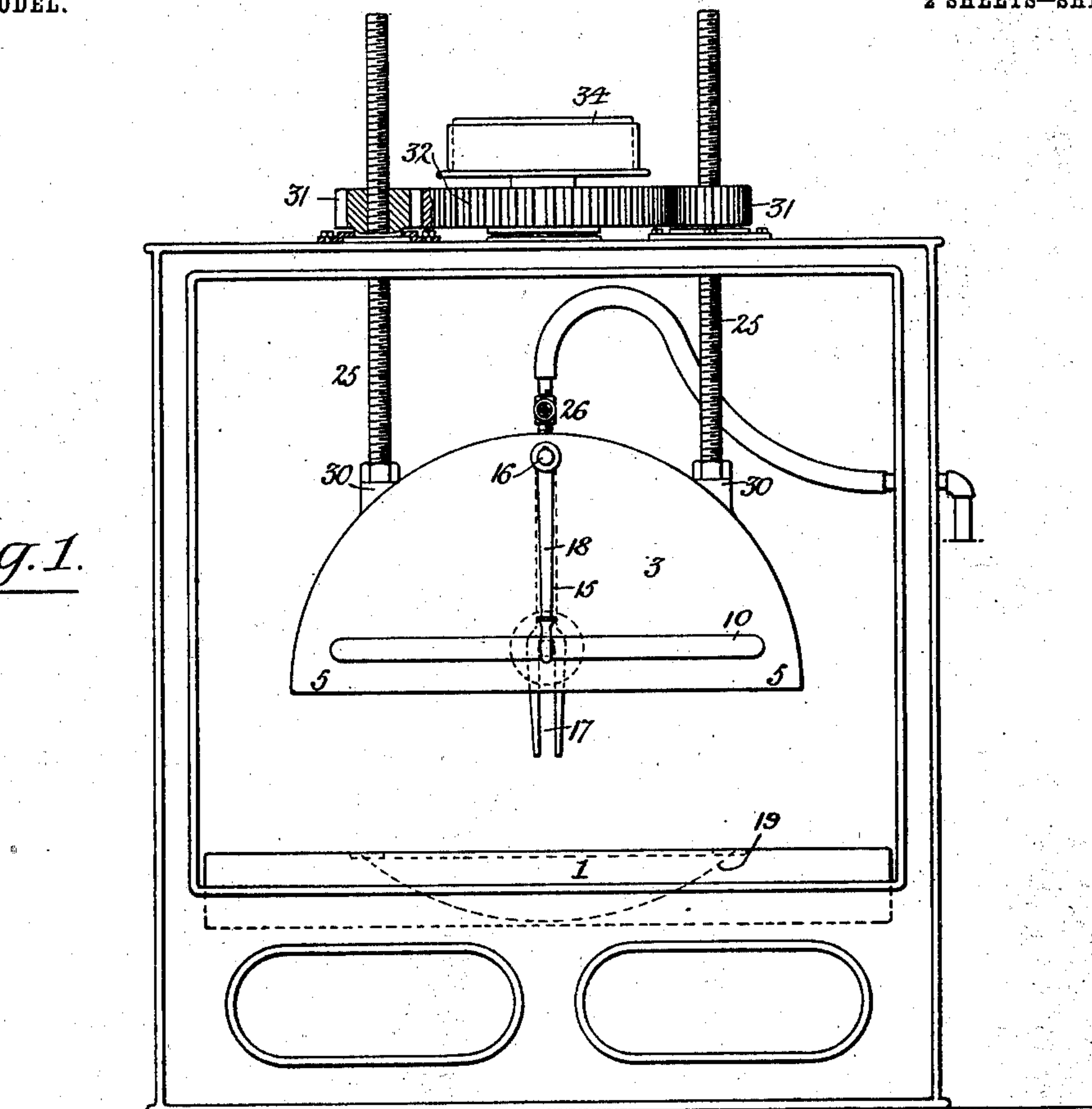
