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Fig. 6.

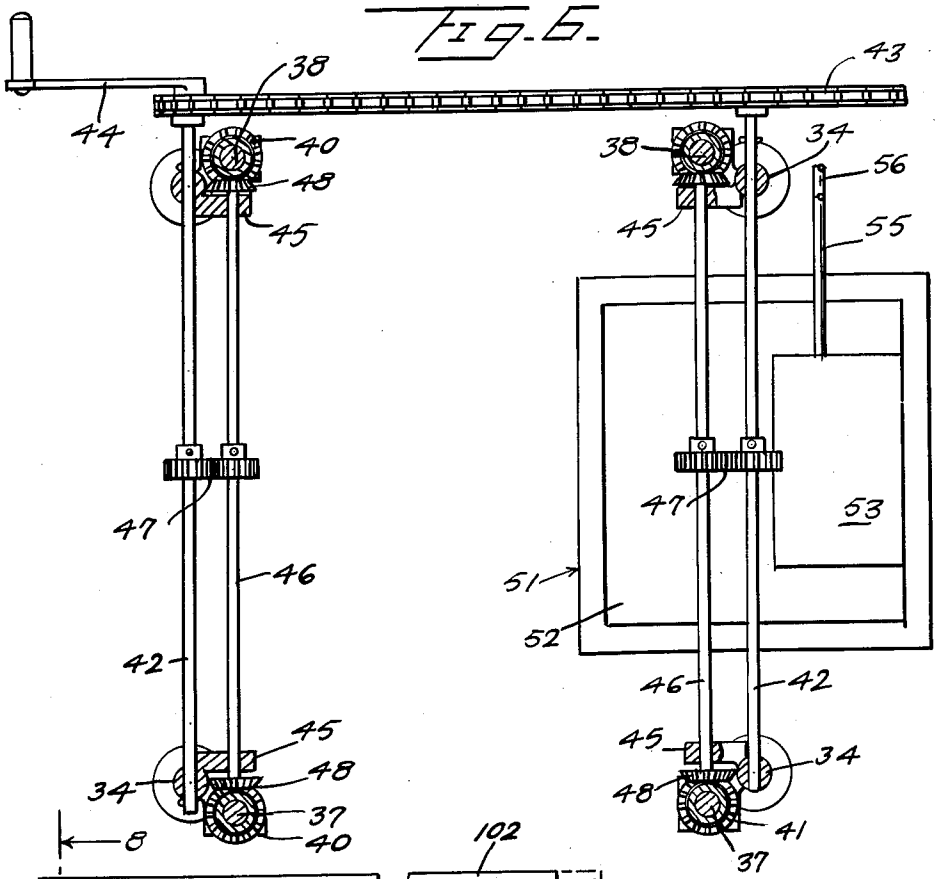


Fig. 7.

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3,032,850

APPARATUS FOR PREFABRICATING MASONRY WALL SECTIONS

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Filed Jan. 6, 1960, Ser. No. 779
4 Claims. (Cl. 25—2)

This invention constitutes a novel apparatus for quickly and accurately prefabricating wall sections and so that a plurality of the wall sections may be quickly assembled to form an exterior or an interior wall or other structure having one or both sides thereof faced.

Another object of the invention is to provide an apparatus which may be utilized and practiced by unskilled or semiskilled laborers without adversely affecting the ultimate product produced.

Another object of the invention is to provide an apparatus for producing prefabricated wall sections of various types of brick, building blocks, stone and other such articles conventionally utilized in masonry construction.

Still a further object of the invention is to provide an apparatus involving successive stations utilized in prefabricating masonry wall sections and which are so constructed and arranged that several wall sections can be prefabricated simultaneously, thereby enabling all of the wall sections required for a particular structure to be quickly and accurately produced.

Still another object of the invention is to provide an apparatus of extremely simple construction which may be readily assembled and which is capable of being partially dismantled, so that the apparatus can be moved to a location where a structure is to be erected for producing the wall sections at the location of the structure, if desired.

