

W. TAYLOR AND F. W. PRESTON.

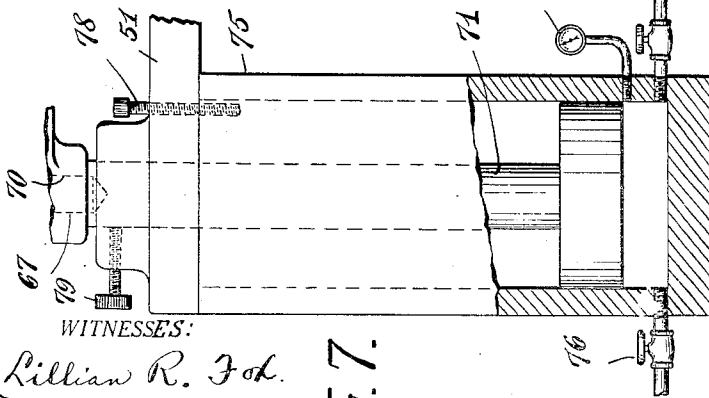
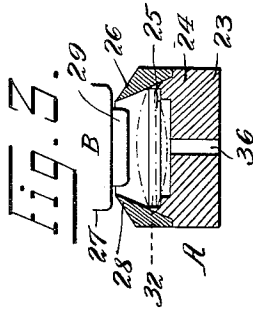
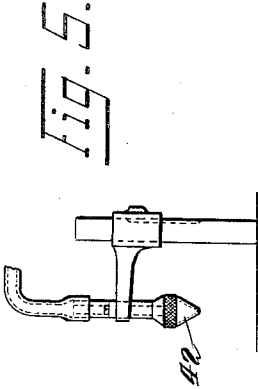
METHOD OF AND MEANS FOR PREPARING LENSES AND THE LIKE FOR GRINDING AND POLISHING.

APPLICATION FILED OCT. 17, 1919.

1,332,778.

Patented Mar. 2, 1920.

3 SHEETS—SHEET 1.



WITNESSES:

Lillian R. Fox.
Maisie Maurus

Fig. 7.