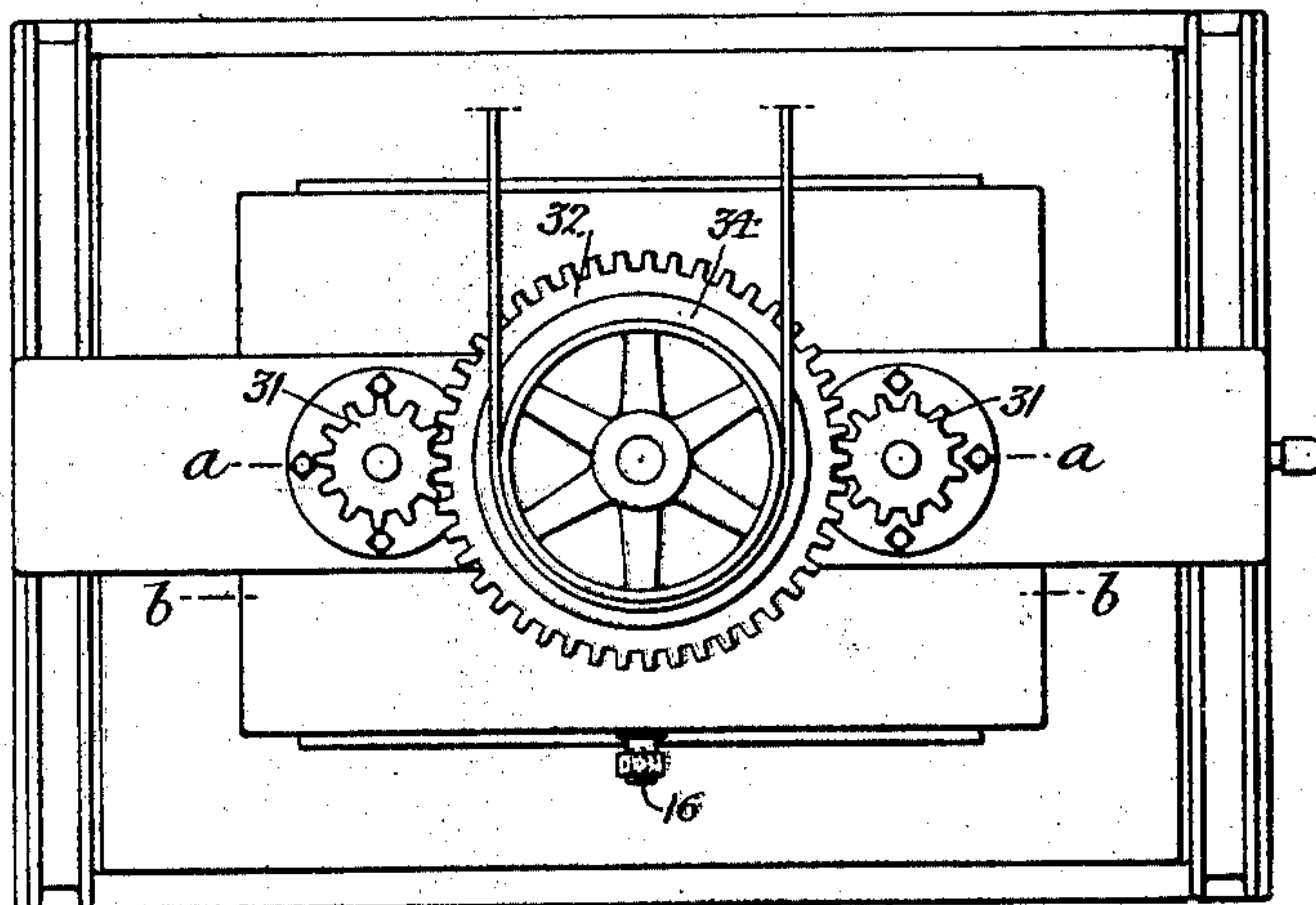


