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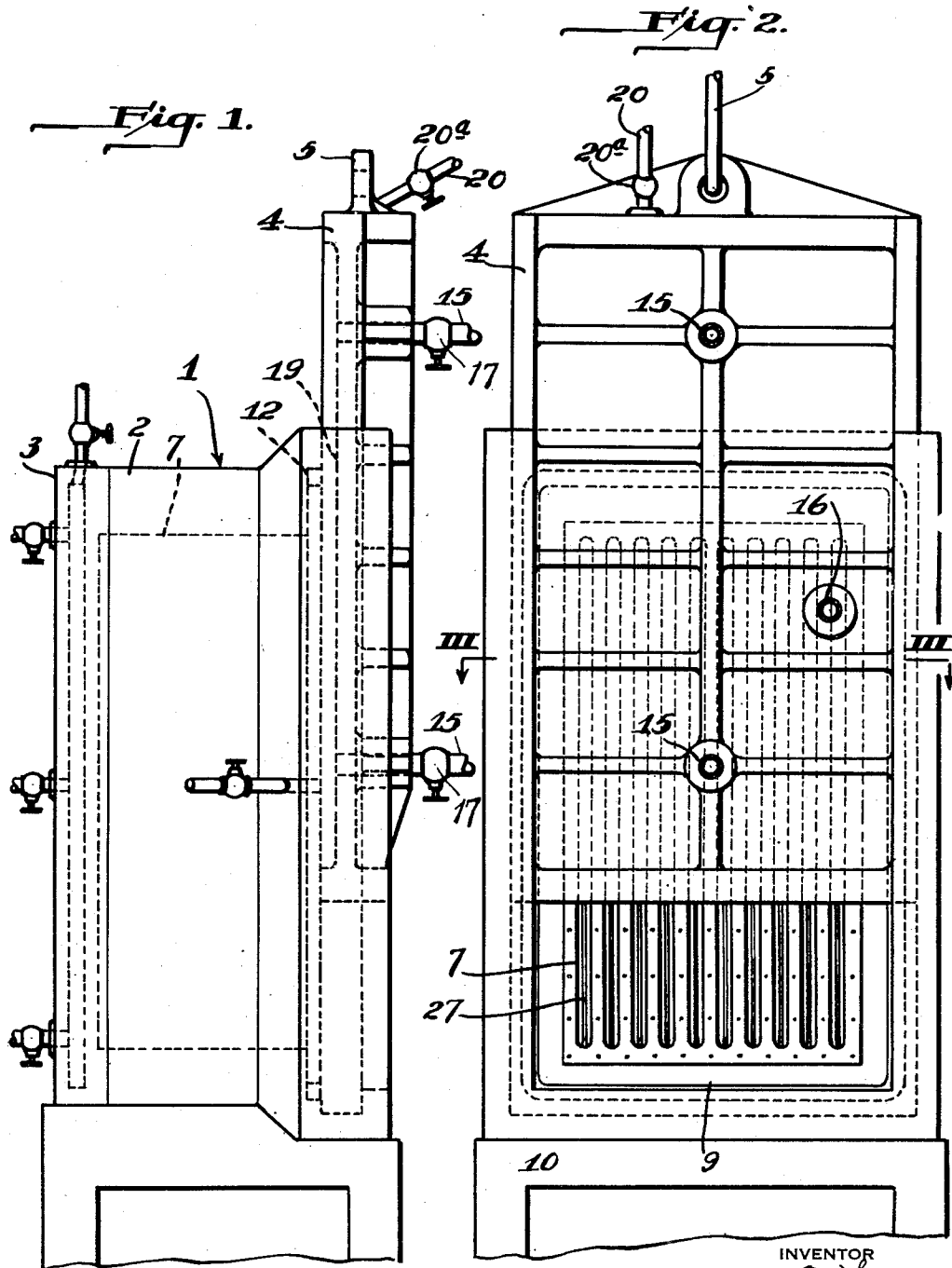
W. O. LYTLE