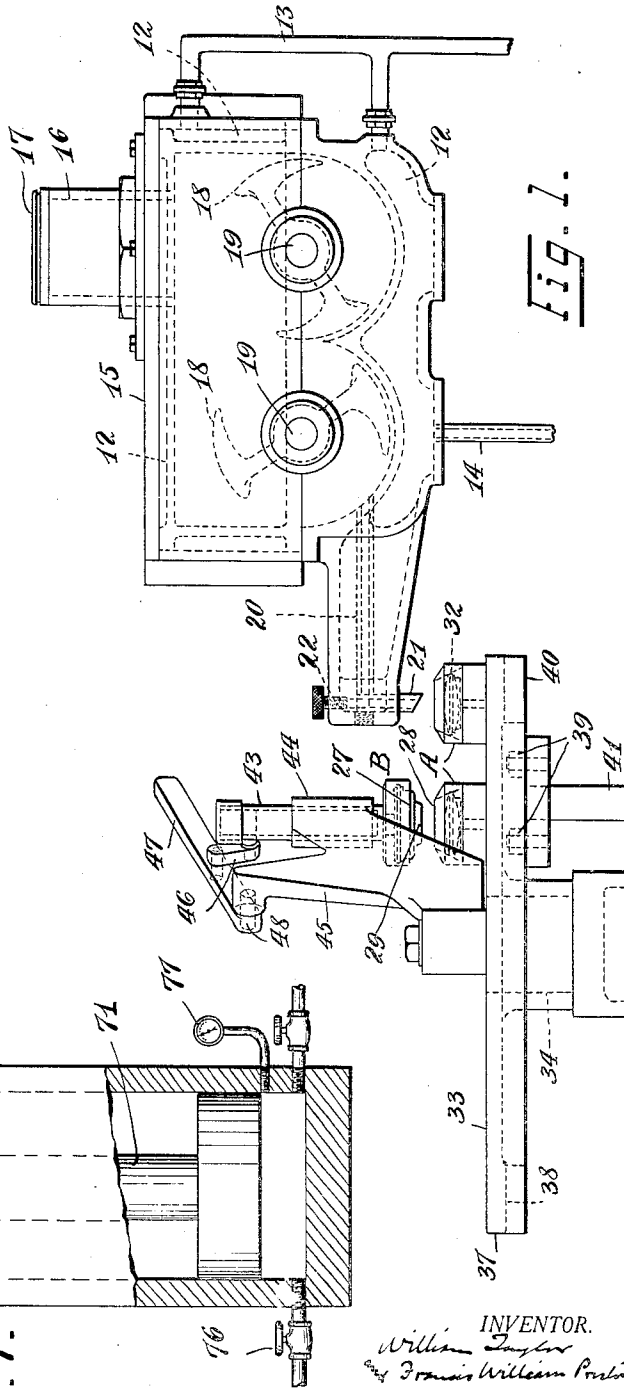


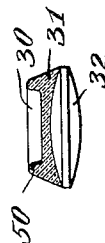
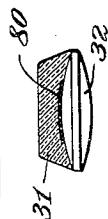
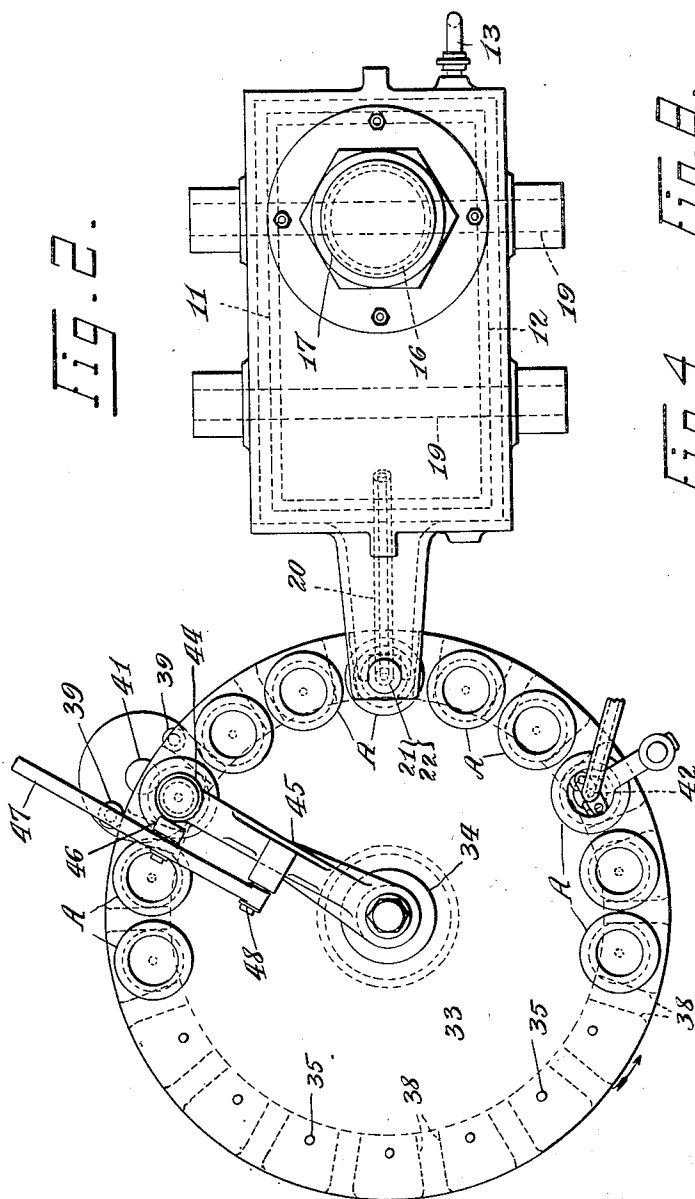
Fig. 1.

INVENTOR.
William Taylor
and Francis William Preston
BY
Arthur H. Kent
Their ATTORNEY.

METHOD OF AND MEANS FOR PREPARING LENSES AND THE LIKE FOR GRINDING AND POLISHING.

Patented Mar. 2, 1920.

3 SHEETS—SHEET 2.



Lillian R. Fox
Maisee Maurus

INVENTOR.
William Taylor
and Francis William Poole
BY

Arthur L. Kent
Their ATTORNEY.

W. TAYLOR AND F. W. PRESTON.

METHOD OF AND MEANS FOR PREPARING LENSES AND THE LIKE FOR GRINDING AND POLISHING.