J. HIRST.
APPARATUS FOR MANUFACTURING GLASS.

APPLICATION FILED JUNE 12, 1903.

NO MODEL.

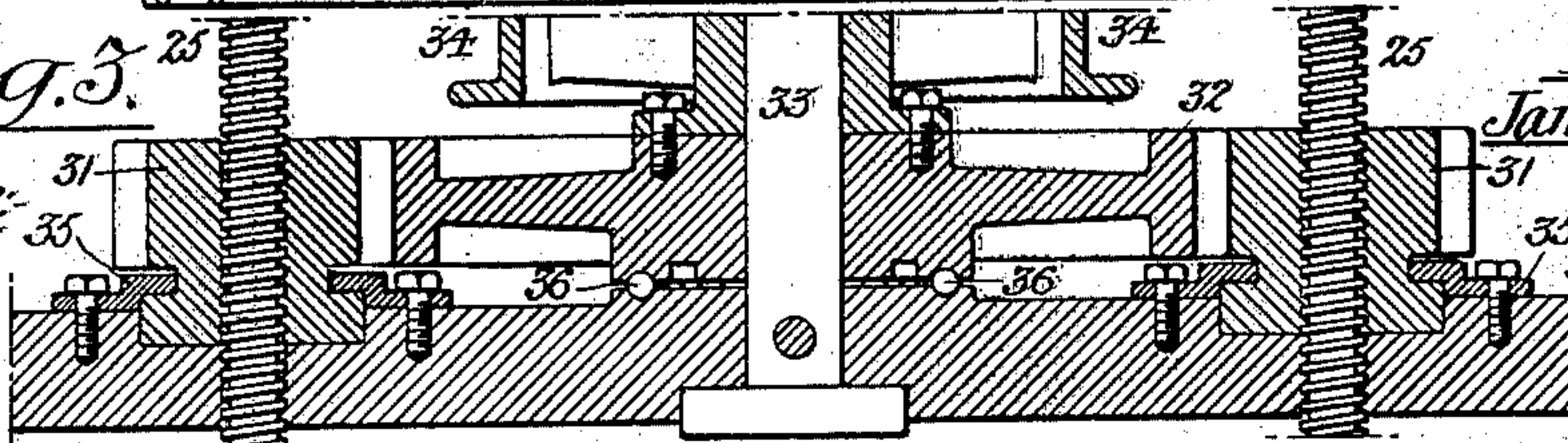
2 SHEETS—SHEET 1.

Fig. 1.Fig. 2.Fig. 3.

Witnesses:

Chas. DeLoe.

H. E. Melius

Inventor:—
James Hirst.

by his attorneys:

