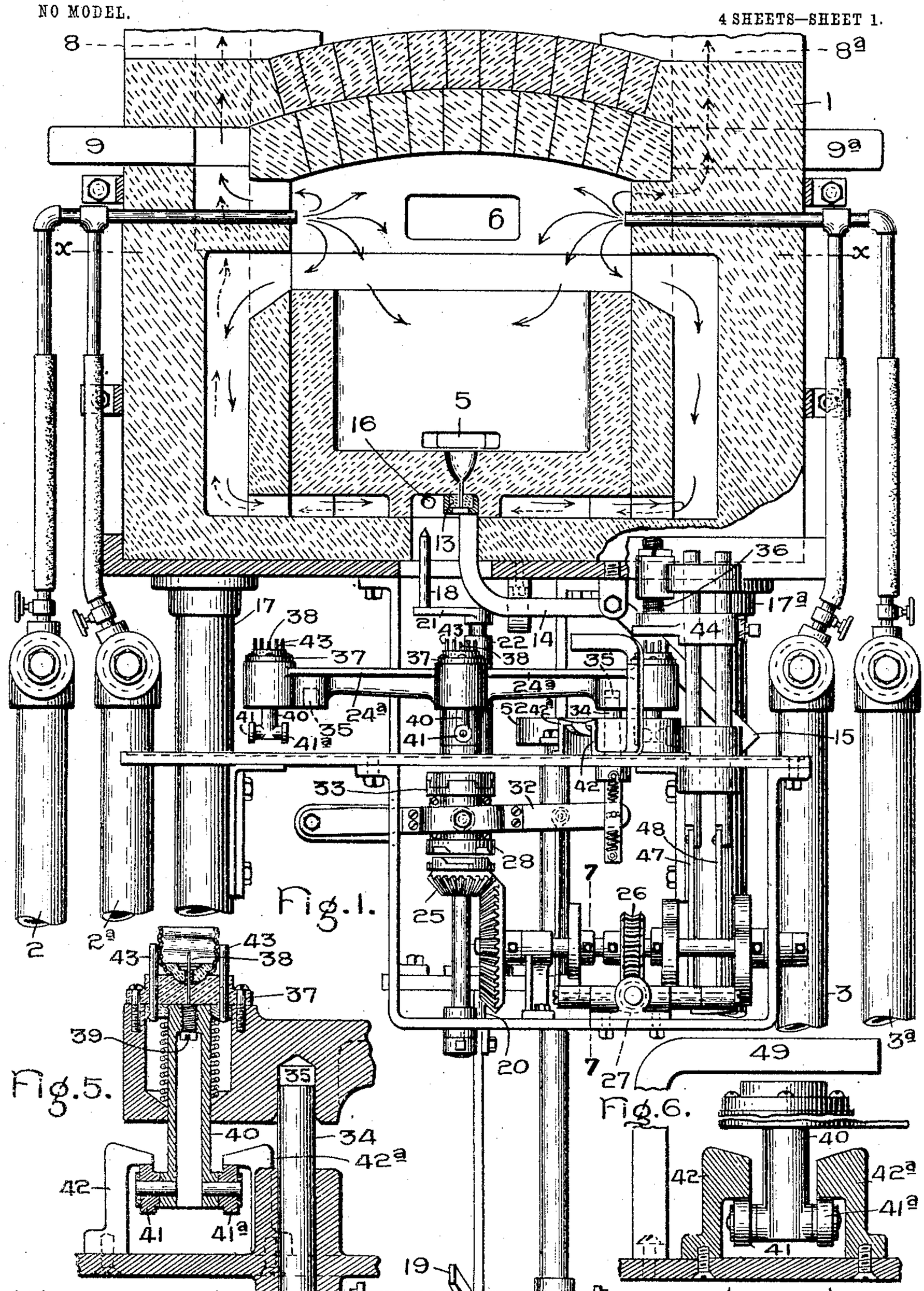
No. 774,708. PATENTED NOV. 8, 1904.

A. SWAN.

PROCESS OF WORKING GLASS.

