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[54] **MULTIPLE PANEL LAMINATING PRESS**

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[52] **U.S. Cl.** ..... **100/93 P**, 100/265, 100/290, 156/583

[51] **Int. Cl.** **B02c 11/08**, B30b 15/34

[58] **Field of Search**.... 100/93 P, 265, 290; 156/583

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Primary Examiner—Douglas J. Drummond

[57] **ABSTRACT**

A building panel laminating press including a base comprising a concrete filled case and carrying a fabricated platen with a flat top surface and vertical columns about its perimeter, a weighted head comprising a concrete filled case and carrying a fabricated platen with a flat bottom surface and slidably coupled with the columns, power driven jack means to shift the head vertically relative to the base and one or more intermediate fabricated platens with flat top and bottom surfaces in vertical spaced relationship between the head and base and supported for limited yieldingly vertical movement; each platen having tubes therein to conduct a heated fluid medium therethrough; and vertically extensible shiftable heat insulated shielding means about and between each adjacent pair of platens and having sides adapted to be manually shifted to open positions to provide access to between the platens.

13 Claims, 15 Drawing Figures

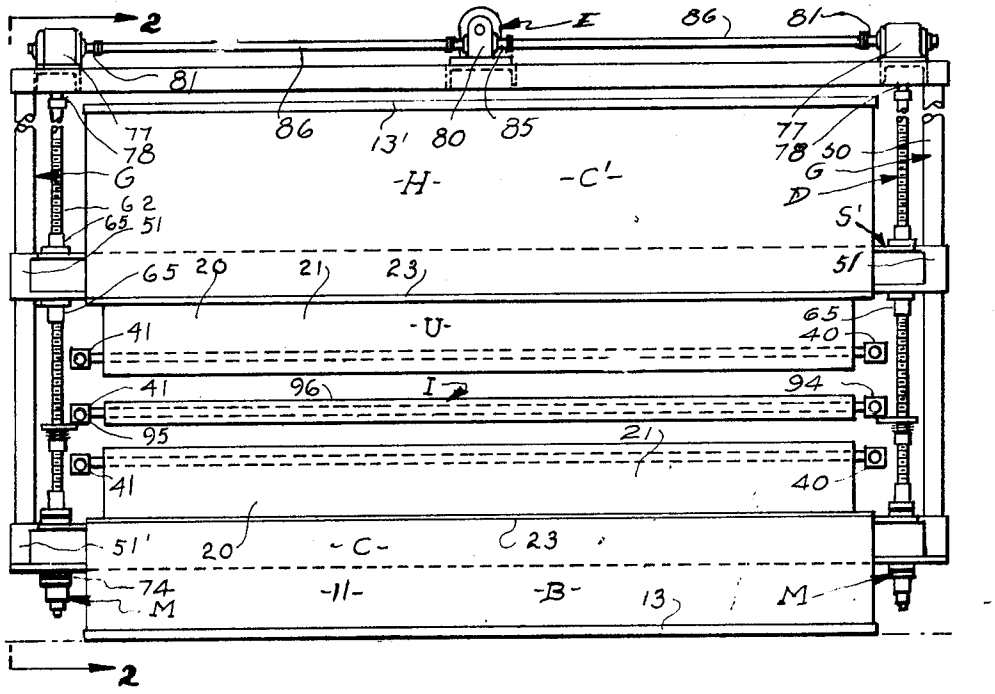


Fig. 1.

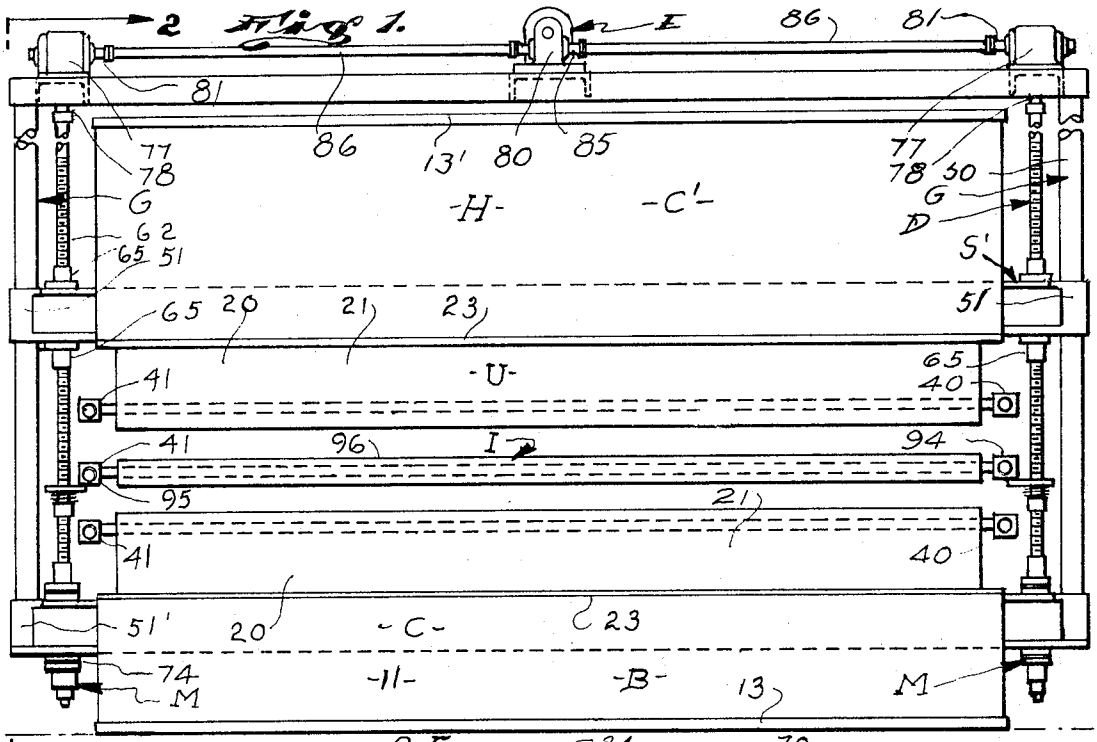
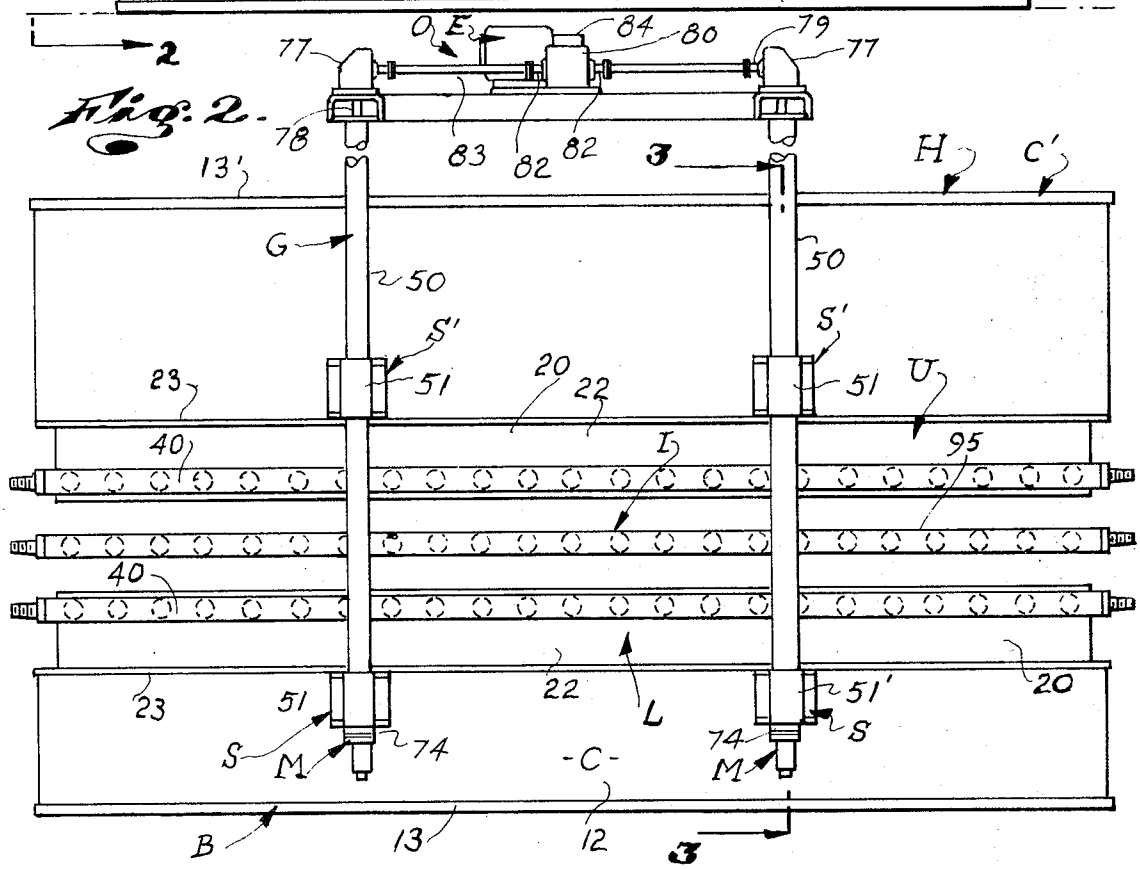