Nowson

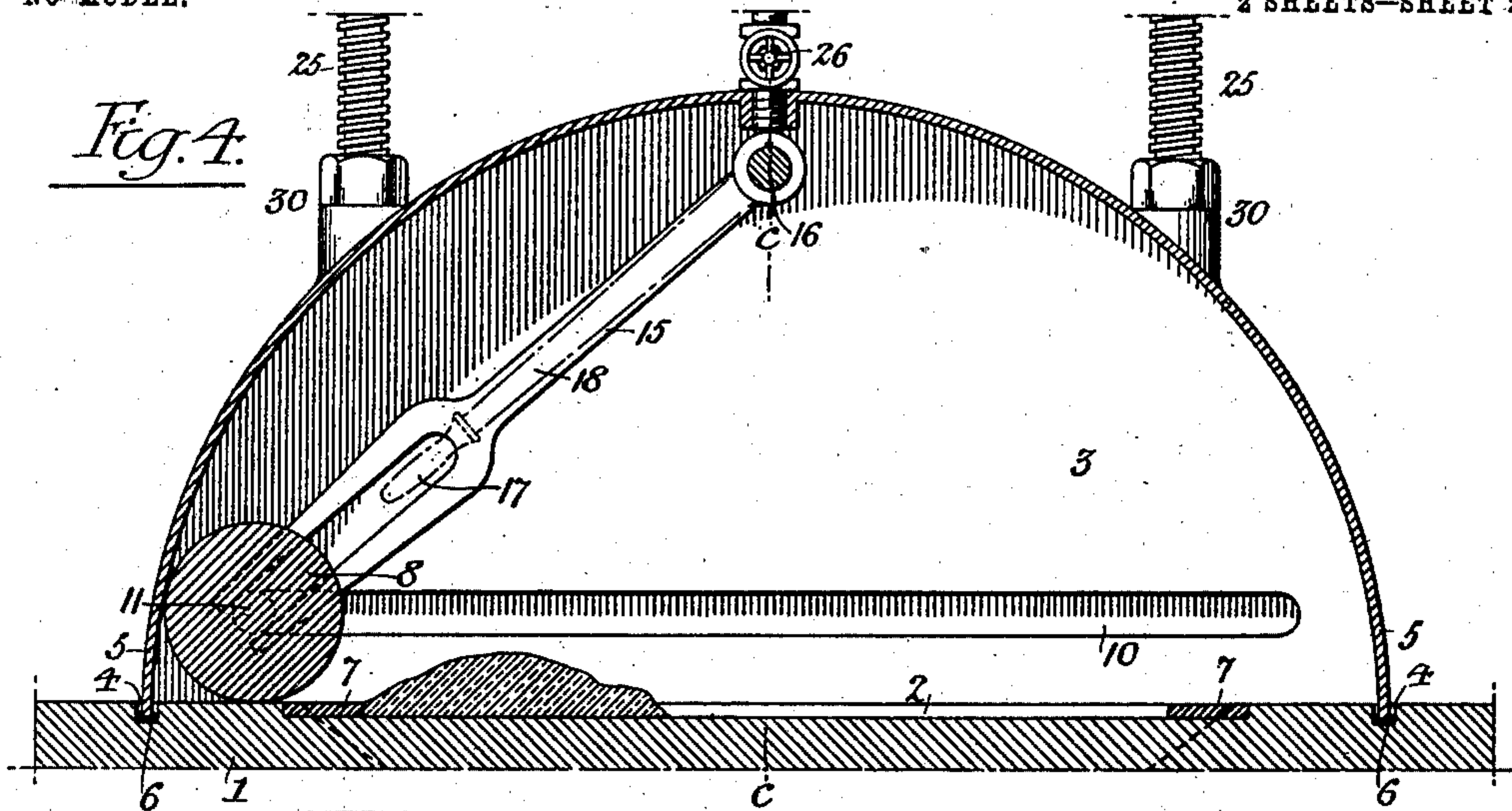
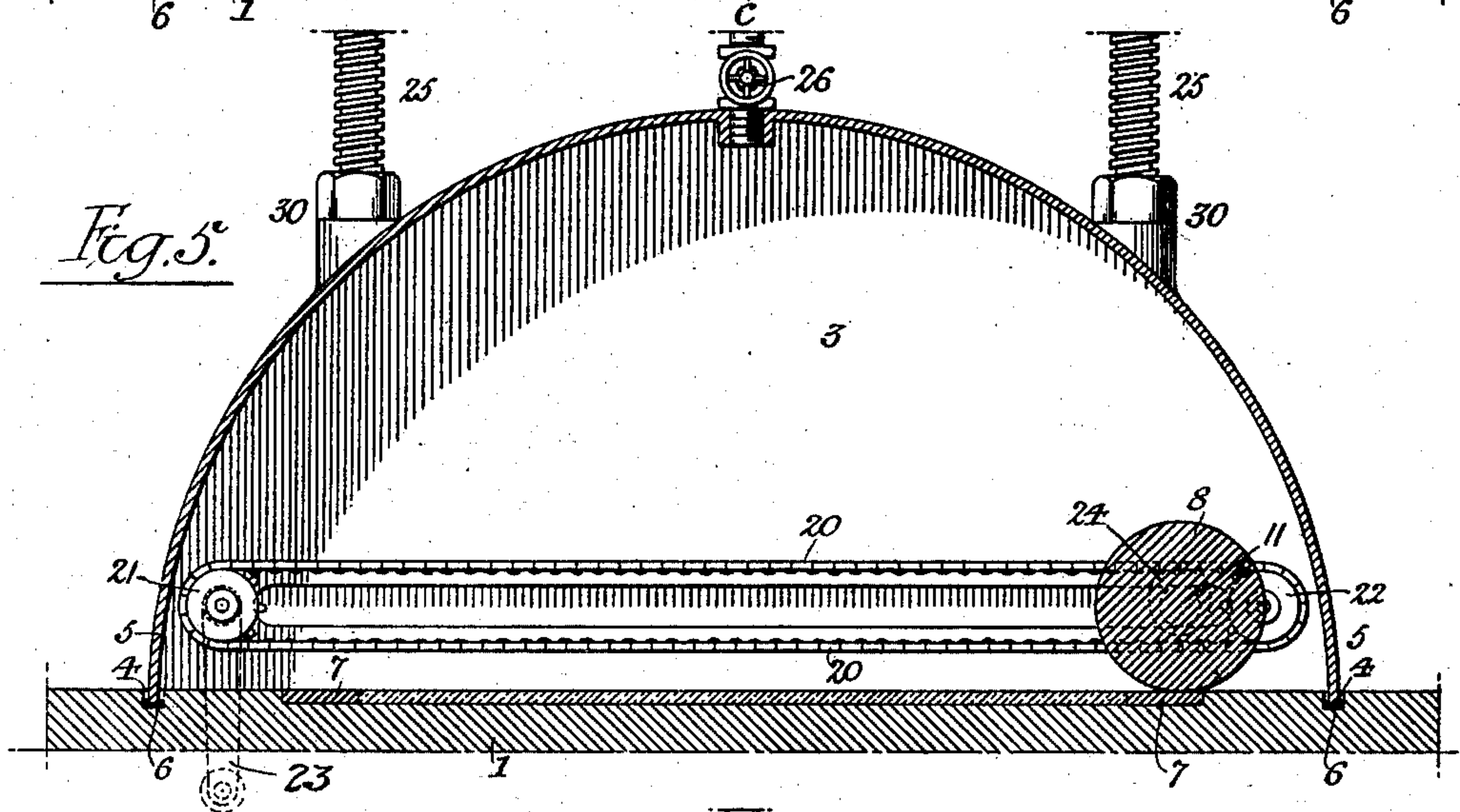