APPLICATION FILED SEPT. 26, 1902.

NO MODEL. 4 SHEETS—SHEET 1.



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Helen Clifford

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NO MODEL. 4 SHEETS—SHEET 2.

Fig. 2.

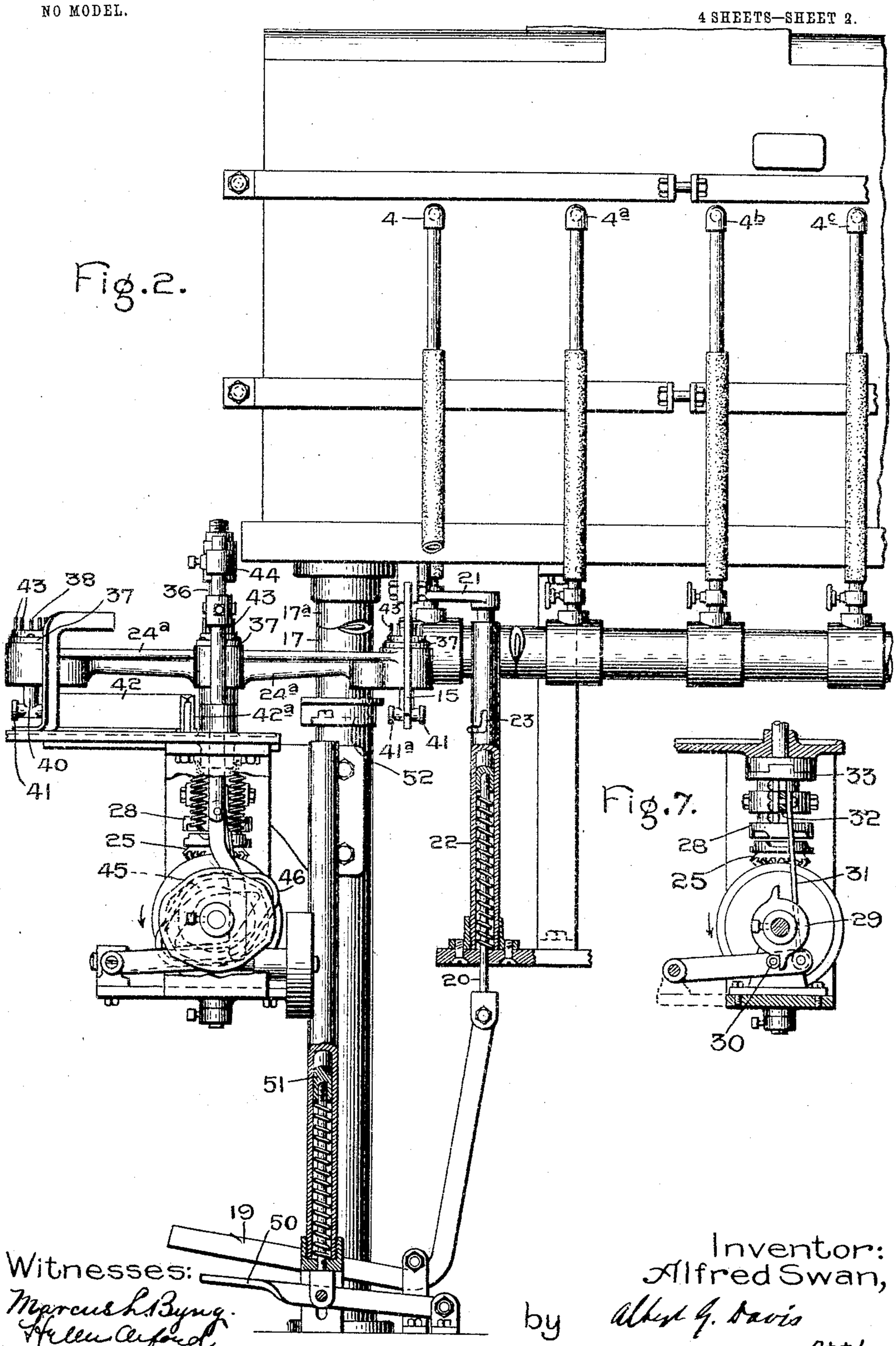

Fig. 7.