1,939,998

PROCESS AND APPARATUS FOR MAKING SAFETY GLASS

Filed Aug. 11, 1932

3 Sheets-Sheet 1



INVENTOR

W. O. Lytle
by
Crosby & Bee
attys

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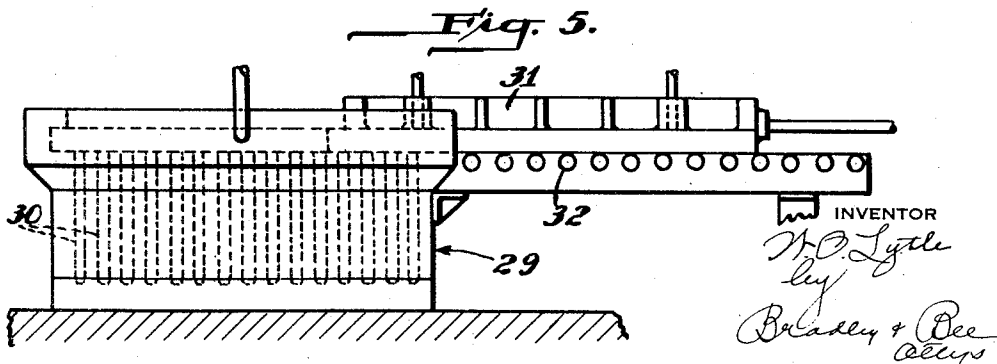