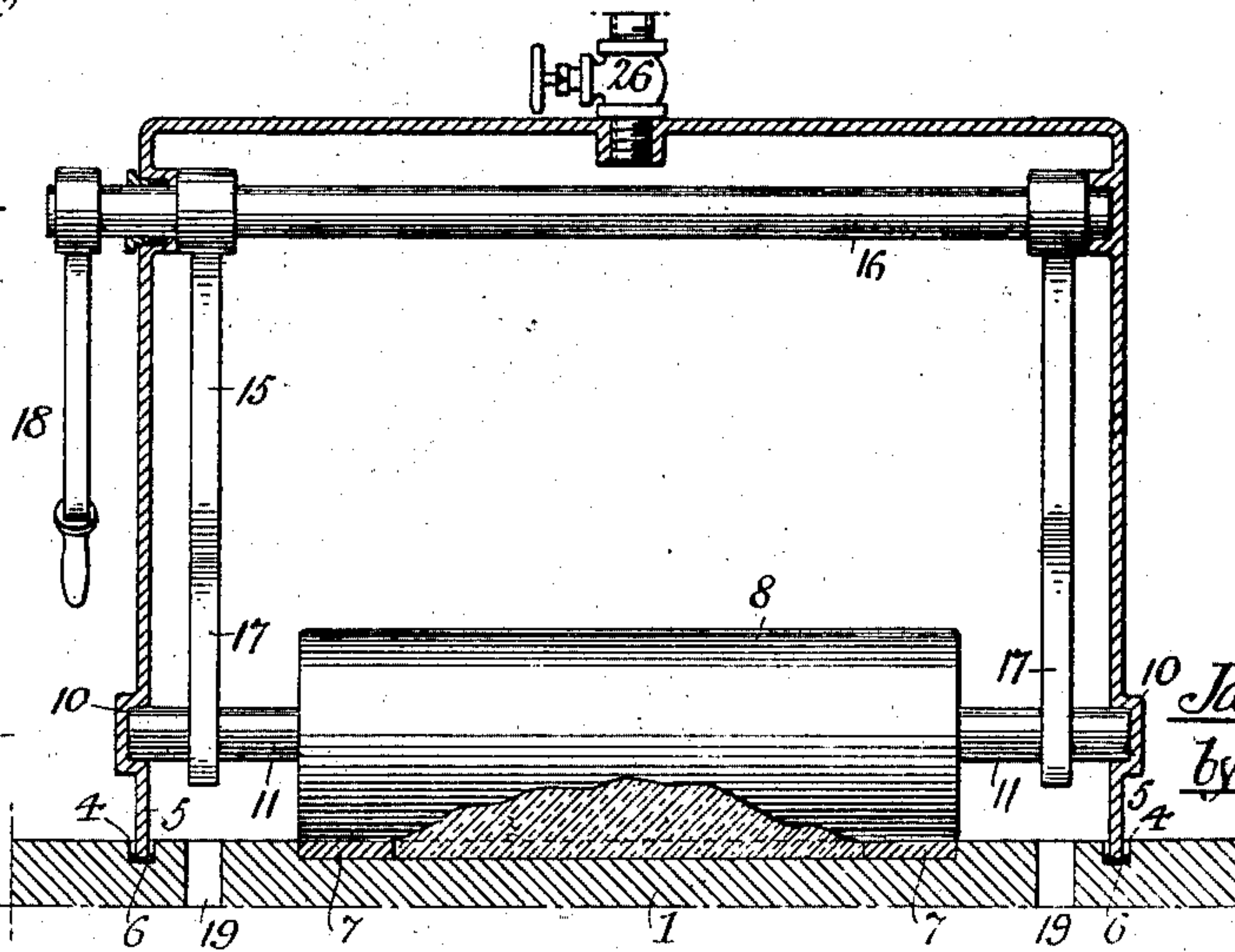
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NO. MODEL.