Various other objects and advantages of the invention will hereinafter become more fully apparent from the following description of the drawings, illustrating a presently preferred embodiment thereof, and wherein:

FIGURE 1 is a side elevational view of a part of the apparatus, constituting a first or initial station thereof;

FIGURE 1A is a fragmentary side elevational view, partly in longitudinal section, showing a part of the apparatus, constituting a second station thereof;

FIGURE 1B is a fragmentary side elevational view illustrating a portion of the apparatus constituting a third station and a fourth station thereof;

FIGURE 2 is an enlarged cross sectional view taken substantially along the line 2—2 of FIGURE 1A;

FIGURE 3 is an enlarged fragmentary longitudinal sectional view showing portions of adjacent ends of the third and fourth stations;

FIGURE 4 is a similar view illustrating portions of adjacent ends of the second and third stations;

FIGURE 5 is a view similar to FIGURE 3 and 4, illustrating portions of adjacent ends of the first and second stations;

FIGURE 6 is an enlarged fragmentary horizontal sectional view, taken substantially along the line 6—6 of FIGURE 1A;

FIGURE 7 is a fragmentary horizontal sectional view of a pan containing a wall section being prefabricated, and taken substantially along a plane as indicated by the line 7—7 of FIGURE 4;

FIGURE 8 is an enlarged fragmentary cross sectional view, taken substantially along the line 8—8 of FIGURE 7;

FIGURE 9 is an enlarged fragmentary vertical sectional view, taken substantially along the line 9—9 of FIGURE 7;

FIGURE 10 is a fragmentary horizontal sectional view, taken substantially along a plane as indicated by the line 10—10 of FIGURE 1B;

FIGURE 11 is a fragmentary side elevational view of one of the spacer bars;

FIGURE 12 is a fragmentary longitudinal sectional view through an end portion of the pan containing a wall section being fabricated at the third station;

FIGURE 13 is a fragmentary sectional view of a portion of a prefabricated wall section, after removal from the apparatus, and

FIGURE 14 is an edge elevational view of another form of building block capable of being assembled in prefabricated wall sections with the apparatus.

Referring more specifically to the drawings, the apparatus for use in practicing the method of prefabricating masonry wall sections, is designated generally 16 and includes four stations, designated generally 17, 18, 19 and 20.

Station 17, constituting the first station of the apparatus 16, comprises an elongated table, designated generally 21, including an elongated rectangular frame 22 which is supported in substantially a horizontal plane by depending supporting legs 23, which are suitably braced, as seen at 24. The frame 22 includes corresponding transversely spaced parallel sides 25. Short posts or standards 26 extend upwardly from the frame sides 25 in transverse alignment with one another. Each post 26 is adjustably connected to its frame side 25 by a fastening 27 which extends through a longitudinal slot 28 of the post and which threadedly engages in the frame side. The transversely aligned posts 26 of the two frame sides 25 support rollers 29 which have shaft ends 30 projecting from the ends thereof and which are journaled in upper portions of the posts 26 and disposed axially of the rollers. The upper portions of the rollers 29 are disposed above the level of the upper ends of the posts 26, and said posts are individually adjustable vertically by means of the fastenings 27 and slots 28 so that the upper portions of all of the rollers 29 are disposed in the same plane. A shelf 31 is secured to and projects outwardly from one end of the frame 22.

The second station 18 also includes a rectangular elongated frame 32, forming a part of an elongated table 33. The frame 32 is supported by depending supporting legs 34, preferably three along each side thereof. Posts 35 extend upwardly from one end of the frame 32 and are connected to the end of the frame 22, located remote from the shelf 31. The table structure 33 includes an elevatable rectangular frame 36. Threaded rods 37 and 38 are secured to and extend downwardly from the sides of the frame 36 and on the outer sides of the stationary frame 32. The rods 37 and 38 are disposed one adjacent each leg 34. Each leg 34 has two vertically spaced laterally projecting guide members 39 and 40 through which the adjacently disposed threaded rod 37 or 38 slidably extends. The guides 39 also form thrust bearings in each of which is journaled a bevel gear 41. The rods 37 extend threadedly through the bevel gears 41. Shafts 42, as best seen in FIGURE 6, extend through and are journaled in the transversely aligned legs 34. The three shafts 42 are connected together to revolve in unison by a sprocket wheel and chain drive 43. A hand crank 44 can be secured to any one of the shafts 42 for revolving the three shafts in unison. The legs 34 have laterally extending bearings 45. Shafts 46 are journaled in the transversely aligned bearings 45. Each shaft 42 is connected to the shaft 46, located adjacent thereto, by meshing gears 47. Bevel gears 48 are fixed to both ends of each shaft 46 and said bevel gears mesh with the bevel gears 41 located adjacent thereto. The threads of the rods 38 are pitched in the opposite directions to the threads of the rods 37. Accordingly, when the crank 44 is turned all the bevel gears 48 and 41 will be rotated for simultaneously advancing the rods 37 and 38 either upwardly or down-

wardly for raising or lowering the elevatable frame 36 relative to the stationary frame 32. Any other suitable form of hoist means for the elevatable frame 36 could be substituted for the mechanical jack type hoist means which has been illustrated and described, such as a hydraulic or pneumatic hoist of a conventional construction.