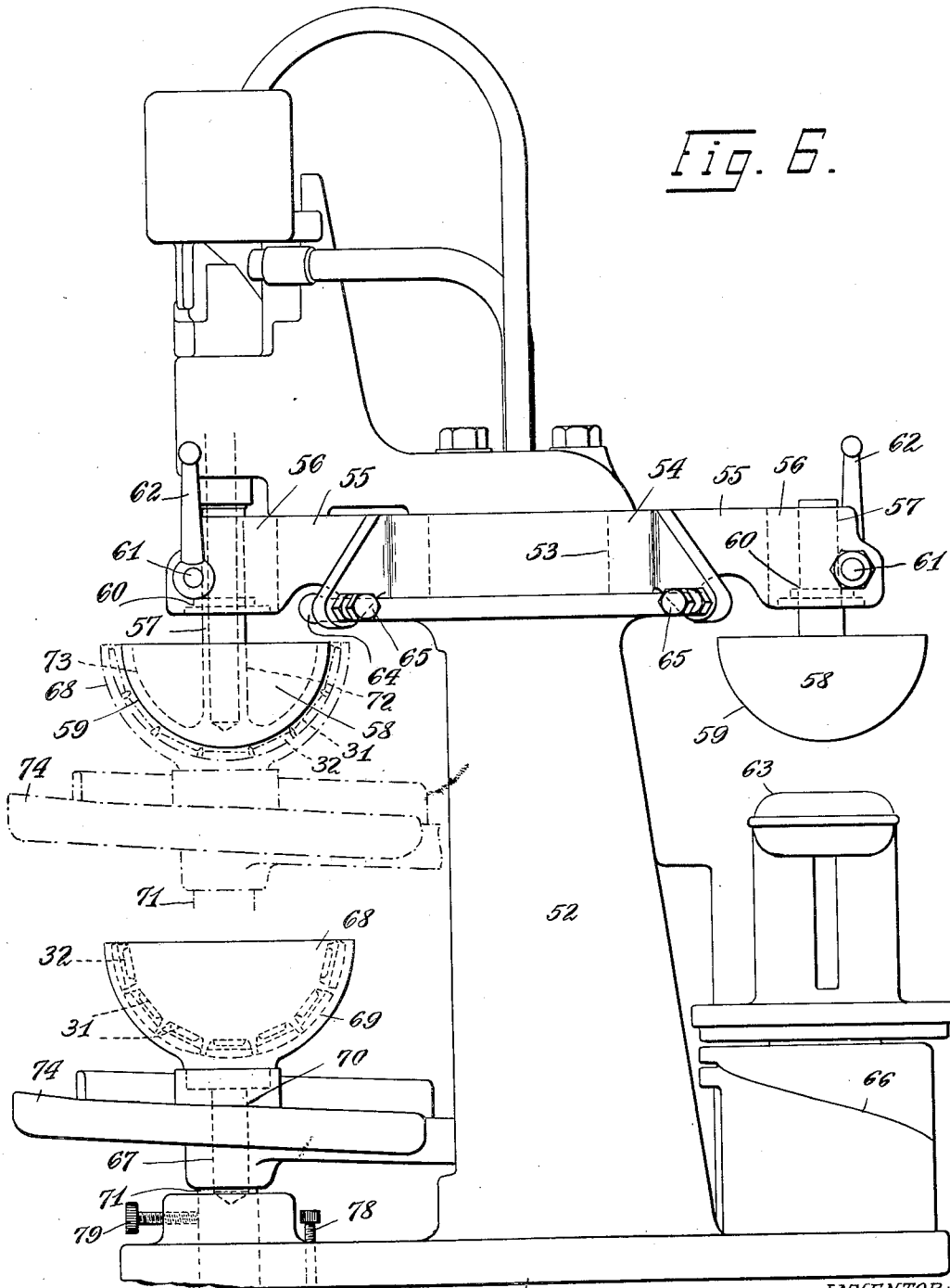
APPLICATION FILED OCT. 17, 1919.

1,332,778.

Patented Mar. 2, 1920.

3 SHEETS—SHEET 3.

Fig. 6.



WITNESSES:
Lillian R. Fox
Marie Maurus

INVENTOR:
William Taylor
Francis William Preston
BY Arthur L. Kears
THE ATTORNEY.