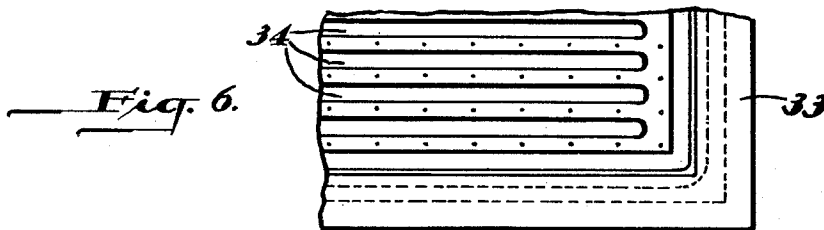
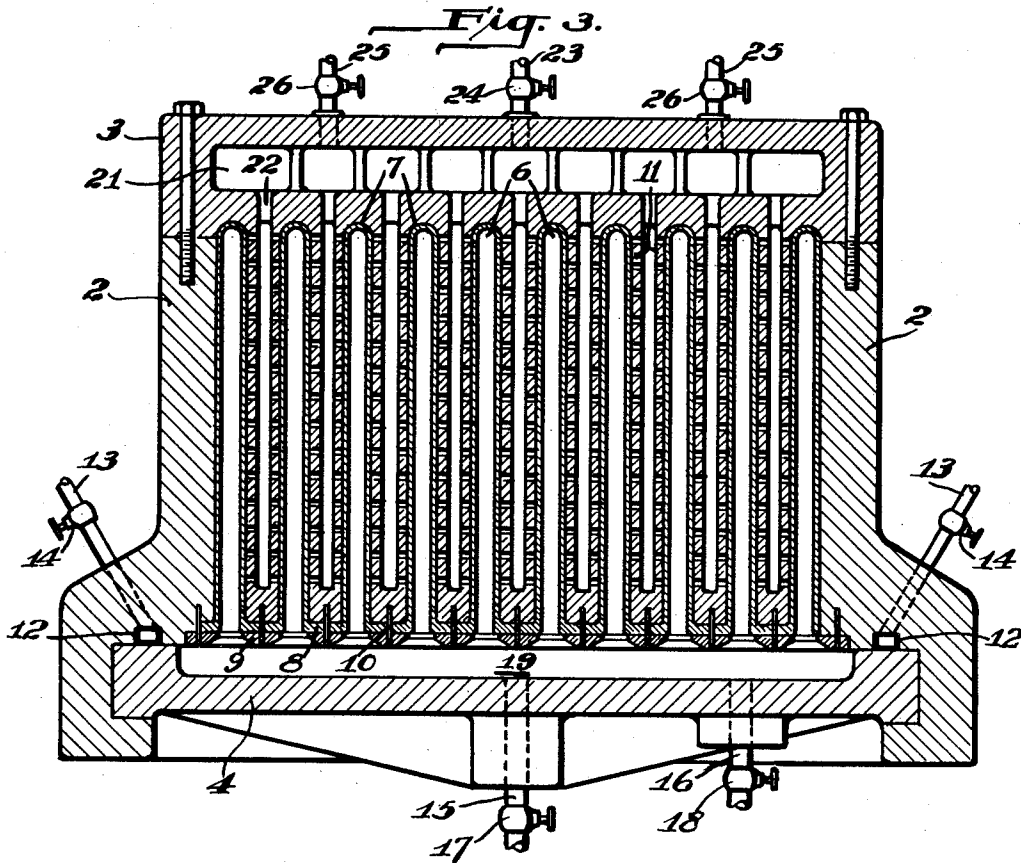
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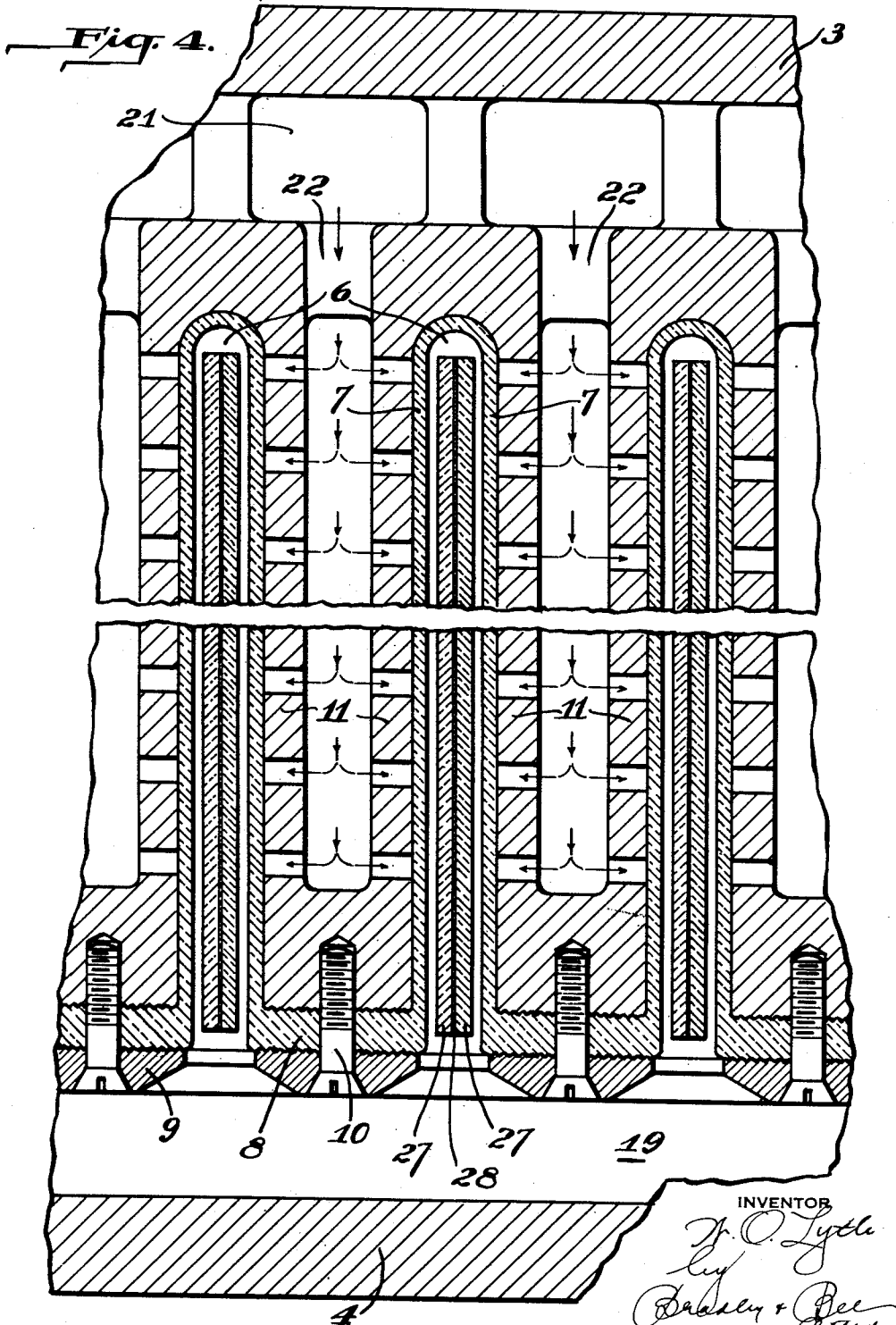
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PROCESS AND APPARATUS FOR MAKING SAFETY GLASS