2
E
86
81
81
77
78
G
62
65
51
86
13'
80
85
-H-
-C'-
77
78
30
G
D
S'
51
65
20
21
23
41
-U-
65
40
41
96
I
94
95
21
41
40
51'
20
-C-
23
74
M
-11-
-B-
13
M

Fig. 2.


2
O
E
84
80
79
77
77
78
83
82
82
3
H
C'
13'
G
50
50
S'
S'
23
51
20
22
51
U
40
I
95
40
23
51
22
L
51'
20
S
M
74
-C-
74
M
S
B
13
12
3

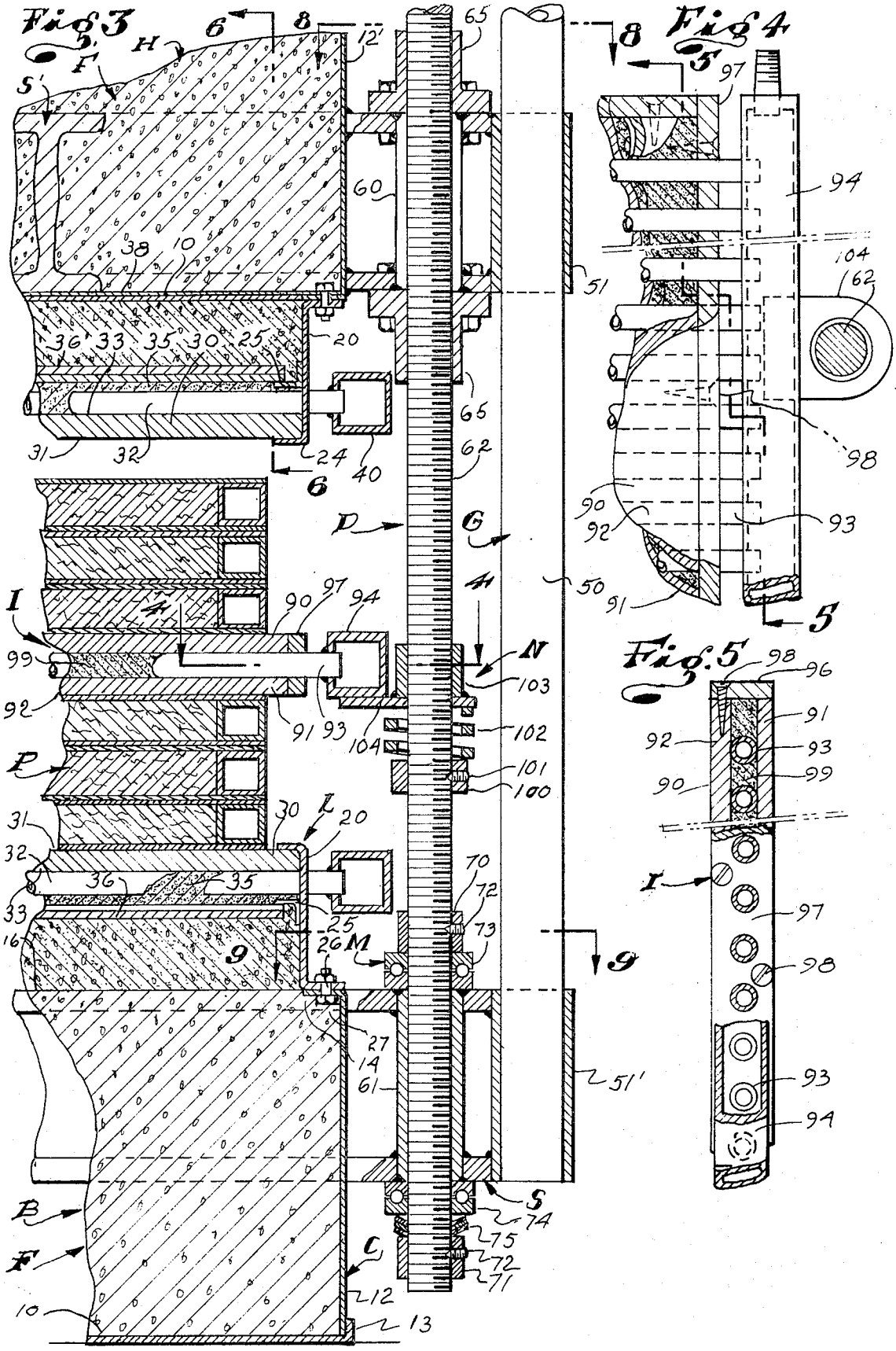

Fig 3
Fig 4
Fig 5
6
8
5
9
F
H
S'
60
10
38
36
33
35
30
25
20
31
32
24
40
65
62
51
12'
D
G
A
50
I
97
94
90
99
92
91
93
104
N
103
102
101
100
P
L
70
72
73
74
75
71
M
27
14
61
51'
B
C
12
13
16
26
98
96
104
91
92
93
99
90
97
94

Fig. 6.

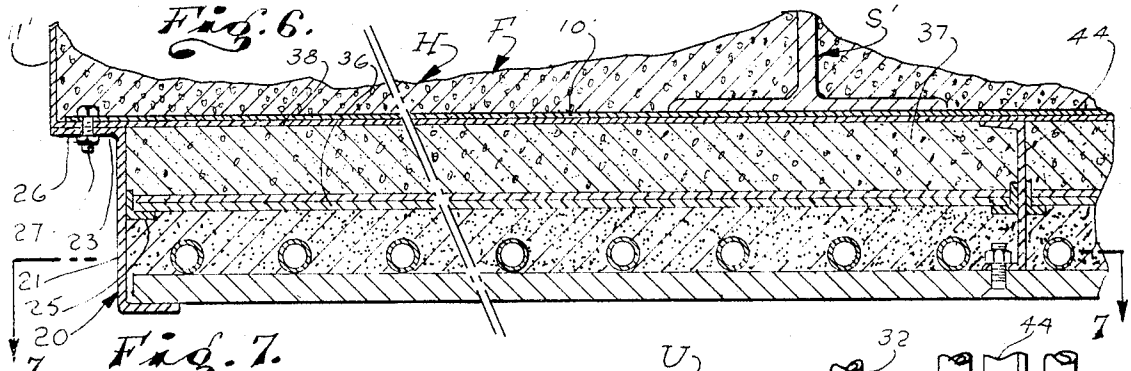


Fig. 7.