UNITED STATES PATENT OFFICE.

WILLIAM TAYLOR AND FRANCIS WILLIAM PRESTON, OF LEICESTER, ENGLAND.

METHOD OF AND MEANS FOR PREPARING LENSES AND THE LIKE FOR GRINDING AND POLISHING.

1,332,778.

Specification of Letters Patent.

Patented Mar. 2, 1920.

Application filed October 17, 1919. Serial No. 331,436.

To all whom it may concern:

Be it known that we, WILLIAM TAYLOR and FRANCIS WILLIAM PRESTON, subjects of the King of Great Britain, and both residing at 5 Stoughton Street Works, Leicester, in the county of Leicester, England, have invented new and useful Improvements in Methods of and Means for Preparing Lenses and the like for Grinding and Polishing, of which 10 the following is a specification.

This invention relates to improved methods of and means for mounting lenses and the like in preparation for the grinding and polishing operations, and it has for its principal 15 objects to provide appliances with which such mounting may be accomplished more expeditiously than heretofore, and with less risk of springing and distorting the lenses in the mounting.

It is usual, in grinding and polishing 20 lenses, to attach each lens to a holder by means of a material such as pitch intervening between the lens and the holder. A number of lenses are frequently held in this way to 25 one holder, so that their surfaces conform to one general surface and may be ground and polished together. Such a group is termed a "block".

The customary manner of attaching lenses 30 to a holder is liable to give rise to various defects in the finished lenses, the principal defect being due to the fact that the lenses, (apparently through local shrinkage and expansion of the pitch) become strained in 35 such manner that although, so long as the lenses remain on the holder and up to the completion of the polishing process, their surfaces may have a form which is satisfactory, nevertheless when finally removed from 40 the pitch the lenses, being released from strain, become distorted.

Systematic investigation of this subject has shown us that, in order to reduce such distortion, the pitch should be homogeneous 45 in composition; the mass of pitch when applied to the lens should be of uniform temperature; the pitch backing on each lens should be placed symmetrically about the axis of the lens; the backings on all similar 50 lenses in a block should be uniform in size and shape; during the time when the lenses are being attached to the holder, it and the tool should be co-axial and be constrained to preserve this relation; at the end of the op- 55 eration their surfaces should be concentric;

and during the operation as little as practicable of the pitch in each lens-backing should be melted by the holder.

We further find that, in the case of some lenses we can reduce the distortion by forming the pitch backing hollow at the center 60 or heart of the mass of pitch, or by preventing its adhesion to the glass at the center or other zone. Distortion of the lenses may increase after the pitch has been heated for 65 some time in the pot, probably owing to some of the constituents of the pitch being evaporated, and accordingly we aim at reducing this deterioration. Finally, in order to reduce the unpleasant labor of handling 70 hot pitch and to expedite output, we perform these operations mechanically in one or more machines.

According to the present invention, a backing of binding material for each lens is 75 separately molded in a closed mold. A group of lenses to which such backings have been applied are brought into contact with a holder which is heated to soften the back- 80 ings, and the lenses are so held that their surfaces are all at a uniform distance from the surface of the holder. In making the back- ings it is desirable to form them so that there is no adhesion between the central part of the lens and the holder, distortion of the 85 lens being thus prevented.

In the accompanying drawings, Figures 1 and 2 illustrate, in side elevation and plan respectively, one form of apparatus for heating and conditioning the pitch, for delivering it to lenses in the molds, for closing 90 the molds, and for coating the surface of each lens with "tacky" previous to the application of the pitch. Fig. 3 is a side elevation, partly in axial section, of one of the 95 molds seen in Figs. 1. and 2. (but drawn to a larger scale) together with the plunger which constitutes the closure for the mold; a bi-convex lens being shown in position in the mold. Fig. 4 is a partly sectional side 100 view of a bi-convex lens with the molded mass of pitch adherent to it. Fig. 5 is a side elevation of a convenient form of "tacky" spray-nozzle.

Fig. 6 is a part side elevation of one form 105 of machine for attaching to holders, either singly or in blocks, lenses to which pitch has been applied in accordance with the invention, preparatory to the grinding or polishing operation; only so much of this machine 110

being shown as is necessary for understanding the invention relative to the operation of "blocking" lenses.