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NO MODEL. 4 SHEETS—SHEET 3.

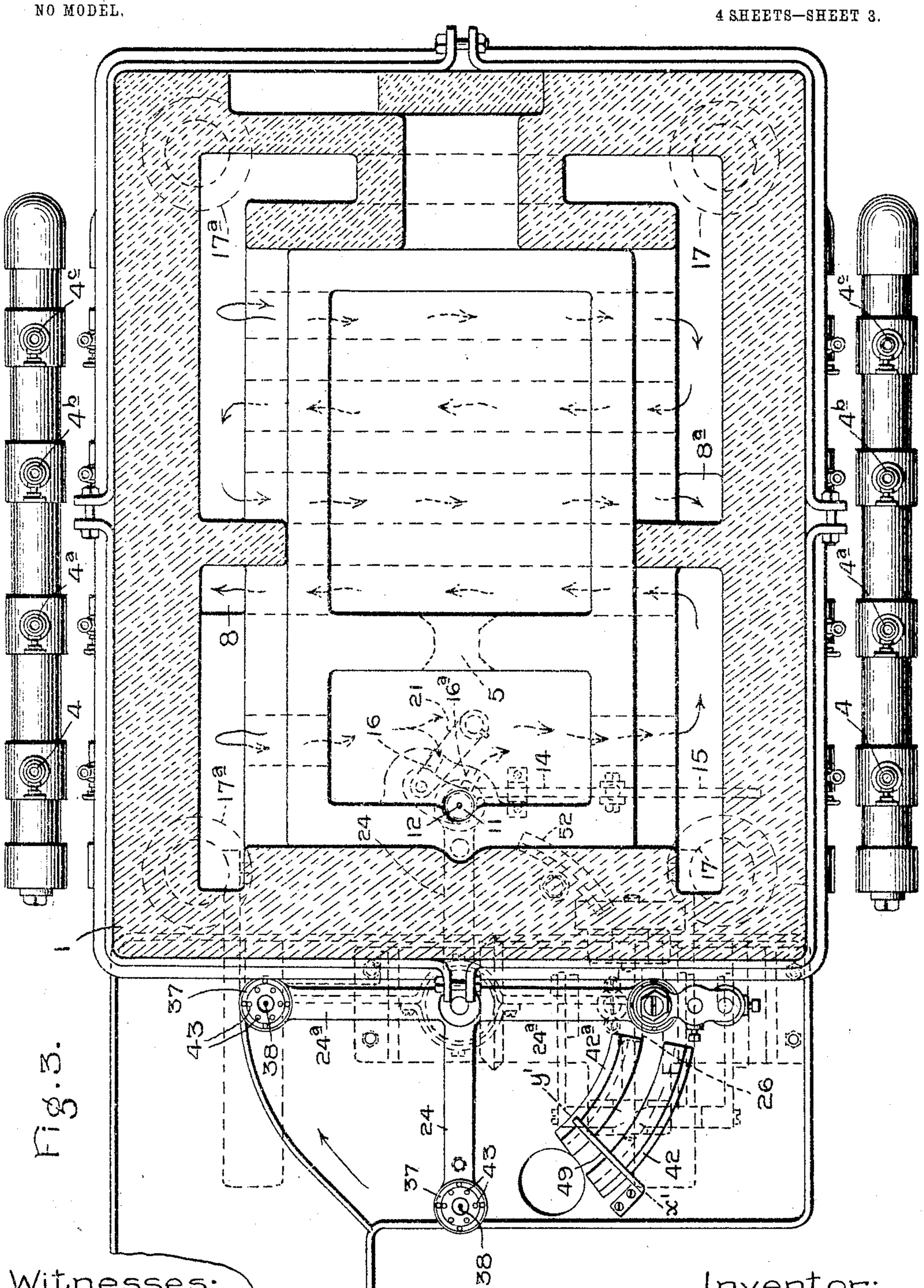

Fig. 3.