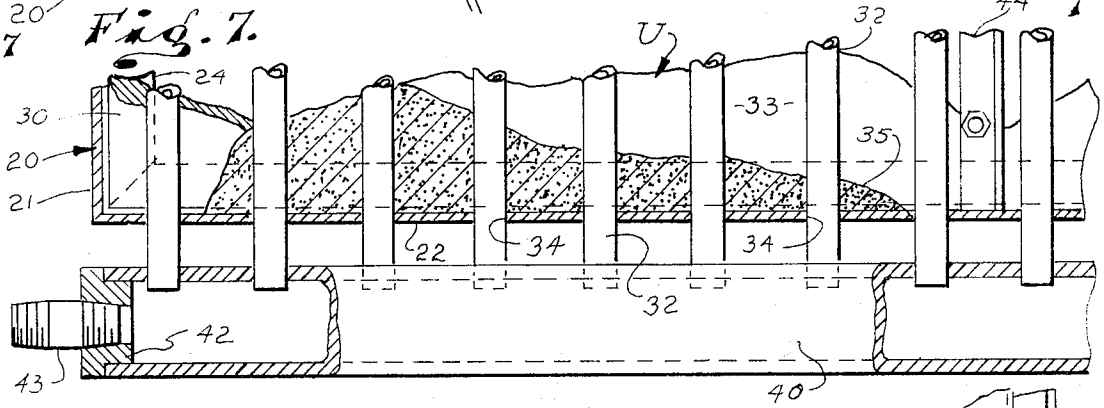


Fig. 11.

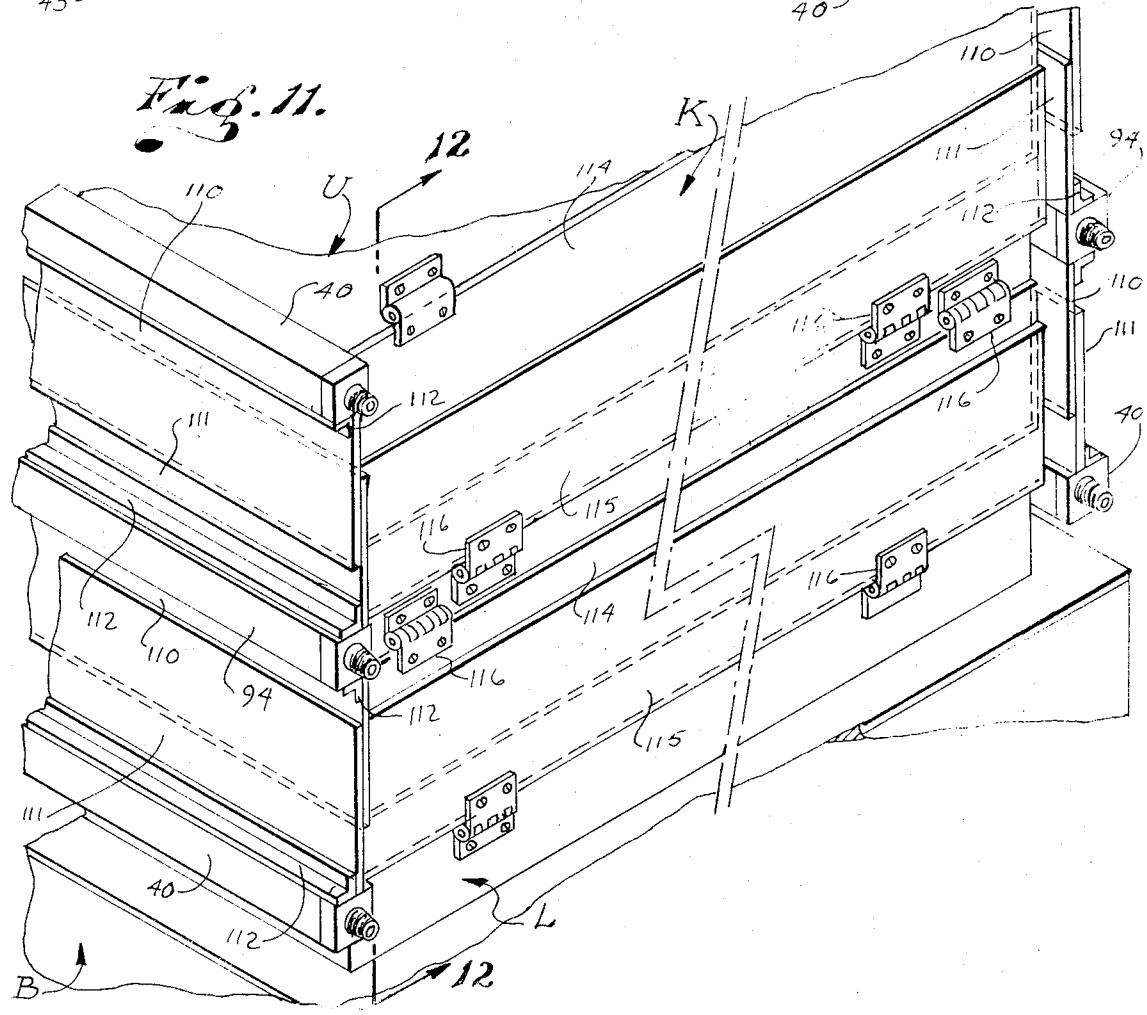


Fig. 10.

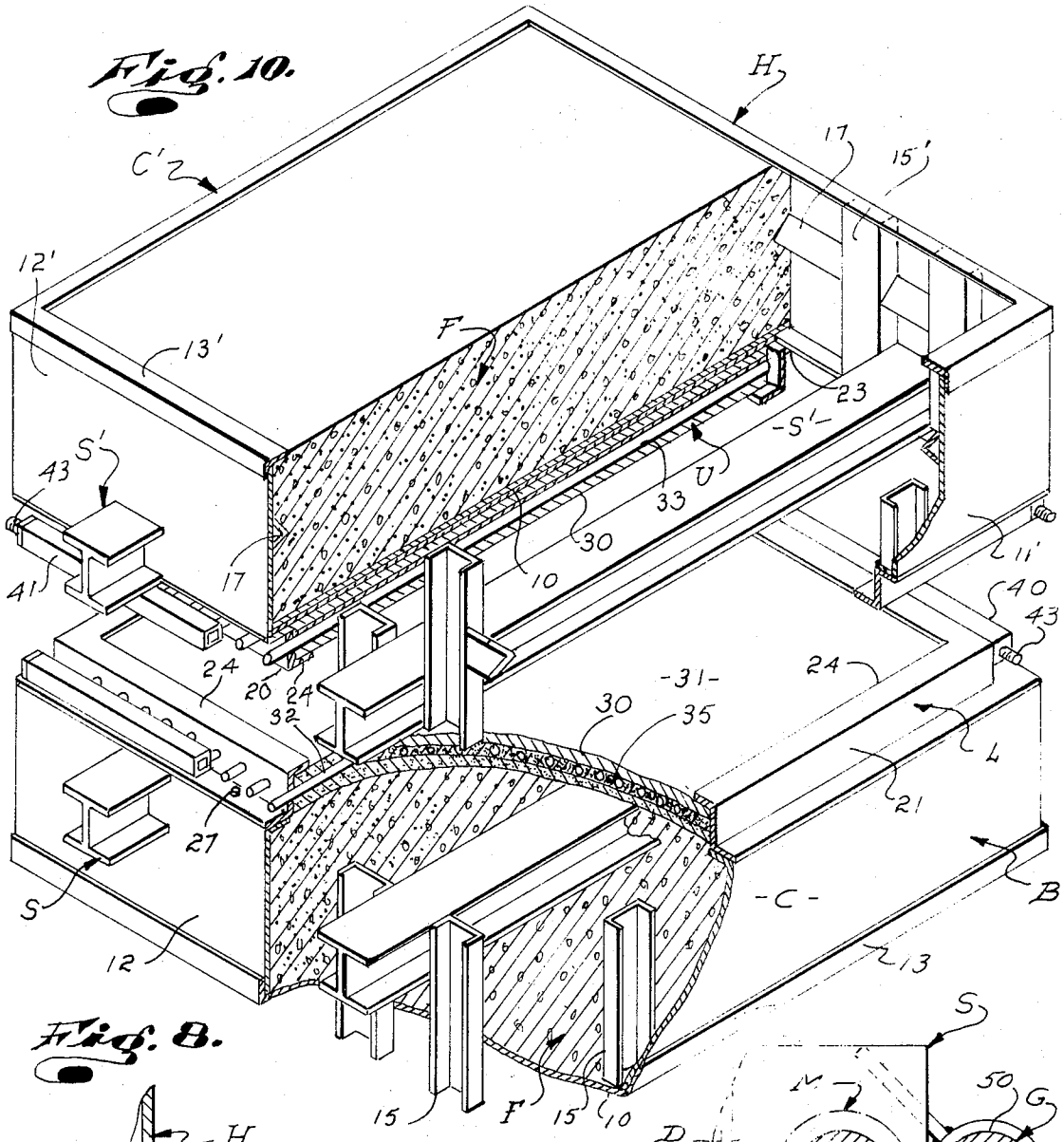


Fig. 8.