Fig. 7 is a fragmentary side view of the cylinder depending from the base plate of the machine shown in Fig. 6.

Fig. 8 is a view similar to Fig. 4, showing a different method of preventing adhesion between the center of the lens and the holder.

11 (Figs. 1 and 2) is the hollow body or container of a mixing machine, of well known type, which we find suitable for use in heating and conditioning the pitch; the container being provided with a steam jacket 12 supplied with steam through a pipe 13, while 14 is a pipe for draining water of condensation from the jacket. The container 11 has a removable cover 15 provided with a hopper 16 for the introduction of fresh pitch into the container, the hopper being normally closed by a cover 17. A pair of rotary paddles 18, 18 mounted on shafts 19, 19 serve to stir up the pitch within the container 11; the shafts 19, 19 being geared together and adapted to be continuously driven by suitable means (not shown). A steam-jacketed pipe 20 leads from the interior of the container to the point where the pitch is to be delivered to the molds, this pipe terminating in an obliquely-chamfered dependent nozzle 21 the passage between which and the pipe itself is controlled by a screw-down valve 22 for regulating the rate of delivery of the pitch.

By suitably adjusting the pressure of the steam within the jacket 12 so as to avoid overheating, the pitch within the container 11 may be kept fluid without deterioration or loss of important volatile constituents, the conservation of which is assisted by the container being closed; while the continuous action of the paddles 18 serves to keep the mass of pitch thoroughly homogeneous and uniform in temperature throughout.

The mold A shown in detail is Fig. 3 comprises a base portion 23 surmounted by a circular ledge 24 presenting at its inner side a seating 25 of a diameter to receive and hold the lens to which the pitch is to be applied, the lens being supported around its margin only, while over the outer side of the ledge 24 is removably fitted an annular inwardly-conical cap 26 which, rising above the upper surface of the lens, forms a coaming adapted both to retain the lens in position within the mold and also to confine the pitch laterally during the molding operation. The plunger B which forms the closure for the mold is adapted to be brought into operative position, after the mold has been filled with pitch, by downward movement in the direction of the common axis of the mold, lens and plunger, and, in the example illustrated, comprises an annular rim

27 adapted to contact with the upper edge 28 of the cap 26 and a central circular projection 29 which, by entering the mass of pitch bounded by the cap, forms in said mass a central depression 30, so that the pitch 31 which adheres to the lens 32 when the latter is removed from the mold, presents in axial section the profile shown in Fig. 4.

In order to facilitate the pitching of a number of lenses in succession, a circular series of molds A is detachably mounted upon a horizontal turntable 33 fitted to revolve about a fixed vertical stud 34 and provided at equal intervals with upright pegs 35 (Fig. 2) adapted to enter holes 36 (Fig. 3) in the base portions 23 of the several molds; the turntable 33 being rotated step-by-step through angular intervals corresponding to those separating the pegs 35. For this purpose, in the example illustrated the turntable 33 has on its lower side a dependent annular flange 37 in which are formed a series of radial grooves 38 opening out at both the external and internal peripheries of the flange; these grooves, which are spaced apart at angular intervals corresponding to those between the pegs 35, being engaged in succession by a pair of crank pins 39 (carrying antifriction rollers) which project vertically from a disk 40 fast on the upper end of a vertical shaft 41 revolved at a suitable speed by any convenient means (not shown). The shaft 41 may be continuously driven through frictional gearing so as to permit of any convenient means (not shown) being employed for arresting the rotation of the turntable 33 periodically during the intervals when successive molds are being dealt with.

As seen in plan view, Fig. 2, the turntable 33 is to be understood as intended to be revolved contra-clockwise so as to bring successive molds A, first, under a spray-nozzle 42 for delivering "tacky" on to the upper surface of each lens 32 in its mold, secondly, under the pitch-delivery nozzle 21, and thirdly under the plunger B which serves as a closure for all the molds in succession. The "tacky" may be ejected by any convenient means, for example a pneumatically operated device such as is commonly employed for spraying paint, varnish or the like.