2 SHEETS—SHEET 2.

Fig. 4.*Fig. 5.**Fig. 6.*

Witnesses:

Chas. W. Co.
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UNITED STATES PATENT OFFICE.

JAMES HIRST, OF VINELAND, NEW JERSEY.

APPARATUS FOR MANUFACTURING GLASS.

SPECIFICATION forming part of Letters Patent No. 742,028, dated October 20, 1903.

Application filed June 12, 1903. Serial No. 161,224. (No model.)

To all whom it may concern:

Be it known that I, JAMES HIRST, a citizen of the United States, residing at Vineland, Cumberland county, New Jersey, have invented certain Improvements in Apparatus for Manufacturing Glass, of which the following is a specification.

My invention relates to the manufacture of plate and window glass; and it consists of a new and improved apparatus for manufacturing such sheet-glass without the necessity of making the preliminary cylinders of glass, which are afterward cut and split and then put through the usual flattening process.

The process of manufacturing glass by means of the apparatus constructed in accordance with my invention forms the subject of a companion application filed of even date herewith, Serial No. 161,223.

My present invention, relating to the apparatus for carrying out my improved process, is fully shown in the accompanying drawings, in which—

Figure 1 is an elevation of the machine embodying my invention. Fig. 2 is a plan view of the same. Fig. 3 is an enlarged sectional view of a part of the apparatus, taken on the line *a a*, Fig. 2. Fig. 4 is an enlarged sectional view taken on the line *b b*, Fig. 3. Fig. 5 is a sectional view similar to Fig. 4, illustrating a modification of my invention; and Fig. 6 is a cross-sectional view taken on the line *c c*, Fig. 4.