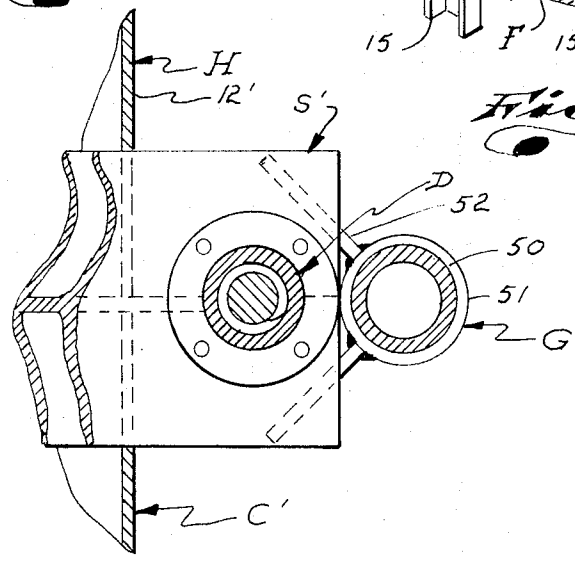


Fig. 9.

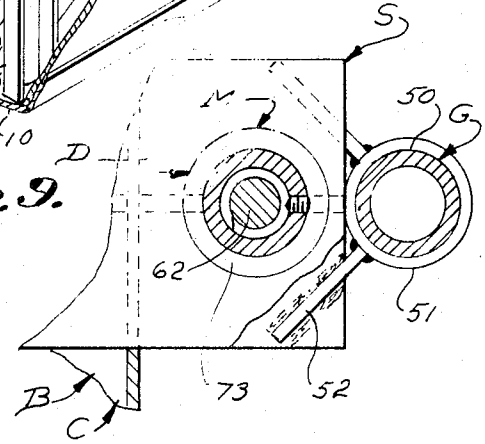


Fig. 12.

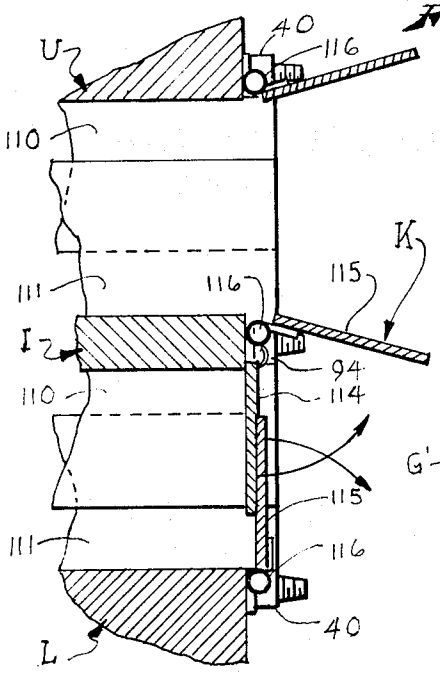


Fig. 13

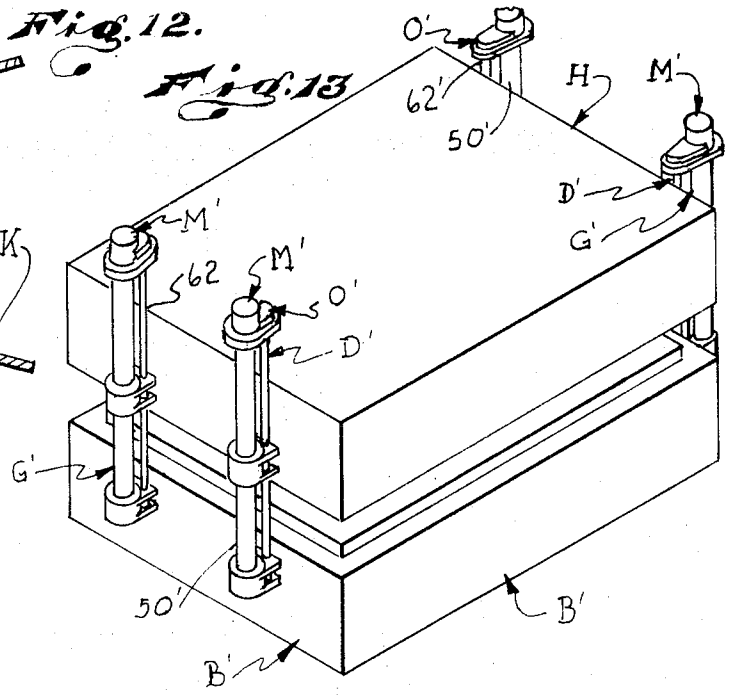


Fig. 14.

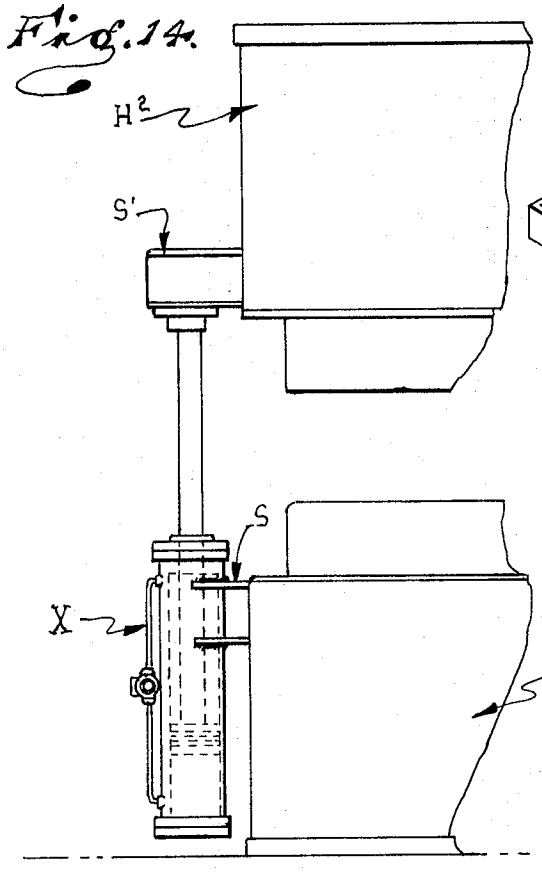
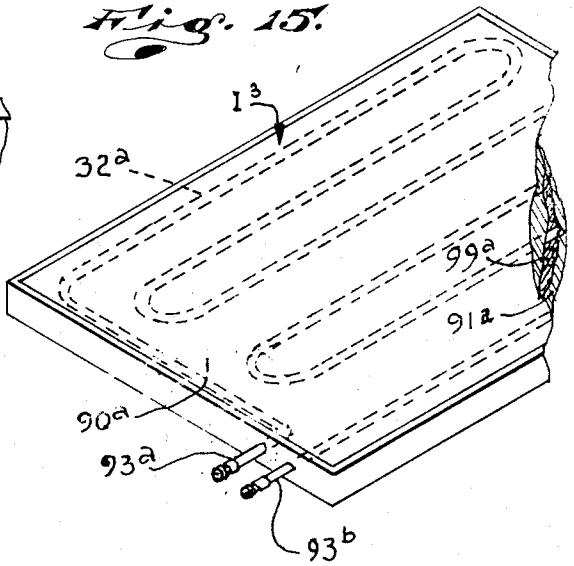


Fig. 15.



MULTIPLE PANEL LAMINATING PRESS

This invention has to do with a press and is more particularly concerned with a novel press construction particularly suited for use in the manufacture of laminate panel structures.

Throughout the construction industry there is an increasing use of and need for modular, structural panels for establishing cargo containers, truck vans, commercial and residental, buildings, and the like.

Structurally sound and stable panels for the above-noted uses are generally laminate structures and are such that they must be subjected to considerable pressure and heat in the course of their manufacture.