The plunger B, which is shown in Fig. 1 as detachably fixed on the lower end of a vertical spindle 43 so as to be changeable to suit different molds, is actuated by sliding the spindle 43 through a stationary guide 44 supported on a bracket 45 extending from the fixed stud 34 about which the turntable 33 revolves; the upper end of the spindle 43 being connected by a link 46 to a hand-lever 47 fulcrumed at 48 to the bracket 45. The spindle 43 may be normally retained in the raised position, so as to hold the plunger B clear of the molds A,

by means of a spring such as a coiled spring housed within the guide 44 but not shown in the drawing. As the plunger is depressed by means of the lever 47 until arrested by the rim 27 encountering the edge 28 of the mold-cap 26, the surplus pitch escapes over the edge 28. After the pitch has set to the shape given to it by the mold and plunger, the plunger is raised and the lens 32 with its adherent mass of pitch can be removed from the mold. The central depression or cavity 30 formed in the mass of pitch, (see Fig. 4) leaves only an annular rim 50 of pitch by which alone the lens is subsequently attached to the holder for grinding or polishing, as hereinafter described; the central depression or cavity 30 serving to relieve the lens 32 of the strain which would be imposed upon it by the cooling of a solid mass of pitch interposed between the lens and the holder, owing to the shrinkage of such mass, which takes place last at its center, resulting in the drawing in of the center of the lens and thus causing distortion.

The machine illustrated in Fig. 6 comprises means for supporting a holder to which the pitch-backings of a number of lenses are to be made to adhere; means for heating the holder; means for positioning the holder relatively to a tool forming a guide or mold in or on the surface of which the lens surfaces to be ground or polished are seated; means for causing the tool with its assemblage of pitch-backed lenses to approach the heated holder so as to cause all the pitch-backings to adhere to it simultaneously; and means for enabling the holder to be cooled when the lenses have become properly bedded upon its surface.

In Fig. 6, 51 is a base-plate adapted for being fixed to a bench or other convenient support and supporting an upright standard 52 having toward its upper end a cylindrical necking 53 about which a turret 54, carrying a pair of radial arms 55, 55, is fitted to rotate in a horizontal plane. Each arm 55 is formed at its outer end with a cylindrical bearing 56 adapted to receive the vertical shank 57 of a holder 58 to which a number of lenses, backed with pitch in accordance with the present invention, are to be attached by causing the pitch-backings of the lenses to adhere simultaneously to the operative surface of the holder. In the example illustrated, each holder 58 is shown as having a convex hemi-spherical operative surface 59 adapted for adhesion to the pitch-backings 31 of a number of bi-convex lenses 32 as in Fig. 4; the surface 59 being disposed symmetrically about the shank 57, the axis of which passes through the center of curvature of said surface. Each holder 58 is mounted in the machine by passing its upwardly-extending shank 57 upward through one of the bearings 56

until a shoulder 60 on the shank encounters a corresponding shoulder formed in the bearing; the bearing being split so as to constitute a pair of spring jaws and provided with a clamping screw 61 adapted to be operated by a handle 62 whereby the shank 57 can be securely clamped in the bearing 56.

The arms 55, 55 project from the turret 54 in opposite directions so that the holders 58, 58 are simultaneously presented, the one (shown at the right hand side of the drawing) in a position vertically above a gas-burner 63, and the other (shown at the left hand side) in position for having the pitch-backed lenses affixed to it; the respective holders 58, 58 being capable of being brought into these positions by rotating the turret 54 and arms 55, 55 about the neck 53 in the one direction or the other alternatively; while such movement of the turret and arms is limited to the exact angle through which they require to be swung, by means of a fixed stop 64 on the standard 52 with which adjustable screw-studs 65, 65 on the turret are adapted to engage from opposite sides alternately.

The gas-burner 63 is circular, and is shown as mounted concentrically on a circular stand comprising a fixed base-portion carried by the base-plate 51 and an upper portion to which the burner is attached; the upper portion resting upon the base-portion rotatably at a helical ramp-surface 66 so as to be capable of being raised or lowered, to vary the distance of the burner 63 from the surface of the holder 58 as may be required, by turning the upper portion of the stand about its vertical axis. Suitable gas-connections (not shown) are provided for enabling such adjustment to be made.