Standards 49 are secured to and extend upwardly from the sides of the frame 36. Rollers 50, corresponding to the rollers 29, are supported and journaled by the transversely aligned standards 49, in the same manner as the rollers 29.

The station 18 also includes a conventional refrigeration unit, designated generally 51, including a compressor 52, condenser 53, and a plurality of hollow freeze plates 54. The freeze plates 54 are mounted on supports 54' which extend upwardly from the sides of the stationary frame 32, within the frame 36 and between the rollers 50. The freeze plates 54 extend cross wise of the table structure 33 and are disposed between the rollers 50 and below the level of the top surfaces thereof, when the frame 36 is in a fully elevated position, as seen in FIGURE 1A. The refrigerating unit 51 may include a supply pipe 55 leading from the condenser 53 to one chamber of a divided header 57 and a return pipe 56 leading from the other header chamber back to the condenser 53. A branch pipe 58 and branch pipe 59 may be provided for each freeze plate 54. The branch pipes 58 lead from the header chamber connected with the supply pipe 55 and the branch pipes 59 connect with the header chamber 57 having communication with the return pipe 56. The pipes 58 and 59 of each freeze plate 54 can open into an end of said freeze plate on opposite sides of a longitudinal partition 60, as seen in FIGURE 5, which extends to adjacent the other end of the freeze plate. In this manner a refrigerant can be efficiently supplied to all of the freeze plates 54.

A hood or shield 61 is disposed over and around the elevatable frame 36 and the freeze plates 54 and is supported by the stationary frame 32. One side wall 62 of the hood 61 etxends downwardly on the outer side of the header 57, as best seen in FIGURE 2. The hood 61 has openings 63 in the ends thereof and strips of canvas or other fabric 64 are supported by and depend from the ends of the hood 61 for normally covering the openings 63.

The third station 19 includes an elongated table structure 65, including an elongated rectangular frame 66 supported by depending legs 67. Short posts 68 are fixed to and rise from adjacent ends of the frames 32 and 66, as seen in FIGURES 1A and 1B, and are connected by bars 69 having upstanding standards 70 in which are journaled rollers 71. Two such rollers 71 are normally provided, corresponding to the rollers 29 and which may be spaced apart a distance corresponding to the spacing of the rollers 29.

The station 19 includes an upper rectangular frame 72 which is disposed above the frame 66, both of which frames are preferably formed of angle iron, as seen in FIGURE 3. The frame 72 is supported above and spaced from the frame 66 by a plurality of coil springs 73 which are interposed between said frames. The sides of the frame 72 have sandards 74 extending upwardly therefrom and rollers 75 are rotatably supported by the transversely aligned standards 74 above the frame 72, said rollers 75 corresponding to the rollers 29, 50 and 71.

The station 19 also includes a conventional vibrator unit 76, which may be either electrically or pneumatically operated and which is supported by the frame 66 and contacts the frame 72 for vibrating the frame 72 vertically when said vibrator is in operation. The springs 73 allow this up and down movement of the frame 72 relative to the frame 66.

The fourth and final station 20 includes an elongated table structure 77 having a top portion including transversely spaced sides 78. A plurality of rollers 79 extend between and are journaled in the sides 78 and have upper portions protruding above the upper edges of the sides 78. Only the end of the station 20, located adjacent the station 19, has been illustrated. The station 20 may be three or four times as long as the stations 17, 18 and 19, for a purpose which will hereinafter become apparent.