The prior art is replete with presses suitable for use in establishing panel structures of the character referred to. Such pressures are, as a general rule, extremely heavy structures made up of metal castings and forgings, including complicated mechanical and/or hydraulic operating means and incorporating complicated heating means. Such presses are extremely costly constructions and are such that it is not economically practical or feasible to make such presses available in abundance and to distribute them in different areas or locations to meet local growing need for panels.

Due to the excessive weight and size, the complicated nature and the exceedingly high cost of heated press constructions, suitable for use in the manufacture of laminated building panels and the like, few such presses are available, the production of such panels is limited, their supply is short and the sources of supply are totally inadequate. As a result of the above, the cost of such panels is excessively high and delivery is so slow and uncertain as to make the regular establishment of buildings and the like of factory-produced modular panels impractical.

The establishment of buildings and the like, with factory produced modular panels, in theory, would be extremely practical and economical. However, the initial capital investment required to establish and equip panel factories with suitable panel-producing presses (as provided by the prior art) has proven to be so high that such factories are not being established and the development of the art of building with modular panels is not developing as has been expected.

An object of my invention is to provide a novel press construction expressly designed for use in the manufacture of laminated, heat cured panel structures suitable for use in the establishment of buildings and the like.

It is an object of this invention to provide a press construction of the character referred to which is extremely simple and a structure which is sufficiently easy and economical to manufacture, so that the capital investment required to establish factories and facilities to produce modular building panels and the like is practical and feasible.

It is another object of my invention to provide a press construction of the character referred to which is so economical to establish and maintain that the cost or price of the panels produced need not be materially affected by the capital investment of the equipment required to produce them.

It is a feature of the present invention to provide a press construction of the character referred to including a pair of like, novel, easy and economical to produce, heated primary platen adapted to be arranged in vertically spaced opposing relationship and one or more novel, heated primary platens.

Yet another object and feature of my invention is to provide a press of the character referred to wherein the lower primary platen is supported and carried by a strong, heavy, rigid base structure comprising a novel reinforced sheet metal case and a filler or core of concrete and a press wherein the upper primary platen is carried by a head unit, similar to the base structure and comprising a reinforced sheet metal case and a filler or core of concrete.

It is an object and feature of my invention to provide a press of the character referred to wherein the operating force applied by the press onto work related thereto is primarily determined and established by the weight or mass of the head.

Another object of the present invention is to provide a press of the character referred to having novel guiding and driving means for and between the base and the head to effect vertical shifting of the head relative to the base, relative to work and relative to intermediate platens arranged between the primary platens carried by the base and the head.

Another object and feature of my invention is to provide a structure of the character referred to having novel support and guide means for the intermediate platens.

Another object of the present invention is to provide a press of the character referred to having novel heat insulating means to prevent the loss of heat, between the upper and lower platens and such that it permits for vertical relative shifting of the platens and the convenient engagement and removal of work from between the platens.

The foregoing and other objects and features of my invention will be understood and will be apparent from the following detailed description of typical preferred forms and applications of my invention, throughout which description reference is made to the accompanying drawings, in which:

FIG. 1 is a side elevational view of my new press;

FIG. 2 is an en end view of my new press taken as indicated by line 2—2 on FIG. 1;

FIG. 3 is an enlarged detailed sectional view taken substantially as indicated by line 3—3 on FIG. 2;

FIG. 4 is a sectional view taken substantially as indicated by line 4—4 on FIG. 3;

FIG. 5 is a view taken as indicated by line 5—5 on FIG. 4;

FIG. 6 is a sectional view taken substantially as indicated by line 6—6 on FIG. 3;

FIG. 7 is a sectional view taken substantially as indicated by line 7—7 on FIG. 6;

FIG. 8 is a sectional view taken substantially as indicated by line 8—8 on FIG. 3;

FIG. 9 is a sectional view taken substantially as indicated by line 9—9 on FIG. 3;

FIG. 10 is an isometric view of the base and head of my new press with portions broken away to better illustrate the details of the construction;

FIG. 11 is an isometric view of a portion of the heat sealing means that I provide for my new press;

FIG. 12 is a sectional view taken as indicated by line 12—12 on FIG. 11, showing portions in another position;

FIG. 13 is an isometric view of my press with a modified form of operating means related thereto;

FIG. 14 is a view showing another modified form of guide and drive means for my new press; and,

FIG. 15 is a view showing an isometric view of a modified heated platen construction.

The press that I provide is an elongate, substantially cubic assembly with a substantially flat, horizontal flat horizontal bottom, like opposite vertical ends and like opposite vertical sides.

The press includes, generally, a lower base assembly B with a flat, upwardly disposed lower platen L, an upper head assembly H with a flat downwardly disposed upper platen U, and shiftable vertically relative to the lower base assembly B, guide means G to guide the head assembly vertically relative to the base assembly, and drive means D to drive the head assembly relative to the base assembly. In the case illustrated, the press further includes an intermediate platen I between the platens L and U and means connecting the platen I with the means D.

The base assembly B includes a substantially square or rectangular sheet metal box or case C with a flat horizontal bottom **10**, vertical side walls **11**, vertical end walls **12** and an open top. The lower edges of the side and end walls and the adjacent edges of the bottom **10** are engaged with and supported in an angle iron frame **13**. The upper edges of the side end walls are provided with laterally inwardly projecting support flanges **14**.

In addition to the foregoing, the case C is provided with suitable reinforcing members, such as vertically extending channel sections **15**, spaced longitudinally of its several sides to extend between the bottom **10** and the support flanges **14** and suitably fixed to their adjacent walls as by welding.

The case C next includes a pair of elongate, laterally spaced, longitudinally extending strings S with end portions projecting longitudinally outward through and from the end walls **12**. The strings S are shown established by I-beams, the top flanges of which are flush with the plane of the open top of the case.

The several parts and portions of the case structure thus far described are fixed and secured together by welding or the like.

The case C described above is filled with a mass or filler F of concrete, the top surface **16** of which is suitably screeded and made flush with the plane of the flanges **14** and open top of the case.

The concrete filler F preferably consists of six sacks of cement per yard mix and rated to withstand about 4,000 p.s.i. When it is poured into the case, it is suitable vibrated to assure that all voids in the case are filled.

The head assembly H includes a case C' which is substantially similar to the case C described above, except tha the case C' is turned upside down and the bottom **10'** thereof is moved down from engagement with the angle iron from **13'** to engagement with the mounting flanges **14'**, which are at the bottom edges of the walls **11'** and **12'** of the inverted case.

The case C', like the case C, includes reinforcing member **15'** and laterally spaced stringers S' similar to the members **15** and stringers S in the case C.

In addition to the members **15'**, the side and end walls **12'** and **11'** of the case C' are shown further reinforced and strengthened by horizontal stiffeners **17**, in the nature of angle iron midway between the upper and lower edges, and extending between the members **15'** related thereto.

The case C' is filled with a concrete filler F' similar to the filler F in the case C.

It will be apparent that the concrete filled cases C and C' are simple, easy and economical to make units and are such that they can be constructed at a remote manufacturing facility, and economically transferred to a panel factory site or fabricated entirely at such a site, set up and filled with concrete.

The upper and lower platens U and L of the base and head assemblies B and H are identical units, each including a square or rectangular frame **20** with vertical side and end walls **21** and **22** with inner and outer edges, outwardly projecting, horizontal mounting flanges **23** on the outer edges of the walls **21** and **23** and inwardly projecting, horizontal stop flanges **24** on the inner edges of said walls.

The frames **20** are shown as being further provided with inwardly projecting intermediate flanges **25** intermediate the inner and outer edges of the walls thereof.

The mounting flanges **23** correspond in dimension with the support flange **14** about the upper edge of the case C of the base assembly B and the support flange **14'** about the lower edge of the inverted case C' of the head assembly H and are adapted to establish flat bearing engagement on and with those support flanges. The flanges **14** and **23** and **14'** and **23'** are provided with registering openings **26** through which suitable fasteners **27** are engaged to fix the frames **20** to their related cases.