When, after having been heated over the burner 63, a holder 58 is brought to the position shown at the left hand side of the drawing (a fresh holder being meanwhile subjected to the heating process), the already heated holder is presented with the axis of its shank 57 in alinement with the axis of the vertical shank 67 of a tool 68 consisting, in the example illustrated, of a cup-shaped member having a concave hemispherical surface 69 adapted for the reception of the lenses 32 which are to be caused to adhere to the holder 58; the surface 69 (to which the contiguous unground or unpolished surfaces of the lenses conform when the lenses are laid side-by-side in the holder) being disposed symmetrically about the shank 67, the axis of which passes through the center of curvature of said surface. The tool 68 is mounted in position in the machine by inserting its downwardly-extending shank 67 into a socket 70 in the upper end of a vertical ram 71 fitted to slide in a cylinder

75 fixed to and dependent beneath the base-plate 51; the cylinder 75 being furnished with means whereby elastic fluid under pressure (for example, compressed air) may be admitted to it so as to raise the ram 71 and cause the tool 68 to approach the holder 58, when required, for the purpose of forcing the assemblage of pitch-backed lenses 32 carried by the tool 68, against the heated surface 59 of the holder by elastic or yielding pressure sufficient to cause the pitch-backings of the entire assemblage of lenses to adhere simultaneously to the holder. A valve 76 may be provided for regulating the fluid pressure, the amount of which may be ascertained from an ordinary pressure-gage 77 placed in any convenient position.

When the heated holder 58 has become sufficiently embedded in the pitch-backings of the lenses, which would generally be when the spherical surfaces 59 and 69 are concentric with one another, further approach of the tool 68 toward the holder 58 may be prevented by a stop 78, or by locking the ram 71 which carries the socket 70 for the tool 68, as for example by means of a clamping-screw 79. Any convenient means may be adopted for indicating when the limit of approach has been reached; in the example illustrated, if the operative surfaces of the holder and tool are both hemispheres, they will be concentric when their edges or rims lie in the same plane.

When the operation of bedding together the holder 58 and the pitch-backings of the lenses is complete, it is usually advisable to cool the holder promptly so as to prevent further melting of the pitch, for which purpose, in the example illustrated, the shank 57 of the holder has an axial passage 72 for the reception of cold water, while the holder itself is concave on its upper side to constitute a basin or trough 73, also for the reception of cold water. The cooling water may be introduced into the passage 72 and basin 73 from above, as required, by means of suitable pipes provided with valves under the control of the attendant. If the holder 58 were concave and the tool 68 convex, the outer surface of the holder might be cooled by allowing water to flow over it from above. In any case a catch-pan, for any surplus water which may fall from the holder 58, may be provided as at 74, this pan being connected with a drain by a suitable outlet pipe.

Modifications may be made in the specific method and apparatus described without departing from our invention. Among them are the following:—

The distortion of the lenses which will be caused by the adherence of a thick layer of pitch to their center portions may be avoided by placing a thin layer of non-adhesive material 80 upon the center of the

lens before the pitch is poured into the mold. It is desirable to use a substance dissoluble in water for this purpose, or a sheet of paper may be used. If this is done, it serves the same purpose as producing a central cavity in the pitch backing in the specific method described.

In the apparatus shown in Fig. 6, the tool 31 may be held by gravity in a spherically curved supporting member instead of being supported upon a stud 67.

Instead of molding a pitch backing on each lens separately as in the specific method described, a single pitch backing may be molded directly in the tool 68 and then transferred to the holder 58 by bringing the two in contact after the holder is heated. The lenses may then be placed in the tool 31 and pressed into the pitch backing, which is adhering to the holder 32.

Although we have described our method and apparatus as applied to mountings in pitch or like binders capable of being softened by heat, they are by no means limited to such use, as many features of our invention are applicable to the mounting of lenses and similar articles in other binders such as plaster of Paris or other cement which like pitch are liable to shrinkage or extension during setting and so, under old methods, tends to distort the lenses.

Our method and apparatus may be applied not only to lenses, but to other articles, such as polishers, for polishing lenses made of a layer of pitch, wax or the like attached to a metal or similar holder.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A method of mounting lenses and the like, comprising separately molding a binder upon the back of each lens in a mold which definitely determines the periphery of the backing and its relation to the axis of the lens, removing each lens with its molded backing from the mold, and applying the backings of a plurality of lenses to a single holder upon which the lenses are to be mounted.

2. A method of mounting lenses, comprising attaching the lens to a holder by a binder adhering to the lens and the holder at the periphery of the lens and not adhering to both the lens and the holder at the center of the lens.