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UNITED STATES PATENT OFFICE

1,939,998

PROCESS AND APPARATUS FOR MAKING
SAFETY GLASSWilliam O. Lytle, New Kensington, Pa., assignor
to Duplate Corporation, a corporation of Dela-
ware

Application August 11, 1932. Serial No. 628,275

10 Claims. (Cl. 49—81)

The invention relates to a process and apparatus for making safety glass which consists of a pair of glass sheets with an interposed reinforcing sheet cemented thereto, such reinforcing sheet ordinarily being celluloid or some other form of cellulose plastic. The invention has for its principal object the provision of improved means and procedure for practicing the so-called double pressing whereby such process may be practiced, both as to the preliminary and final pressing without handling or shifting the plates between the preliminary and final pressing steps as has heretofore been necessary, thus simplifying the operation and reducing the labor required. In the double pressing operation as heretofore practiced, it has been customary to preliminarily laminate the sheets in a platen press, or to pass them between pressure rolls, thus sealing the edges of the plates, after which they were finally pressed by placing them in a tank or autoclave filled with a pressing fluid and applying heat and pressure. In the practice of my present invention, these two steps of first pressing to seal the joints and finally pressing in direct contact with a fluid under pressure are carried out in a single tank or container. The preferred form of apparatus is shown in the accompanying drawings, wherein:

Figure 1 is a side elevation of the apparatus with the sliding door or closure partially open. Fig. 2 is a front elevation of the apparatus of Fig. 1. Fig. 3 is a horizontal section on the line III—III of Fig. 2. Fig. 4 is a partial horizontal section also on the line III—III of Fig. 2, but on an enlarged scale. And Figs. 5 and 6 are side elevations illustrating two modifications of the construction wherein the tank or autoclave is differently positioned.

Referring first to the construction of Figs. 1 and 4, 1 is a pressing tank or autoclave made up of the side members 2, 2, the back member 3, which is in the form of a header and is bolted to the side members 2, 2, as indicated in Fig. 3; and 4 is a sliding gate or closure suitably mounted in slideways and movable vertically by means of a chain 5 connected to a suitable hoist, which is not shown. Mounted in the container are a plurality of narrow vertical compartments 6, 6, 6, etc. which open toward the gate 4 and whose walls 7 are formed of rubber. The forward edges of the rubber sheet 7 are turned laterally, as indicated at 8 (Fig. 4) and clamped in position by means of a cover 9 secured by the bolts 10. The clamping surfaces are corrugated, as indicated in the drawings, in order to give

greater security. The header member 3 is provided with a plurality of parallel perforated plates 11, 11, etc. which act as supports for the rubber sheet 7, such support being necessary when a vacuum is applied to the exterior of the rubber compartments as later explained in connection with the operation of the apparatus.

In order to make a proper seal between the gate or closure 4 and the guideways of the container, the hollow rubber gaskets 12, 12 are provided, as indicated in Fig. 3, to which are connected supply pipes 13 provided with valves 14. When the door is in closed position, an application of air pressure through the pipes 13 causes the pipes 12 to expand and make a seal at the edges of the gate or closure. The gate is also provided with a plurality of inlet passages to which are connected the pipes 15, 15 and 16 having the valves 17 and 18. Since all of the compartments 6 open into the space 19 between the gate and the ends of the compartments, fluid pressure may be supplied simultaneously to the interior of the compartments or exhausted therefrom by means of the pipes 15, 15 and 16, the pipes 15 being connected to a means for supplying a pressing fluid, preferably a high boiling liquid, while the pipe 16 is connected to an exhausting device. Two inlet pipes 15, 15 are employed in order to provide for a circulation of the pressing fluid. The gate is provided with a further passage carrying a venting pipe 20 having a valve 20^a, this vent being employed to permit the escape of air when the pressing fluid is being supplied through the pipe 15.

The space 21 inside the autoclave which is connected to the slots 22, 22, 22, etc. may be exhausted by means of the vacuum pipe 23 provided with a valve 24, or pressure may be supplied to this space by means of the pipes 25 provided with valves 26. The use of the two inlet pipes 25, 25, permits of a circulation of the pressing fluid.