In practice, the fasteners **27** include bolts engaged in the openings in the flanges **14** and **14'**, with their heads within the cases C and C' and retained therein by the concrete fillers and with their shanks projecting from the flanges in the nature of studs to be cooperatively received in the openings in the flanges **23** of the frame **20**. Nuts are engaged on the studs or bolt shanks to secure the frames **20** to the cases C and C'.

Each platen U and L includes a flat, square or rectangular plate **30** of heavy gauge metal arranged within the frame **20** with its perimeter in bearing engagement on and with the stop flange **24** of the frame.

The plate **30** is preferably established of one inch thick 6061-TS aluminum plate stock and is such that it establishes a highly effective, efficient heat conducting and distributing part with a flat, inwardly disposed, work engaging surface **31** on a common plate with and within the confines of the of the stop flange **24**.

Each of the platens U and L further includes a plurality of elongate, straight, laterally spaced, longitudinally extending tubes **32** in bearing heat conducting contact with the inside or outer surfaces **33** of the plate **30**. In the case illustrated the ends of the tubes project outwardly through openings **34** in the end walls **22** of the frame **20** and are adapted to conduct steam, hot water or the like.

The plates next include a matrix **35** of equal refractory, heat conducting cement, such as "Thermon" cement produced by Thermon Manufacturing Company of Houston, Texas, within the frame, on and about the tubes **32** and on and between the surface **33** and the plane of the intermediate flanges **25** of the frame.

The platens next include a partition **36** of heat insulating material within the frame **20** on the plane of and supported by the intermediate flanges **25** and adapted to contain and hold the Thermon cement (which cement does not set up hard) captive. The partition **36** is

preferably established of two ¼ inch thick sheets of asbestos cement board, such as produced by Johns Mansville Company.

Next, each platen U and L includes a core **37** of concrete in the frame **20** outward of the partition **36** and screeded flush with the mounting flange **23** of the frame to define a flat outer surface which establishes flat opposing bearing engagement on and with the opposing surfaces of the filler F of the case C or C'.

In practice, a thin layer of grout **38** can be provided between the cores **37** and fillers F to assure solid, firm, uninterrupted, structurally sound support therebetween.

Finally, each platen U and L includes supply and outlet manifolds or logs **40** and **41** extending longitudinally of the end walls **22** of the frames **20** and communicating with the open ends of the tubes **32**, as clearly illustrated throughout the drawings.

The manifolds or logs **40** and **41** are simple, straight, tubular sections with longitudinally spaced tube end receiving openings along one side thereof and can, as illustrated, be provided with plugs **42** at their ends and in which suitable coupling means, such as nipples **43** are engaged to connect the manifolds to and with the hoses extending from the discharge and return ends of a suitable steam generating means, or the like (not shown).

The ends of the tubes **32** are fixed and sealed in the openings in the manifolds by welding.

In addition to the foregoing, if the size and extent of the platens dictates, suitable intermediate reinforcing members, such as simple channel sections **44** can be arranged in the frames **20** to extend transverse the interior of the platen structures to stiffen the same.

With the platen construction illustrated in the drawings and described above, it will be apparent that the platens U and L are rather simple, easy and economical to manufacture units and are such that they can be advantageously manufactured in whole or in part at a remote manufacturing site or at the site of the panel plant where the press is to be established and used.

It is highly important to note that the platens are extremely effective and efficient heat conducting and transferring units; that substantially all of the heat of the fluid medium conducted by the manifolds into and through the tubes **32** is conducted directly to the plates **30** where the tubes contact the plates and is conducted indirectly to the plates by the Thermon matrix **35**, between the points of direct contact. The asbestos, insulating partition **36** effectively prevents or impedes the conduction and loss of heat outward in the platens and into the mass of the concrete cores and fillers of the platens and cases.

It is also significant to note that an extremely rigid, strong, accurate and durable heated platen construction established of relatively light, inexpensive, easy to work and use metal parts and relatively inexpensive, easy to work and use cement products and/or materials, is provided by the present invention, which construction is far less costly than heavy cast and machined all metal heated press platens, established in accordance with common and accepted practices.

The guide means G that I provide is adapted to guide and maintain the head assembly H in vertical alignment with the base assembly B and with the flat downwardly disposed inner surface **31** of the plate **30** of the upper platen U in opposed relationship with the corresponding, upwardly disposed inner surface **31** of the plate **30** of the lower platen L.

The means G preferably includes two elongate laterally spaced, vertical, cylindrical columns **50** at each end of the base section B. Each column **50** has a lower end suitably fixed to an adjacent end of one of the stringers S of the case C and projects upwardly therefrom to slidably engage in and project through a guide sleeve **51** fixed to the end of a related stringer S' of the case C' of the head section H.

In practice, the lower ends of the columns **50** are fixed to their related ends of the stringers S by means of guide sleeves **51'** similar to the sleeves **51** and in which the columns are fixed as by welding. With such a relationship of parts, the basic structure and relationship of parts at and between the stringers and columns is the same throughout the construction and the only significant distinction is that the sleeves **51** are free to slide relative to the columns, while the sleeve **51'** are fixed relative to the columns by the application of a simple weld.

As shown in FIGS. **8** and **9** of the drawings, the sleeves **51** and **51'** are provided with angularly related mounting flanges **52** that project between the flanges of the I-beam stringers and which are fixed thereto by weldings.

With the means G provided, it will be apparent that the head assembly H is free to shift vertically relative to the base assembly B and is maintained in axial alignment therewith at all times.

The drive means D that I provide is adapted to drive the head assembly H vertically relative to the base assembly B and preferably includes four like jack mechanisms, two at each end of the construction, each being related to related ends of the stringers S and S' adjacent the guide means columns **50** related thereto.

In the preferred form, the means D includes axially aligned upper and lower tubular journals **60** and **61** extending through and fixed in the outer related end portions of the stringers S and S', spaced longitudinally inwardly of the guide tubes **51** and **51'** on side stringers. Elongate vertical screws **62** slidably engaged through and extending between the journals **60** and **61**, bearing means M securing the lower end of the screws to the lower journals **61** for free rotation and against axial movement relative thereto, threaded collars **65** fixed to the upper stringers S', at opposite ends of the journal **60** and threadedly engaged with the screws and operating means O to synchronously rotate the screws.

The bearing means M includes vertically spaced upper and lower stop rings **70** and **71** threadedly engaged on the lower portion of each screw to occur in spaced relationship above and below the upper and lower ends of the journal **61** related thereto and releasably secured in fixed position thereon by set screws **72**; upper and lower anti-friction thrust bearings **73** and **74** about the screws and between the ends of the journals **61** and the sleeves **70** and **71** related thereto.

In the preferred carrying out of the invention, and as illustrated in the drawings, a set of resilient washers **75** are engaged between the lower collar **71** and bearing **74** to yieldingly maintain the several parts and portions of the bearing means M in desired, yieldingly, pressure engagement with each other.

The operating means O, to synchronously rotate the screws and effect raising and lowering of the head assembly H, can vary widely in form and construction

and is shown as including a frame structure **76** fixed to and extending between the upper ends of the columns **50** of the means G and overlying the head assembly H in vertical spaced relationship, a gear box **77** fixed to the top of the frame structure above each screw **62,** and having a vertical output shaft **78** coupled to the screw and a horizontal input shaft **79** projecting laterally inwardly relative to the longitudinal vertical plane of the press, an intermediate gear box **80** at each end of the construction, between the sides thereof having a central longitudinally inwardly projecting input shaft **81** and a pair of output shafts **82** connected with the shafts **79** of the related gear boxes **77** by coupler shafts **83,** a reversibly electric motor E with a reduction gear **84** mounted on the frame structure centrally of the construction and having a pair of longitudinally extending output shafts **85,** each connected with the input shaft **81** of a related gear box **80** by a coupler shaft **86.**

With the means O that I provide, it will be apparent that the motor E can be energized to effect synchronous rotation of the screws of the means D in a clockwise or counterclockwise direction and to effect raising and lowering of the head assembly H relative to the base assembly B as desired and as circumstances require.

In addition to the foregoing, my new press construction includes the intermediate, heated platen I, which platen is carried by the means D and occurs on a horizontal plane between the upper and lower platens U and L.