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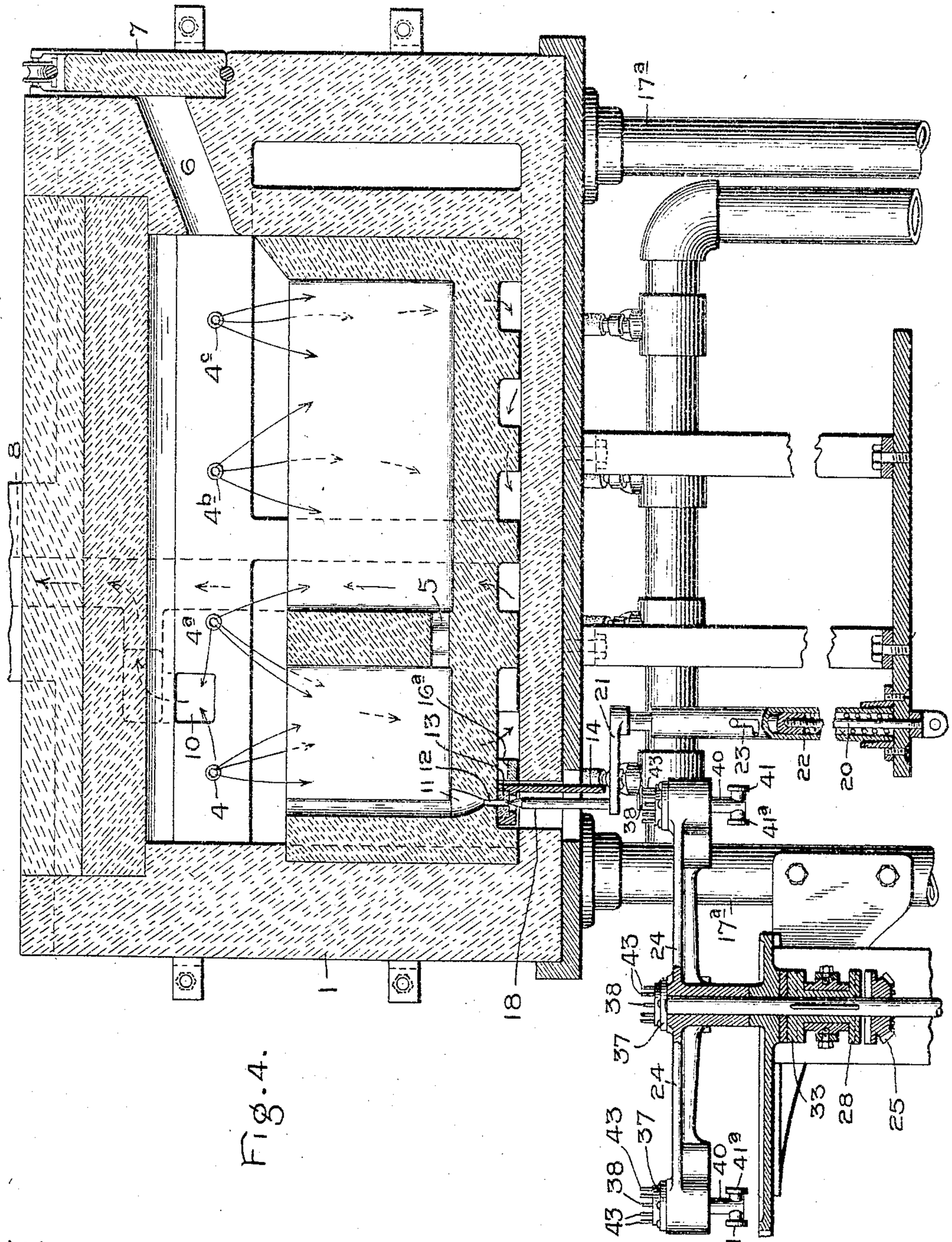

Fig. 4.

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No. 774,708. Patented November 8, 1904.

UNITED STATES PATENT OFFICE.