In the apparatus forming the subject of my present invention, which I employ in carrying out the process forming the subject of the companion application before referred to, 1 represents the mold table or bed upon which the mass of glass is spread, which table is preferably mounted on a firm solid base, 2 the recessed portion of the same in which the sheet of glass is formed, and 3 the air-tight shell or cover, preferably square in section, which is caused to descend and inclose the surface of the table and the glass spread upon the same. The table is provided with a groove 4, adapted to receive the edges 5 of this cover, and this groove is provided with any suitable form of packing material (indicated at 6) in order that an air-tight joint may be maintained at this point. The weight of the shell

or cover and the means whereby it is held down are sufficient to keep the joint tight. By preference I employ a frame 7, surrounding the recessed portion of the table, which frame may be removed after the glass has been rolled and will thereby provide a space to facilitate the removal of the sheet of glass. The roller 8 is carried by the cover 3, the sides of the same being grooved at 10 to support and guide the end spindles 11 of the roller, and this roller may be moved across the mold table or bed in any suitable manner. In the drawings I have shown two forms of mechanism for accomplishing this result. In Figs. 1, 4, and 6 I have shown a pendulum-arm 15, pivotally mounted on a cross-shaft 16, which is arranged to be rocked, so as to move this pendulum-arm (and another mounted on the opposite end of the shaft and shown in Fig. 6) back and forth. These pendulum-arms have forked ends 17, arranged to engage the spindles 11 of the roller, whereby the latter may be moved across the table. The shaft 16, carrying the pendulum-arms, is oscillated by means of a handle 18. In order to permit the passage of the pendulum-arms past the center of the mold table or bed, the latter is slotted at 19, as clearly shown in Figs. 4 and 6.

In Fig. 5 a chain 20 is employed to move the roller 8, such chain passing over sprocket-wheels 21 and 22, mounted on opposite ends of the shell or cover 3, one of such sprocket-wheels being driven by means of a handle 23. (Shown in dotted lines.) By preference a chain is mounted on each side of the cover. These shells carry collars or depending members 24, arranged to engage the spindles 11 of the roller, and by this means the roller may be moved back and forth as the chains are traversed, the spindles of the same turning in the collars or depending members 24.

In Fig. 4 the roller is shown just before the rolling operation commences, while in Fig. 5 the roller has passed over the mass of glass and has flattened it into sheet form.

The shell or cover 3 carries threaded members 25, by means of which it is lowered onto the mold table or bed with the aid of other suitable mechanism. At the center of the top of this shell connection is made with a

tube leading from the source of air-pressure, and a valve 26 is employed to control the same. In lieu of this arrangement several inlets may be provided for the air under pressure, as may be desirable or expedient.

The supports for the cover 3 are indicated at 25 and comprise vertically-moving threaded rods or spindles firmly secured to said cover at 30 and having gear-wheels 31, which act as nuts and serve when turned to raise and lower such threaded rods and with them the cover 3. These gear-wheels are driven by means of a central wheel 32, mounted on a short shaft 33, which also carries a driving-pulley 34, by means of which the gear-wheels 32 and 31 are turned, so that the movement of the gears engaging the threaded spindles will be uniform, and thereby insuring the lowering of the bell-cover in a uniform manner and with some amount of force.

The gear-wheels are held against vertical movement by means of retaining-collars 35, and by preference the central wheel 32 is provided with a ball-bearing 36. When in operation, it is necessary that the cover 3 be dropped onto the mold table or bed as quickly as possible, and by this means friction will be lessened and the movement of the gears rendered very much easier. When the covers are dropped onto the molds or tables, an air-tight chamber is formed, and consequently the means for moving the roll must pass through a properly-packed gland in order that there can be no leakage at this point.

Instead of arranging the shell or cover to be bodily raised from the mold table or bed it may be raised slightly and then moved to one side. The bed also may be movable from under the shell or cover, and a series of beds may be employed, to which such shell or cover may be moved to perform the necessary operations.

The operation of my improved apparatus is as follows: The glass is first poured onto the mold table or bed, having a perfectly-level top with a true plane surface, which is preferably highly polished. After the glass has been placed on this table I cause the air-tight shell or cover 3 to descend and inclose the entire surface of the mold table or bed and the glass carried by the same. This cover carries the roller 8, of sufficient weight to roll the glass on the mold table or bed to a predetermined thickness, and I prefer to carry out this rolling operation under air-pressure. The roller is passed from one end of the table to the other one or more times, as may be necessary, and the glass is thereby evenly spread over the entire surface of such table. I regulate the thickness of the plate by the depth of the recess, and to facilitate the removal of the sheet of glass I may employ the frame fitting the walls of this recess. After this has been done I increase the air-pressure within the shell or cover to the highest possible point, and this pressure being directed evenly over the entire surface of the glass

causes the same to be pressed in a firm and even manner on the metal table, receiving thereby from the even pressure of air on one side and the polished surface of the table on the other a true smooth surface which requires no subsequent rubbing or other treatment.