The platen I is equal in longitudinal and lateral extent with the platens U and L and includes upper and lower plates **90** and **91** similar to the plates **30** of the platens U and L and defining flat work-engaging surfaces **92** opposing the surfaces **31** of the platens U and L.

Arranged between the plates **91** and **90,** in lateral spaced relationship and extending longitudinally therebetween, is a plurality of steam conducting tubes **93.** The tubes are in bearing, supporting and heat conducting engagement with the adjacent inner surfaces of the plates **90** and **91** and have ends projecting from between the end edges of the plates, which ends connect and communicate with manifold logs **94** and **95** similar to the manifold logs **40** and **41** of the platens U and L.

The sides and the ends of the platen I are provided with and closed by side and end walls **96** and **97,** established of metal bar stock and secured to their adjacent edges of the plates by means of screw fasteners **98.** The end walls **97** are provided with openings through which the end portions of the tubes **93** extend.

The interior of the platen I, between the plates, side and end walls and about the tubes therein, is filled with a filler **99,** heat conducting cement, such as Thermon cement, to provide added support for the plates, between the tubes, and to conduct and effect substantially uniform heat distribution from the tubes to and throughout the plates of the platen.

The platen I is supported in predetermined spaced relationship between the platens U and L by vertically adjustable, vertically yielding carrier means N between each screw **62** of the drive means D and the end portion of the platen related thereto.

The means N related to each screw **62,** as clearly illustrated in FIGS. **3** and **4** of the drawings, includes a vertically adjustable stop nut **100** threaded on the screw and releasably secured in fixed relationship therein by means of a set screw **101,** an elongate compression spring **102** engaged about the screw **62** above the nut **100** and having its lower end stopped against said nut; a support sleeve **103** slidably engaged about the screw **62,** above the spring **102** and engageable on and with the upper end of the spring and a coupling plate or bracket **104** fixed to and extending between the sleeve **103** and the platen I or, as is shown in the drawings, between said sleeve and the manifold log of the platen adjacent thereto.

The platen I is adapted to occur or to be arranged between two adjacent pieces of work or panels P, of a pair of multiplicity of panels arranged between the platens U and L and is such that it assures the application and distribution of the necessary and desired heat into and throughout the work, within the mass of the work and between the primary upper and lower platens U and L.

The spring loaded carrier means N serves to yieldingly support the platen I for limited vertical movement to compensate for variations in the vertical extent of the work or stack of panels P when subjected to the vertical, compressive forces exerted thereon by the press and also serves to urge the platen vertically out of engagement with the work below the platen, when the work above the platen is moved out of supported engagement thereon and so that the work below that platen can be conveniently drawn, laterally outwardly, from below said platen.

In practice, the platen I can be eliminated when a small number of panels is being worked upon or a plurality of such platens can be provided when a large number of panels is being worked upon.

In the case illustrated, I have shown the press loaded with and acting upon six panels P, there being three panels stacked together between each adjacent pair of heated platens. It has been determined that the number of panels that can be advantageously and effectively stacked together between adjacent heated panels in my new press construction depends greatly upon the construction, thickness and the materials from which the panels are established. It is conceivable that a panel construction might be such that only one panel could be effectively worked upon between adjacent heated platens, in which case a press with but one intermediate platen could work on and establish but two panels at a time, or could be provided with additional intermediate panels I to increase the capacity, as desired. On the other hand, it is conceivable that the construction of the panels being worked upon might be such that four or five panels can be effectively worked upon between adjacent pairs of platens.

In the case illustrated and assuming that the panels P are such that three such panels can be effectively worked upon between each adjacent pair of paltens, it will be apparent that by adding one additional platen I, the capacity of the press can be increased to nine panels. By adding two or three additional platens I, the capacity of the press can be increased to 12 or 16 panels, as desired or as circumstances require.

An important feature of my invention resides in the fact that the means G, C and N occur at the ends of the press whereby the opposite sides of the press are open and unobstructed, providing free access at each side of the press for the purpose of shifting panels P into and out of engagement between the platens from either or

both sides, as desired and as production line activity requires.

In practice, capacity of the press, that is, the force in foot pounds per square inch which the press is capable of exerting upon the work, is determined primarily by the weight of thehead assembly H, which weight is easily and accurately determined and established by the collective mass of the various elements, components and/or parts of the assembly H, and is easily and conveniently established at a given predetermined force by the volume and resulting mass of the concrete filler F' in the case C' of the assembly H.

In practice, the drive means D can be employed to draw the platens and work into tight pressure engagement, to assure that the work is urged into its desired flat planar condition. In doing so the means D exerts additional pressure.

In light of the above, it may be more accurate to state that the mass of the head H is such that it, by its own mass exert the minimum required force on the work and that the means D serves to increase the force, above that required minimum to assure proper seating of the work and a desired safety factor of force to assure desired lamination of the parts of the work.

It is significant to note that the guide means G simply guides the assembly H relative to the assembly B and is not relied upon to transmit any part of the work energy produced by the press. Accordingly, the means G need not be made exceedingly heavy and strong, but is such that it can be rather light, simple and economical to manufacture.

It is further significant to note that the means D is in the nature of a multiple screw jack means primarily required to raise or lift the head assembly; it is not required to generate and exert the major part of the work energy or force applied by the press onto the work related thereto. Accordingly, the means D and the operating means O therefore can be made relatively light and inexpensively as comparred with the drive and/or operating means of conventional presses wherein such means function to generate the major part of the applied forces of the presses.

In addititon to the foregoing, in the preferred carrying out of the invention and as illustrated in FIGS. **11** and **12** of the drawings, I provide heat sealing means K about and extending between the several platens U, L and I and adapted to prevent the free escape of heat from about and between the platens.

The means K is shown as including upper and lower end platens **110** and **111** of heat insulating material, such as asbestos cement board, fixed to each adjacent, related pair of vertically spaced manifolds **40** and **94** at the ends of the several platens and each being of sufficient vertical extent to extend more than half way between its related pair of manifolds when the manifolds are in their maximum vertical spaced relationship with each other.

The pairs of upper and lower platens **110** and **111** are mounted to occur in spaced vertical planes and so that the inwardly disposed surface of one establishes sliding sealing engagement with the outwardly disposed surface of the other.

In practice, the plates can be secured to the manifolds or other structure related to the plates and in the case illustrated are secured to the manifolds by means of angle iron mounting strips **112.**

The means K further includes pairs of upper and lower plates **114** and **115** similar to the plates **110** and **111** fixed to the front and rear sides of each adjacent related pair of vertically spaced plates to normally occur in similar sliding sealing engagement with each other. Each of the plates **114** and **115** is pivotally mounted to its related platen to swing outwardly relative thereto and to provide free access to the space between the platens, as clearly illustrated in FIG. **12** of the drawings.

Suitable hinge means **116** are provided to mount the plates **112** and **113,** which spring means are preferably spring loaded to maintain the plates in their normal vertical positions. In one preferred carrying out of the invention, the hinge means **116** include releasable latching means to releasably hold the plates in their open position.

The lowermost of each pair of plates serves as an inclined extension of the platen with which it is related, when in its open position, and facilitates the moving of work into and out of engagement in the press.

In practice, the hinge means **116** and the means provided or included to releasably hold the plates **114** and **115** in the normal and open positions can vary widely in form and construction without departing from the spirit of this invention.

The provision of the means K increases the thermal efficiency of the press as much as 300 percent and its importance cannot be under estimated.

The means K was not shown in FIGS. **1** through **10** of the drawings so as not to obscure other details of the construction and in FIGS. **11** and **12** of the drawings it has been shown related to the platens only so as not to obscure its details of construction.

In practice, and as illustrated diagrammatically in FIG. **13** of the drawings, the operating means O' for the meand D' can include individual gear reduced, reversible motor M' carried by the upper ends of the columns **50'** and coupled with the upper ends of the shafts **62'** related thereto. In such an embodyment of the invention, the motors M' are driven relative to the base B' synchronously to effect raising and lowering of the head H'.

In yet another form of my invention and as illustrated in FIG. **14** of the drawings, the means G, D and O are replaced by hydraulic or pneumatic double acting cylinder and ram units X acting between the related ends of the beams S and S'. In this form of the invention, the cylinder and ram units X are essentially hydraulic or pneumatic jacks and serve to move the head H^2 up and down relative to the base B^2 and also serve to guide the hed relative to the base.