ALFRED SWAN, OF NEW YORK, N. Y., ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

PROCESS OF WORKING GLASS.

SPECIFICATION forming part of Letters Patent No. 774,708, dated November 8, 1904.

Original application filed March 25, 1901, Serial No. 52,707. Divided and this application filed September 26, 1902. Serial No. 124,900. (No model.)

To all whom it may concern:

Be it known that I, ALFRED SWAN, a subject of the King of Great Britain, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Processes of Working Glass, of which the following is a specification.

This invention relates to glass-molding machines, the particular object being the manufacture of an improved base for incandescent electric lamps. The bases of Edison lamps are commonly composed of a brass shell which constitutes one terminal of the filament and a centrally-positioned contact constituting the other terminal of the filament, the two being held in definite relation by a plaster-of-paris filling. Sometimes a porcelain compound is used in place of the plaster-of-paris. The type of base to which this invention relates is similar in some respects to the porcelain type, but is cheaper to manufacture, stronger, and practically moisture-proof and air-tight. The brass shell and center contact are connected rigidly together by a web of glass in which both parts are firmly seated. A construction of this kind was fully described in a companion application filed by me, Serial No. 53,882, on or about April 1, 1901. My present invention relates to the manufacture of these bases, although some of its features are applicable to other products.

In carrying out the invention I provide a furnace in which the glass mixture is maintained in fusion in a state of free mobility, so that the glass mixture will flow freely, like water. Gas and air pipes are applied to the furnace and means provided by which the heat may be maintained to keep the glass in a fluid condition. In the bottom of the furnace is a small opening through which while the machine is running the glass is permitted to flow in an uninterrupted stream, means being provided for shutting off the stream when the machine is stopped. Beneath the furnace is a group of molds or supports in which the parts of the lamp-base or other article to be molded are set, these molds preferably being arranged so that while some of the bases are in process of being filled with liquid glass and pressed into shape others are in a position to be assembled by the operator or operators. The molds are carried on a rotary head adapted to have an interrupted movement controlled automatically by the machine, by which the assembled parts of the base are brought first beneath the stream of fluid glass and held there for a sufficient interval to receive the proper amount of the glass to constitute the web between the shell and center contact, after which the mold and shell which it carries are quickly shifted beneath a die, where the glass is pressed into shape, firmly uniting the parts of the base. Another automatic movement of the machine then ejects the finished base and consecutively brings other bases beneath the stream of molten glass and die. By permitting the stream of glass to flow uninterruptedly the aperture in the bottom of the furnace does not clog up and the machine is always in condition to supply the bases fed by the rotary carrier with glass of the best working consistency.

While these improvements are of particular advantage in the manufacture of lamp-bases, certain features are applicable also to other uses where it is desired to cheaply mold such a material as glass.

My present application is restricted to the process of working glass and is a division of my original application, Serial No. 52,707, filed March 25, 1901, in which claims are made to other features of my invention than those claimed herein.

The distinguishing feature of my process is that fluid glass—that is, glass which has been raised to such a high temperature that it will flow freely through a small orifice—is admitted to the contacts of an incandescent lamp-base and then solidified. When in such a fluid condition, the glass flows in around the base parts before it is chilled by contact with them and with the die and by exposure to the air. Also a close union between the glass and the brass base parts is obtained when fluid glass is used, making the completed base practically air-tight and moisture-proof. An-

other distinguishing feature of my process lies in maintaining a continuously-running stream of molten glass while the molding operation is going on and intermittently applying a mold or receiver for a definite interval, so that an accurately-measured quantity of glass is supplied, permitting a smooth finish in the molded product and also admitting of a perfect operation of the feed, as clogging of the feed-opening is avoided.

In the accompanying drawings, which illustrate the invention, Figure 1 is a sectional elevation of a machine embodying my improvements. Fig. 2 is an elevation on a plane at right angles to that of Fig. 1. Fig. 3 is a top plan, the furnace being in section on line *x x* of Fig. 1. Fig. 4 is a partial sectional elevation on a plane at right angles to that of Fig. 1. Fig. 5 is an enlarged detail view of one of the base-carriers. Fig. 6 is an enlarged detail of the arrangement for ejecting the finished base, being a section on line *x' y'* of Fig. 3; and Fig. 7 is a detail view of the clutch controlling the intermittent feed of the bases and of the cam for controlling the same.