3. A method of mounting lenses, comprising molding a binder on the back of the lens in such a way as to leave a central recess in the molded binder, and applying the binder to a holder so that the binder adheres to the lens and the holder around the periphery of the lens and does not adhere to both the lens and the holder at the center of the lens.

4. A method of mounting lenses, comprising molding a binder on the back of a lens, pressing a central recess in the molded binder, and applying the binder to a holder so that the binder adheres to the lens and the holder around the periphery of the lens and does not adhere to the holder at the center of the lens.

5. A method of mounting lenses or the like, comprising separately molding a binder upon the back of each lens, placing the lenses in a tool, and approaching said tool to a holder so as to bring the molded binders in contact with the holder and the surfaces of the lenses at a uniform distance from the surface of the holder.

6. A method of mounting lenses or the like, comprising separately molding a binder upon the back of each lens, placing the lenses in a tool, approaching said tool to a heated holder upon which the lenses are to be mounted, and continuing said approaching movement until the molded binders are in contact with the holder and the outer surfaces of the lenses are at a uniform distance from the surface of the holder, and then stopping said approaching movement and cooling the holder.

7. A method of mounting lenses and the like, comprising pressing previously molded binding material between a holder upon which the lenses are to be mounted and the inner surfaces of a plurality of lenses held in a tool by approaching said tool and said holder, and stopping said approaching movement when the outer surfaces of the lenses are at a uniform distance from the holder.

8. Apparatus for mounting lenses or the like, comprising a frame, a curved tool adapted to hold a plurality of the lenses, a stub shaft upon said tool mounted on said frame, a curved holder upon which the lenses are to be mounted, a stub shaft upon said holder mounted upon the said frame coaxially with the stub shaft of said tool, means for causing the relative approach of the holder and the tool along the line of the axis of such stub shafts, and means for arresting said approach when the outer surfaces of the lenses in said tool are equidistant from the surface of said holder.

9. Apparatus for mounting lenses or the like, comprising a frame, a curved tool adapted to hold a plurality of the lenses, a stub shaft upon said tool mounted on said frame, a curved holder upon which the lenses are to be mounted, a stub shaft upon said holder mounted on said frame, coaxially with the stub shaft of said tool, and means for applying elastic pressure to one of said stub shafts to cause the relative ap-

proach of the holder and the tool along the line of the axis of the stub shafts.

10. Apparatus for mounting lenses and the like, comprising a tool adapted to hold a plurality of the lenses, a holder upon which said lenses are to be mounted, means for applying elastic pressure to cause the relative approach of the holder and the tool, and means for arresting said approach when the outer surface of the lenses in the tool are equidistant from the surface of the holder.

11. Apparatus for mounting lenses or the like by a binder which is softened by heat, comprising a tool adapted to hold a plurality of the lenses, a holder upon which the lenses are to be mounted, means for heating said holder, means for causing a relative approaching movement of said tool and holder, and arresting said approaching movement when the surfaces of the lenses are equidistant from the surface of the holder, and means for thereupon cooling said holder.

12. An apparatus for mounting lenses or the like by a binder which is softened by heat, comprising a frame, a turret pivotally mounted upon said frame, a tool adapted to hold a plurality of the lenses mounted upon said frame, a heater mounted upon another part of said frame at the same distance from the point at which said turret is pivoted as said tool, and a holder upon which the lenses are to be mounted mounted upon said turret at the same distance from the point at which said turret is pivoted as the tool and the heater.

13. Apparatus for mounting lenses or the like, comprising a tool having a smooth spherically curved surface adapted to hold a plurality of the lenses, a spherically curved holder upon which the lenses are to be mounted, coaxial with said tool, means for causing the relative approach of said tool and said holder along their common axis, and means for arresting said movement when the surface of the tool and the surface of the holder are concentric.

14. Apparatus for mounting lenses or the like, comprising a tool having a smooth spherically curved surface adapted to hold a plurality of the lenses, a spherically curved holder upon which the lenses are to be mounted, coaxial with said tool, means for causing the relative approach of said tool and said holder along their common axis, and means for indicating the point in said movement at which the surface of the tool and the surface of the holder are concentric.

WILLIAM TAYLOR.

FRANCIS WILLIAM PRESTON.