The apparatus 16 also includes a plurality of elongated relatively shallow pans or trays 80, only one of which has been shown. The pan 80 is of a length nearly equal to the length of the station 17, 18 or 19, and is of a width somewhat less than the width of said station or at least less than the width of the station 18, as illustrated in FIGURE 2. The side walls 81 of the pan or tray 80 are each provided with one or more small drain openings 82 located a predetermined distance above the pan bottom 83. The pan bottom 83 has one or more threaded drain ports 84 which are normally closed by threaded plugs 85. The undersides of the plugs 85 are disposed flush with the underside of the bottom 83 and the upper sides of said plugs are preferably flush with the upper sides of the bottom 83, when the plugs 85 are in applied positions, as seen in FIGURE 9. Removable selector strips 86 are disposed against the inner sides of the end walls 87 of the pan 80 and have threaded studs 88 extending outwardly therefrom through openings 89 of the walls 87. Nuts 90 engage the studs 88 for detachably securing the selector strips to the end walls 87. The selector strips 86 extend upwardly above the level of the upper edges of the walls 81 and 87 and are provided, above the level of said walls, with spaced upwardly opening notches 91, as seen in FIGURE 8, for mounting selector spacer bars 92 and 93 in desired positions above the pan or tray 80.

The spacer bars 92, each comprises a strip of angle iron having a horizontal top flange 94 and a depending vertical flange 95. Short pins 96 are fixed to and depend from the top flange 94 in longitudinally spaced relation to one another. The spacer bars 93 are identical to the spacer bars 92, except that the pins 96 thereof are staggered relative to the pins 96 of the spacer bars 92. Spacer bars 97 are also provided which are of T-shape cross section, as seen in FIGURE 2, and which have pins 96', not shown, in FIGURE 2 but illustrated in FIGURE 7, extending downwardly from the horizontal top bar 98 thereof on opposite sides of the depending flange or web 99. The pins 96' of the spacer bar 97, located on opposite sides of the web 99, are staggered relative to one another as seen in FIGURE 7.

In utilizing the apparatus 16 in the practice of the method of prefabricating masonry wall sections, one of the pans is initially placed upon the rollers 29 of the station 17, as illustrated in FIGURE 1. Said pan or tray 80 has the removable selector strips or spacer bar supports 86 disposed against and secured to the inner sides of the end walls 87 of said tray or pan. A row of bricks 100 is then placed end-to-end within the tray or pan 80 between the end walls 87 and along the near side wall 81, as viewed in FIGURE 1, with a slight spacing between the bricks 100. A spacer bar 92 is then applied over this first row of bricks with the ends of its flange 95 engaging in the left hand notches 91 of the strips 86 and with said flange 95 bearing against the side faces of the brick, which are disposed remote from the side faces thereof which engage the side wall 81, and with the top flange 94 resting upon the upper longitudinal edges of said first row or course of brick. The pins 96 of said spacer bar 92 will engage between upper portions of the adjacent ends of the brick 100. The next row of brick is then laid in the same manner on edge in the pan 80 and against the flange 95 of the previously applied spacer bar 92, but with the brick of the second row or course staggered relative to the brick of the first row or course, as illustrated in FIGURE 7. A spacer bar 93 is then applied to the brick of the second row or course in the same manner as previously described with reference to the application of the spacer bar 92. However, the pins 96 of the spacer bar 93 are staggered relative to the pins of the spacer bar 92 so that one pin 96 of the spacer bar 93 will be located between each end

brick of the second course and the adjacent end wall **87** of the pan. Thus, the bricks **100** of the second course are staggered relative to the bricks **100** of the first course. The subsequent courses of brick are laid in the same manner as previously described with the spacer bars **92** and **93** being alternately employed for staggering the bricks of the alternate courses, as illustrated in FIGURE 7. After the last two rows or courses of brick are applied the spacer bar **97** is applied so that the pins **96'** thereof will hold the bricks of these two courses staggered relative to one another. It will thus be seen that the bricks of each course are held separated from one another by the pins **96** and **96'** and the bricks of the different courses are maintained properly spaced by the depending flanges **95** and **99**.

While the pan **80** has been described as being completely filled with brick **100**, it will be readily apparent that bricks could be omitted from parts of certain of the courses to provide for openings in a wall, for example, to be constructed from a plurality of the prefabricated wall sections, to provide door or window openings. The shelf **31** is provided so that charts and descriptions can be placed thereon. These charts and descriptions can be numbered consecutively and each can be utilized in turn for forming a wall section, as previously described, so that the wall sections will be prefabricated in a desired order in which the wall sections will be subsequently assembled, and an unskilled or semiskilled laborer can be employed for assembling the bricks of the wall sections in the pans **80** at the station **17**, utilizing such charts and descriptions, not shown.