1 represents a glass-furnace made of fire-brick or other refractory material, to which gas and air are fed in regulated volumes to furnish the necessary heat to keep the glass melted by means of pipes 2 2^a 3 3^a at the sides of the furnace, from which branch pipes communicate on each side of the furnace with a plurality of pipes or nozzles 4 4^a 4^b 4^c. Within the furnace is a melting-pot the walls of which are made of refractory material and which is provided with two chambers communicating with one another through an opening 5 at or near the bottom of an intermediate partition or diaphragm dividing the pot into two chambers. The larger chamber is intended to receive the frit or raw material from which the glass is made, containing a percentage of cullet or broken glass, which after the machine has been running may be supplied from the part of the glass passing through the aperture in the pot and not used in the bases. The bottom of the pot is channeled, as indicated in Figs. 1, 3, and 4, to secure a uniform distribution of the hot gases of combustion. The arrows in Figs. 1, 3, and 4 show the manner of effecting this distribution. The furnace is provided with a charging-hole 6, which may be closed when in action by a sliding door 7. Flues 8 8^a, leading to the chimney, provide a draft which may be regulated by dampers 9 9^a, and a flue is provided, as indicated at 10, Fig. 4, by which the upper part of the furnace may be placed in direct communication with the chimney. In the bottom of the small chamber of the melting-pot is a conical recess 11, communicating with a small bore 12, against which is normally held when the machine is in action a perforated button 13, of porcelain or other refractory material, mounted on an iron arm 14, adapted to be controlled by a hand-lever 15. The channels under the melting-pot are arranged so as to direct a part of the products of combustion around this porcelain nozzle, as will be seen in Figs. 1, 3, and 4, branch openings 16 16^a (see Fig. 3) permitting a part of the products of combustion to be diverted from their path and circulate around the nozzle 13, thereby preventing the glass from chilling in said nozzle and obstructing the feed.

The furnace is supported on an iron casting held by pillars 17 17^a, between which is supported the molding apparatus. An iron pin 18, having a conical tip, is arranged to close and open the glass-feed opening at the pleasure of the operator and is controlled by a foot-lever 19, linked to a spring-pressed rod 20, carrying a crank 21, in which the pin 18 is mounted. The rod 20 is contained in a fixed tube 22, in the wall of which is a right-angled slot 23, through which projects a pin mounted on an extension of the spring-pressed rod. Thus the operator by shifting laterally the treadle 19 permits the spring-pressed rod to be shifted in the slot 23 and brings the tapering pin 18 into the feed-opening of the melting-pot. It may be removed by pressing the treadle with the foot and then pushing it in the opposite direction, so as to lock the pin in the angle of the slot.

Beneath the furnace is a rotary head provided with a plurality of arms 24 24^a, &c., of which four are shown in the type of machine illustrated. This head is mounted in a rotary spindle carrying a loose gear driven by a worm-wheel 26 in gear with the worm 27, mounted on the drive-shaft of the machine. A clutch 28, feathered on the shaft secured to the rotary head, is adapted to be shifted downwardly (see Figs. 1 and 4) to clutch the gear 25 to the spindle. In the position shown in Fig. 1 the gear has been disconnected and the head is in a position of rest, coöperating clutch-jaws on the sleeve and a fixed part of the frame holding the parts in a position of rest. The clutch is shifted by means of a cam 29, driven by the shaft on which the worm-wheel 26 is mounted. This cam is shown in detail in Fig. 7 provided with two diametrically opposite projections coöperating with a roller 30, carried by a pivoted lever, to which is linked by a rod 31 a shifting lever 32, pivoted to the clutch. In the position shown in Fig. 7 the clutch has just been thrown out of action, which, as will be seen, is effected instantly, disconnecting the rotary spindle from the driving-gear and bringing it to rest by engagement of the upper clutch members 33. It is important that this position should be perfectly definite, since it is the position in which one base is in position to receive the molten glass and another in position to be pressed by the die. I therefore provide an auxiliary alining device consisting of a spring-