The modified forms of the invention shown in FIGS. **13** and **14** clearly show that the gudie means G and the drive and operating means D and O provided in the first form of are subject to considerable variation without departing from the broad spirit of the invention.

FIG. **15** of the drawings is a view showing a platen I^3 with an electric resistance heater element 32^a arranged between the plates 90^a and 91^a in heat conducting contact therewith and embedded within the thermon case or filler 99^a. The element 32^a is a metal jacketed, sinuate element arranged wholly within the platen and having two terminal ends 93^a and 93^b projecting from one side of the platen to connect with a suitable power supply.

In light of the above, it will be apparent that while in the preferred carrying out of the invention any suitable fluid or gaseous heating medium can be used to heat the press, it can be heated electrically without departing from the spirit of the invention.

Having described typical preferred forms and applications of my invention, I do not wish to be limited and/or restricted to the specific details herein set forth, but wish to reserve to myself any modifications and/or variations that may appear to those skilled in the art.

I claim:

1. A press of the character referred to comprising a lower, fixed base assembly including a concrete filled lower case and a lower platen fixed to and carried by the lower case and including a heat conducting plate with an upwardly disposed work engaging surface and a lower surface and heating tubes in heat conducting contact with the lower surface of the plate, an upper vertically shiftable head assembly including a concrete filled upper case of predetermined mass, an upper platen fixed to and carried by the upper case and including a heat conducting plate with a downwardly disposed work engaging surface spaced above and opposing the upwardly disposed work engaging surface of the plate of the base and having an upper surface and heater tubes in heat conducting contact with the lower surface of the plate of said head, guide means to guide the head assembly including vertical columns fixed to and projecting upwardly from the base assembly, and guide parts fixed to the head assembly and slidably engaged with the columns, drive means to shift the head assembly vertically relative to the base assembly and including vertically extending jack means secured to the base assembly about the perimeter thereof Having described my invention, I engaging the head assembly to shift it vertically relative to the base assembly, said press further includes an intermediate platen including top and bottom heat conducting plates and with outer surfaces defining top and bottom work engaging surfaces opposing the upper and lower work engaging surfaces and opposed inner surfaces, heater tubes between and in heat conducting contact with the inner surfaces of the top and bottom plates, and support means to support said intermediate platen freely between the upper and lower platens for limited vertical movement relative thereto.

2. A press as set forth in claim **1** wherein said press is an elongate structure with opposite ends and opposite sides, said guide means and drive means being arranged at the opposite ends of the press whereby said opposite sides of the press are unobstructed for free access to the space between the platens.

3. A press as set forth in claim **1** wherein said cases include vertical side and end walls, laterally spaced, longitudinal beams extending between the end walls and projecting longitudinally outward from the end walls and a concrete filler within the confines of the wall and about the beams, said guide means and said drive means extending between and related to outwardly projecting end portions of the beams.

4. A structure as set forth in claim **1** wherein the upper and lower platens include frames with vertical side and end walls, mounting means securing the frames to their related concrete filled cases, means on said walls supporting said plates in spaced relationship with their related cases, a partition of heat insulating material within the frames between the plates and their related cases, a core of concrete between the partitions and their related cases, and a matrix of heat conducting cement between the plates and the partitions and through which the tubes extend, said end walls of the frames having openings through which end portions of the tubes extend.

5. A structure as set forth in claim **1** wherein the upper and lower platens include frames with vertical side and end walls, mounting means securing the frames to their related concrete filled cases, means on said walls supporting said plates in spaced relationship with their related cases, a partition of heat insulating material within the frames between the plates and their related cases, a core of concrete between the partitions and their related cases, and a matrix of heat conducting cement between the plates and the partitions and through which the tubes extend, said end walls of the frames having openings through which end portions of the tubes extend, an intermediate platen including top and bottom heat conducting plates with outer surfaces defining top and bottom work engaging surfaces opposing the upper and lower work engaging surfaces and with inner opposing surfaces, heater tubes between and in heat conducting contact with the opposing inner surfaces and support means to support said intermediate platen freely between the upper and lower platens for limited vertical movement relative thereto.

6. A press as set forth in claim **1** wherein said cases include vertical side and end walls, laterally spaced, longitudinal beams extending between the end walls and projecting longitudinally outward from the end walls and a concrete filler within the confines of the wall and about the beams, said guide means and said drive means extending between and related to outwardly projecting end portions of the beams, the upper and lower platens including frames with vertical side and end walls, mounting means securing the frames to their related concrete filled cases, means on said walls supporting said plates in spaced relationship with their related cases, a partition of heat insulating material within the frames between the plates and their related cases, a core of concrete between the partitions and their related cases, and a matrix of heat conducting cement between the plates and the partitions and through which the tubes extend, said end walls of the frames having openings through which end portions of the tubes extend.

7. A structure as set forth in claim **1** wherein said jack means includes elongate screws rotatably carried by the base assembly and threaded collars carried by the heat assembly and engaged with the screws, said construction further including a gear reduced reversible prime mover mounted above the head assembly in fixed relationship with the columns and power trains between the prime mover and the upper ends of the screws.

8. A structure as set forth in claim **7** wherein said cases include vertical side and end walls, laterally spaced, longitudinal beams extending between the end walls and projecting longitudinally outward from the end walls and a concrete filler within the confines of the wall and about the beams, said guide means and said drive means extending between and related to outwardly projecting end portions of the beams.

9. A structure as set forth in claim **7** wherein the upper and lower platens includes frames with vertical side and end walls, mounting means securing the

frames to their related concrete filled cases, means on said frames supporting said plates in spaced relationship with their related cases, a partition of heat insulating material within the frames between the plates and their related cases, a core of concrete between the partitions and their related cases, and a matrix of heat conducting cement between the plates and the partitions and through which the tubes extend, said end walls of the frames having openings through which end portions of the tubes extend.

10. A press as set forth in claim **1** including heat shielding means about and between the platens and including upper plates or heat insulating material mounted adjacent each side of the upper platen and depending therefrom, lower plates of heat insulating material mounted adjacent each side of the lower platens and projecting upwardly therefrom and establishing sliding sealing engagement with the upper plates related thereto, the upper and lower plates at one side of the platen being hingedly mounted whereby said plates can be pivoted outwardly relative to the platens to provide access to the space between the platens.

11. A press as set forth in claim **1** including heat shielding means about and between the platens and including upper plates or heat insulating material mounted adjacent each side of the upper platen and depending therefrom, lower plates of heat insulating material mounted adjacent each side of the lower platen and projecting upwardly therefrom and establishing sliding sealing engagement with the upper plates related thereto, and upper and lower plates at diametrically opposite sides of the platen being hingedly mounted whereby said plates can be pivoted outwardly relative to the platens to provide access to the space between the platens from opposite sides of the press.

12. A press as set forth in claim **1** including an intermediate platen yieldingly supported in spaced relationship between the upper and lower platens, heat shielding means about and between each adjacent pair of platens and including upper plates of heat insulating material mounted adjacent each side of the upper platen of each related pair of platens and depending therefrom, lower plates of heat insulating material mounted adjacent each side of the lower platen of each adjacent pair of platens and projecting upwardly therefrom and establishing sliding sealing engagement with the upper plates related thereto, the upper and lower plates at one side of the press being hingedly mounted whereby said plates can be pivoted outwardly relative to the press to provide access to the space between their related platens.

13. A press as set forth in claim **1** including an intermediate platen yieldingly supported in spaced relationship between the upper and lower plates, heat shielding means about and between each adjacent pair of platens and including upper plates of heat insulating material mounted adjacent each side of the upper platen of each related pair of platens and depending therefrom, lower plates of heat insulating material mounted adjacent each side of the lower platens of each adjacent pair of platens and projecting upwardly therefrom and establishing sliding sealing engagement with the upper plates related thereto, the upper and lower plates at diametrically opposite sides of the press being hingedly mounted whereby said plates can be pivoted outwardly relative to the press to provide access to the space between their related platens from opposite sides of the press.

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