After the assembly of the brick **100** and spacer bars in the pan **80** has been completed, water is applied to the pan. The openings **82** will limit the depth of the water which can be held by the pan **80**, as seen in FIGURE 12 in which the water is indicated by the numeral **101**. As soon as the water has been applied to the pan **80**, the pan is pushed from right to left as seen in FIGURES 1 and 1A from the station **17** to the station **18**. When the pan containing the brick and water is moved to the station **18** (FIGURE 1A) the frame **36** is in an elevated position so that the rollers **50** are located partially above the level of the freeze plates **54** so that the pan **80** will ride on said rollers in moving to its position of FIGURE 1A. During travel of the pan from the station **17** to the station **18** the canvas flap **64** at the right hand end of FIGURE 1A will be deflected upwardly by the leading end of the pan to allow said pan to enter the hood **61** through the opening **63** normally closed by said flap **64**. The refrigerating unit **51** is operating when the pan **80** is moved to the station **18** and the crank **44** is then immediateely operated to lower the frame **36** and rollers **50**, so that the bottom **83** of the pan will rest upon the quick freeze plates **54** to effect a quick freezing of the water **101**. Thus, the freezing of the water will be accomplished before any appreciable amount of the water can be absorbed by the bricks **100**, to prevent damage to the bricks. The crank **44** is then manually turned in the opposite direction to return the frame **36** and rollers **50** to the elevated positions thereof as seen in FIGURE 1A and so that the pan will again be supported by said rollers and out of engagement with the freeze plates **54**. The pan **80** is then manually moved again from right to left through the exit opening **63** at the left hand end of FIGURE 1A and under the canvas flap **64** thereof which is deflected upwardly by the pan. It will be obvious that the hood **61** is utilized to trap the cold from the freeze plates within said hood so that the rapid freezing of the water **101** can be accomplished. The pan **80** in moving from right to left from the station **18** rides over the rollers **71** and onto the rollers **75** at the station **19**. The rollers **71** and **75** are located coplanar to one another, when the vibrator **76** is not in operation, and also coplanar with the rollers **29** and the rollers **50**, when said last mentioned rollers are in their fully elevated positions of FIGURE 1A.

When the loaded pan **80** reaches the station **19** the

spacer bars **92**, **93** and **97** are removed and a mortar retaining frame **102**, preferably formed of wood, is applied around the brick and around the spacer supporting strips **86**. The bricks **100** are held correctly spaced relative to one another and in a desired pattern in the pan after removal of the spacer bars **92**, **93** and **97** by a thin layer of ice **101** between the bottom portions of the bricks, as seen in FIGURE 12. Mortar is then spread over the entire area of the upper surfaces of the bricks, after which the vibrator **76** is placed in operation for vibrating the frame **72** and the rollers **75**, supported thereby, so that the mortar **103** will be tightly packed between the brick **100**, as seen in FIGURE 12, down to the level of the ice **101**. If desired, the operator at station **19** may make any one of the commercial mortar joints, such as a flush joint as shown in FIGURE 12 or a recessed joint, such as shown in FIGURE 13. Thereafter, the residue of the mortar is washed from the upper surfaces of the bricks.

The pan **80** is then manually propelled from right to left as seen in FIGURE 1B over the rollers **75** and onto the rollers **79** of the station **20**. At the station **20** the plug or plugs **85** are removed so that as the ice melts the water **101** can drain from the pan through the openings **84**. By the time the water drains from the pan **80** the mortar **103** will be sufficiently set to retain the recessed joint **104**, as seen in FIGURE 12. The station **20** is made of sufficient length so that several pans **80** can be stored thereon for curing the mortar joints **103**. When this has been accomplished the frame **102** can be removed and the prefabricated masonry will section **105** can then be removed from the pan **80**. By prefabricating wall sections utilizing the aforedescribed method and in a regular sequence, said wall sections will be in a correct order for assembly.

FIGURE 13 shows a portion of one wall section **105** having the indented mortar joints **104** on an upper face thereof. Thus, both faces of the wall section **105** may have such indented mortar joints where it is desired to utilize the wall section as a part of a wall or other structure both sides of which will be exposed, as for example, for interior partition walls of buildings, for flower planters and for numerous other uses.

It will also be apparent that the different stations can be operated by different workmen so that while one pan is being processed at station **17**, another pan is being processed at station **18**, a third at station **19** and with one or more additional pans being located at station **20**.

Bricks have been described in connection with the practice of the method; however, various other types of building blocks may be prefabricated into wall sections by use of the apparatus in the practice of the method. Any type of brick may be employed as well as numerous types of building blocks and stone. Slight irregularities in the size of the brick or building blocks will be taken care of by the depending flanges and pins of the spacer bars. If the apparatus is utilized for prefabricating wall sections of stone pieces of irregular shape the spacer bars may be dispensed with.