pressed pin 34, (see Fig. 1,) mounted on the bench and raised or lowered into the plane of rotation of the base-carrying arm. The upper part of this rod enters a recess in the rotary arms, as indicated at 35, and this brings the parts of the base in accurate alinement with the die 36, presently to be described. Each of the arms of the rotary head is provided with a plate 37, having a central recess through which projects a spring-pressed pin 38, mounted on the end of an adjusting-screw 39 and carried by a spring-pressed tube 40, in the lower end of which are mounted rollers 41 41ª. These rollers as the head is rotated ride under stationary guides 42 42ª, having inclined deflecting edges to shift the tube 40 downwardly and withdraw the pin 38 from the plate 37. A row of pins 43, arranged in a circle, forms an open receptacle for the shell of the lamp-base, and the pin 38 steadies the center contact.

The parts in an assembled position, with the closed web pressed into shape, are shown in Fig. 5. Thus it will be apparent that when the head is rotated, being shifted a quarter of a revolution in the present type of machine each time the head is clutched to the drive-gear, the two pieces of the lamp-base in one of the arms are brought beneath the melting-pot and the stream of glass fed into the shell. It is held in this relation for a short period while the cam 29, Fig. 7, makes a half-revolution, after which it is put in clutch with the gearing and rapidly shifted beneath the die, being centered in accurate relation thereto by means of the clutch members 33 and pin 34, as already described. When beneath the die, the plate 44, Fig. 1, will be shifted downwardly so as to surround the upper part of the shell and the die 36 brought against the soft charge in the shell. These movements are effected by means of two cams. (Seen in side elevation in Fig. 1 and in end elvation in Fig. 2.) The cams are each provided with cam-grooves 45 46, angularly displaced relatively to one another, as seen in Fig. 2. In the grooves are rollers connected to pivoted rods 47 48, which respectively shift the die and the plate 44. The cam-grooves have a somewhat different shape, as seen in Fig. 2, by which the plate 44 is shifted first around the shell and is withdrawn after the die has been removed from the base. After the glass has been pressed into shape the clutch is again operated and the rotary head shifted, carrying the finished base past the cam-plates 42 42ª, (shown in Fig. 3,) by which the pins carried by the spring-pressed tube 40 are lowered away from the lamp-base, and a bar 49 (see Figs. 3 and 6) sweeps the base from the arms and permits it to drop into the receptacle under the operator's bench.

It is sometimes desirable to remove a base from the machine before reaching the die if the parts should have received too much material or receive it improperly from the furnace. In such a case the operator may withdraw the shell before reaching the die by operating a treadle 50, to which is connected a spring-pressed rod 51, on the upper part of which is mounted a cam-plate 52. This normally lies above the rollers 41 41ª, attached to the base-carrying tube; but when the treadle 50 is operated it is depressed so as to be in the plane of rotation of the rollers and has a cam-face which operates in the same manner as the cams 42 42ª already described, serving to withdraw the pins and free the lamp-base, which drops into a receptacle beneath the operator's table.

Thus it will be seen that all parts of the melting operation are automatic except the assembling of the parts in the molds or carriers. As two of the arms on the four-part rotary head are always free to the operator, he may assemble the parts of these arms while the other two are under the glass-feed and the die, respectively.

The molten glass flowing when the arms are in the act of being shifted may be received in a box or vessel on the floor and is useful as cullet for mixing with the raw material of which the glass is made and which is necessary to the manufacture of good glass.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The process of manufacturing articles partly of glass, consisting in maintaining a continuously-flowing stream of molten glass, rotating a plurality of molds so that each mold passes periodically into the stream, placing in each mold the part to which the glass is to adhere, and maintaining each mold successively in the stream for a predetermined interval.