In order to load the apparatus, the gate is moved to its upper position, thus exposing the outer ends of the compartments 6, 6, etc. Into these compartments are placed the sets of sheets for laminating. In each case, the set of sheets comprises a pair of glass sheets 27, 27 and an interposed sheet 28 of cellulose plastic reinforcing, the contacting surfaces of the sheets being provided with a suitable cement, such as gelatin, which will form a bond upon the application of heat and pressure. After the tank or autoclave is loaded, the gate 4 is moved down to closed position and air pressure is applied to the sealing

pipes 12, 12. The air is now exhausted from the
 space 19 and from the interiors of the compart-
 ments 6 by means of the vacuum pipe 16. At the
 same time that the air is thus exhausted by means
 5 of the pipe 16 or after a short interval, fluid
 under pressure is supplied to the space 21 in the
 tank outside the compartments 6, 6, etc. by
 means of the pipes 25, 25, such fluid being prefer-
 10 ably steam so as to provide heat as well as
 pressure. The application of this pressure aids
 the vacuum in causing the flexible walls 7, 7 to
 collapse and apply pressure to the sets of sheets
 lying in the compartments, thus compositing or
 15 laminating the sheets and preparing them for the
 final laminating operation, as later described.
 The steam pressure may be relatively light as all
 that is necessary is to rid the sets of sheets from
 entrapped air and seal the sheets at the edges so
 20 that the liquid employed in the final pressing
 operation will not penetrate at the edges of the
 plates. The application of vacuum to the com-
 partments 6, 6, etc. while pressure is being ap-
 plied to the sheets is generally desirable for suc-
 25 cessful operation in order to get rid more cer-
 tainly of any entrapped air between the sheets.
 It is quite possible to perform this preliminary
 pressing operation without the application of
 any pressure through the pipes 25, 25, although it
 30 is much preferred to apply such pressure. If
 such pressure is not applied through the pipes 25,
 25, the pressing force is supplied due to the ex-
 hausting of the air from the space 19 and com-
 partments 6 by means of the exhaust pipe 16.
 This gives an atmospheric pressure in the pres-
 35 sure tank outside the compartments 6, 6, etc. of
 about 12 pounds per square inch and, under cer-
 tain conditions, this pressure is sufficient to pre-
 liminarily laminate the sheets in the compart-
 40 ments.
 The plates in the compartments 6, 6, etc. now
 having been preliminarily laminated, final com-
 positing is accomplished by admitting a pressing
 fluid under pressure to the space 19 and to the
 45 interior of the compartments, such fluid being
 preferably a solvent of the cellulose plastic, such
 as diethylene glycol, although various other fluids
 may be used as is well known in the art. This
 liquid is admitted through the pipes 15 and
 50 brought up to a proper temperature and pressure,
 the pressure being preferably about 150 pounds
 per square inch and the temperature about 250 de-
 grees F. This gives the final pressing action upon
 the composited plates in the rubber-walled com-
 55 partments. The preliminary pressing operation,
 as above described, prevents any penetration of
 the liquid at the edges of the plates. During
 this operation, the perforated plates 11, 11 at
 the sides of the rubber sheets 7 may be so made as
 60 to support such sheets and prevent the bursting of
 the bags. At this time, the space 21 may be open
 to the atmosphere, but it is preferable to sup-
 port the compartments by admitting pressure to
 this space sufficient to counterbalance the pres-
 65 sure applied to the interior of the compartments.
 After this final pressing operation, the pressing
 fluid is withdrawn from the space 19 and the
 interior of the compartments and the door 4 is
 moved to its upper position to permit the re-
 70 moval of the completed plates. In order to
 facilitate this removal and to permit the ready
 insertion of a new set of plates into each set of
 compartments, vacuum is applied to the space 21
 by means of the pipe 25. This application of
 75 vacuum causes the walls 7 to move out to the po-
 sition shown in Fig. 4, so that any resistance to

the removal of the completed plates is removed.
 The plates may now be removed and a new set of
 sheets prepared for lamination inserted in the
 compartments.

In Fig. 5, the position of the autoclave 29 is
 shifted so that the compartments 30 open up-
 80 wards. In this case, the gate 31 slides horizontal-
 ly upon suitable rollers 32 in order to reduce the
 friction. The operation of the apparatus is as
 heretofore described and the details of con-
 85 struction are substantially the same. Fig. 6 illus-
 trates another modification in which the auto-
 clave 33 occupies the same position as in the con-
 struction of Figs. 1 to 4, but in this case the com-
 90 partments 34 for receiving the sets of sheets are
 arranged horizontally instead of vertically. The
 operation and details of construction are the
 same in this form of apparatus as in that of Figs.
 1 to 4. It will further be understood that in the
 application of the preliminary pressure to the
 95 exterior of the rubber compartments, it is not
 necessary that both sides of the compartment
 shall collapse in order to composite the plate as
 the inward movement of the rubber wall on one
 side only will accomplish the desired function, 100
 so that the process may be practiced in a com-
 partment having only one side flexible or mov-
 able.