FIGURE 14 illustrates a building block **106** having openings or bores **107** extending between opposite sides **108** thereof. If such building blocks are utilized, pieces of waterproof paper **109** are adhesively secured to the opposite sides **108** for sealing the bores **107**. The sealed bores **107** then provide sealed air chambers in a wall section prefabricated from such blocks **106**.

In FIGURES 7, 8 and 9 the mortar retaining frame is illustrated applied to the pan **80** before removal of the spacer bars; however, said spacer bars will be removed before the motor retaining frame is applied.

Various modifications and changes are contemplated and may be resorted to, without departing from the function or scope of the invention as hereinafter defined by the appended claims.

I claim as my invention:

1. An apparatus for prefabricating masonry wall sec-

tions comprising a shallow pan including a substantially flat bottom and an upstanding surrounding wall in which a plurality of masonry elements are adapted to be placed in spaced apart relation to one another and resting on the pan bottom to form a predetermined wall section pattern; an elongated supporting structure including an end portion constituting a first station and having a top surface on which said pan is initially supported in substantially a horizontal plane for applying the masonry elements thereto, a quantity of water applied to and filling the lower portion of said pan and in which the masonry elements are partially submerged at said first station, said supporting structure including a second station disposed contiguous to the first station and to which the pan is moved from said first station, a refrigerating unit forming a part of the second station for freezing the water contained in the pan at said second station, a third station disposed contiguous to the second station to which the pan is moved from said second station and at which the upper surface of the pattern formed by the masonry elements is adapted to be coated with mortar, a vibrator forming a part of said third station for vibrating the pan for causing the mortar to fill the spaces between the masonry elements and to be packed upon the ice contained in the bottom of the pan, and a fourth station disposed contiguous to the third station for receiving the pan from said third station for storing the pan while the mortar is cured and the ice is melted, said third and fourth stations constituting parts of said supporting structure said pan being provided with a first drainage means in said surrounding wall for limiting the depth of the water in the pan at the first station and a second drainage means in the bottom for completely draining the pan at said fourth station, said second, third and fourth stations having top surfaces normally disposed substantially coplanar with the top surface of said first station, the top surface of said second station including a plurality of elements disposed in spaced apart relation to one another, said refrigeration unit including a plurality of quick freeze plates disposed between and beneath said top surface elements, and means for raising and lowering said top surface elements for lowering the pan onto the freeze plates and for elevating the pan therefrom.

2. An apparatus as in claim 1, said third station including an upper section of which the top surface thereof constitutes, a part, means yieldably supporting said upper section whereby said upper section is vibrated relative to the remainder of the supporting structure by said vibrator.

3. An apparatus for prefabricating masonry wall sections comprising a shallow pan including a substantially flat bottom and an upstanding surrounding wall in which a plurality of masonry elements are adapted to be placed in spaced apart relation to one another and resting on the pan bottom to form a predetermined wall section pattern; an elongated supporting structure including an end portion constituting a first station and having a top surface on which said pan is initially supported in substantially a horizontal plane for applying the masonry elements thereto, a quantity of water applied to and filling the lower portion of said pan and in which the masonry elements are partially submerged at said first station, said supporting structure including a second station disposed contiguous to the first station and to which the pan is moved from said first station, a refrigerating unit forming a part of the second station for freezing the water contained in the pan at said second station, a third station disposed contiguous to the second station to which the pan is moved from said second station and at which the upper surface of the pattern formed by the masonry elements is adapted to be coated with mortar, a vibrator forming a part of said third station for vibrating the pan for causing the mortar to fill the spaces between the masonry elements and to be packed upon the ice contained in the bottom of the pan, a fourth station disposed contiguous to the third station for receiving the pan from said third station for storing the pan while the mortar is cured and the ice is melted, said third and fourth stations constituting parts of said supporting structure, and a plurality of spacer bars each having a top flange resting on the top surfaces of certain of the masonry elements and a depending flange disposed between certain of the masonry elements and dividing the masonry elements, separated by said depending flange, into courses, and pins depending from said top flange and disposed between the masonry elements of at least one such course.

4. An apparatus as in claim 3, and locator members secured to and rising from two opposed walls of the pan and having upawrdly opening notches in which the ends of the spacer bars are received for supporting said bars in correctly spaced relation to one another.

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