2. The process of manufacturing articles partly of glass, consisting in maintaining a continuously-flowing stream of molten glass, rotating a plurality of molds so that each mold passes periodically into the stream, placing in each mold the part to which the glass is to adhere, maintaining each mold successively in the stream for a predetermined interval, and shaping the material in each mold.

3. The process of making a base for an incandescent lamp, consisting in placing the metallic parts for the base in a mold in the proper position relative to each other, moving the mold into a continuously-flowing stream of molten insulating material, maintaining the mold in the stream for a predetermined time so that a definite amount of the molten material runs into it, and shaping the material in the mold.

4. The process of making a base for an incandescent lamp consisting in placing the metallic parts in a mold in the proper position relative to each other, moving the mold into a continuously-flowing stream of molten material, maintaining the mold in the stream for a predetermined time so that a definite amount of molten material runs into it, and compress-

ing the material in the mold into the desired form.

5. The process of manufacturing articles partly of glass consisting in maintaining a continuously-flowing stream of molten glass, rotating a plurality of molds so that each mold passes periodically into the stream, placing in each mold the part to which the glass is to adhere, maintaining each mold successively in the stream for a predetermined interval, and compressing the material in each mold into the desired form after it has moved from the stream and while another mold is in the stream.

6. The process of making a base for an incandescent lamp, consisting in placing the metallic parts in a mold in the proper position relative to each other, moving the mold into a continuously-flowing stream of molten insulating material, and maintaining the mold in the stream for a predetermined time so that a definite amount of molten material runs into it.

7. The process of making bases for incandescent lamps, consisting in rotating a plurality of molds so that each mold passes periodically under a feed device for insulating material, placing in each mold the metallic parts for a base, maintaining each mold successively under the feed device for an interval, feeding insulating material to the base parts in each mold while under the feed device, and shaping the material in each mold after it has moved from the feed device and while another mold is receiving its charge.

8. The process of making a base for an incandescent lamp, consisting in placing the shell and center contact for the base in a mold in the proper position relative to each other, moving the mold into a continuously-flowing stream of molten insulating material, maintaining the mold in the stream for a predetermined time so that a definite amount of the material runs into it, and shaping the material so as to form an opening therethrough to the center contact.

9. The process of making bases for incandescent lamps, consisting in rotating a plurality of molds so that each mold passes periodically under a feed device for insulating material, placing in each mold the shell and center contact for a base, maintaining each mold successively under the feed device for an interval, feeding insulating material to the parts in each mold while under the feed device, and shaping the material in each mold so as to form an opening therethrough to the center contact.

10. The process of making bases for incandescent lamps consisting in rotating a plurality of molds so that each mold passes in cooperative relation to a feed device for insulating material, placing the metallic parts for a base in each mold in proper relative position, feeding insulating material to the base parts in each mold and automatically shaping the material in the several molds about the base parts therein.

11. The process of making bases for incandescent lamps consisting in rotating a plurality of molds so that each mold passes periodically under a feed device for insulating material, placing a shell and center contact for a base in each mold in proper relative position, feeding insulating material to the parts in each mold while under the feed device and shaping the material in each mold so as to form an opening therethrough to the center contact.

12. The process of making bases for incandescent lamps consisting in maintaining a continuous stream of molten glass, rotating a plurality of molds so that each mold passes periodically under the stream, placing a shell and center contact for a base in each mold in proper relative position, maintaining each mold in the stream for a predetermined time so that a definite amount of molten glass runs into it, shaping the material in each mold while another mold is in the stream so as to form an opening therethrough to the center contact and automatically ejecting the finished base.

13. The process of making a base for an incandescent electric lamp consisting in placing the metallic shell and the metallic contact or contacts which form the terminals of the completed lamp in a mold in proper relative position, then admitting glass to said parts at a temperature high enough to permit it to flow freely, and then pressing the glass about said parts.

In witness whereof I have hereunto set my hand this 19th day of September, 1902.

ALFRED SWAN.

Witnesses:
S. N. WHITEHEAD,
JOHN E. MITCHELL, Jr.