What I claim is:

1. A method of laminating sheets of glass and 10
 reinforcing material which consists in placing the
 sheets in a compartment with a flexible side, ap-
 plying fluid pressure to the exterior of the com-
 partment to preliminarily laminate the sheets,
 and then supplying fluid under pressure to the in- 11
 terior of the compartment to finally composite
 the sheets.
2. A method of laminating sheets of glass and
 reinforcing material which consists in placing 12
 the sheets in a compartment with a flexible side,
 applying fluid pressure to the exterior of the
 compartment to preliminarily laminate the sheets,
 and then supplying heated fluid under pressure 13
 to the interior of the compartment to finally
 composite the sheets. 130
3. A method of laminating sheets of glass and
 reinforcing material which consists in placing
 the sheets in a compartment with a flexible side,
 applying fluid pressure to the exterior of the com-
 partment to preliminarily laminate the sheets, 14
 exhausting the air from the interior of the com-
 partment, and then supplying heated fluid under
 pressure to the interior of the compartment.
4. A method of laminating sheets of glass and
 reinforcing material which consists in placing 15
 the sheets in a compartment with a flexible side,
 applying fluid pressure to the exterior of the com-
 partment to preliminarily laminate the sheets,
 exhausting the air from the interior of the com-
 16 partment, applying fluid under pressure to the
 exterior of the compartment, and finally applying
 heated fluid under pressure to the interior of the
 compartment. 135
5. A method of laminating sheets of glass and
 reinforcing material which consists in placing 17
 the sheets in a compartment with a flexible side,
 applying fluid pressure to the exterior of the com-
 partment to preliminarily laminate the sheets,
 supporting the side walls of the compartment
 against outward movement and supplying heated 18
 fluid under pressure to the interior of the com-
 partment to complete the lamination of the
 sheets. 145
6. In apparatus for laminating sheets of glass
 and reinforcing material, a pressure tank having 19

a releasable closure means on one side, a series of compartments in the tank for receiving the sets of sheets to be laminated opening toward said closure and having flexible side walls, means whereby the space inside the compartments is sealed off from the remainder of the space inside the tank, means for supplying fluid under pressure to the space in the tank lying outside said compartments to preliminarily press the sheets, and means supplying fluid under pressure to the space inside the compartments to finally press the sheets.

7. In apparatus for laminating sheets of glass and reinforcing material, a pressure tank having a releasable closure means on one side, a series of compartments in the tank for receiving the sets of sheets to be laminated opening toward said closure and having flexible side walls, means whereby the space inside the compartments is sealed off from the remainder of the space inside the tank, means for supplying fluid under pressure to the space in the tank lying outside said compartments to preliminarily press the sheets, and means supplying heated fluid under pressure to the space inside the compartments to finally press the sheets.

8. In apparatus for laminating sheets of glass and reinforcing material, a pressure tank having releasable closure means on one side, a series of compartments in the tank for receiving the sets of sheets to be laminated opening toward said closure and having flexible side walls, means whereby the space inside the compartments is sealed off from the remainder of the space inside the tank, means for exhausting the air from the space inside the compartments, and means for

supplying fluid under pressure to the space inside the compartments to finally press the sheets.

9. In apparatus for laminating sheets of glass and reinforcing material, a pressure tank having a releasable closure means on one side, a series of compartments in the tank for receiving the sets of sheets to be laminated opening toward said closure and having flexible side walls, means whereby the space inside the compartments is sealed off from the remainder of the space inside the tank, means for supplying fluid under pressure to the space in the tank lying outside said compartments to preliminarily press the sheets, means for exhausting the air from said space, means for exhausting the air from the space inside the compartments, and means for supplying fluid under pressure to the space inside the compartments to finally press the sheets.

10. In apparatus for laminating sheets of glass and reinforcing material, a pressure tank having a releasable closure means on one side, a series of compartments in the tank for receiving the sets of sheets to be laminated opening toward said closure and having flexible side walls, means whereby the space inside the compartments is sealed off from the remainder of the space inside the tank, perforated metal plates engaging the side walls of the compartments for supporting them when pressure is applied to the interior of the compartments, means for supplying fluid under pressure to the space inside the tank lying outside said compartments to preliminarily press the sheets, and means supplying fluid under pressure to the space inside the compartments to finally press the sheets.

WILLIAM O. LYTLE.

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