The mold table or bed is preferably heated before the glass is placed upon the same to insure the plasticity of the glass. After the sheet of glass has been finished and set it may be removed in any suitable manner and taken to a leer and tempered in the usual way.

Numerous modifications of my invention will naturally suggest themselves. Hence I do not wish to be limited to the precise construction and arrangement of parts shown herewith; but

What I claim, and desire to secure by Letters Patent, is—

1. The combination in an apparatus for manufacturing sheet-glass, of a table to receive the glass, means for rolling said glass, and means for directing air under pressure over the upper surface of the glass.

2. The combination in an apparatus for manufacturing sheet-glass, of a table to receive the glass, an air-tight cover adapted to inclose the upper surface of the table and the glass, a roller arranged to pass over the glass, and means for supplying air under pressure to said cover for the purpose of acting on the upper surface of said glass.

3. The combination in an apparatus for manufacturing sheet-glass, of a table to receive the mass of glass, an air-tight cover adapted to inclose the upper surface of the table and glass, means for raising and lowering said cover, a roller arranged to pass over the glass, and means for supplying air under pressure to said cover for the purpose of acting on said glass.

4. The combination in an apparatus for manufacturing sheet-glass, of a table to receive the mass of glass, an air-tight cover adapted to inclose the upper surface of the table and glass, a roller carried by said cover, means for moving said roller across the mass of glass while inclosed by the cover, and means for supplying air under pressure to said cover for the purpose of acting on the glass.

5. The combination in an apparatus for manufacturing sheet-glass, of the table arranged to receive the glass, a frame in which said table is mounted, a cover carried by said frame, means for raising and lowering said cover onto the table, means for packing said cover when lowered onto the table, and means for introducing air-pressure to said cover after it has been lowered onto the table.

6. The combination in an apparatus for manufacturing sheet-glass, of a table arranged to receive the glass, said table having a smooth, true and highly-polished surface, a frame in which said table is fixed, a cover arranged to inclose the top of the table and the glass carried thereby, threaded spindles

carried by said cover, nuts engaging said spindles and means for turning said nuts whereby the cover may be raised and lowered.

5 7. The combination in an apparatus for manufacturing sheet-glass, of the table having a recess to receive the glass, said table having a smooth, true and highly-polished surface, a cover adapted to inclose the upper surface of the table, means for packing the
10 same, a roller carried by said cover and adapted to act on the glass, means carried on the outside of the cover for moving the roller, and means for supplying air under pressure to said cover for the purpose of acting on the
15 glass.

8. The combination in an apparatus for manufacturing sheet-glass, of the mold-table upon which the glass is poured, a frame in which said table is mounted, a cover arranged
20 to inclose the table and the glass upon the same, the table being grooved to receive the edge of the cover and having packing material in said groove, threaded spindles carried by the cover, gear-wheels mounted in the
25 frame and engaging said threaded spindles, an intermediate gear-wheel for moving the wheels in engagement with the threaded spindles, and means for moving said intermediate gear-wheel.

30 9. The combination in an apparatus for manufacturing sheet-glass, of the mold-table arranged to receive the glass, a cover arranged

to inclose the table and glass, a roller carried by said cover, the latter being grooved on the sides to receive the end spindle of the roller
35 whereby it may be supported by the cover, means arranged outside the cover for moving the roller, such means having members within the cover engaging the spindles thereof and permitting the ready turning of the roller,
40 and means for packing such operating means at the point where it passes through the cover.

10. The combination in an apparatus for manufacturing sheet-glass, of the mold-table upon which the glass is poured, said table
45 having a true, smooth and highly-polished surface, a frame in which said table is mounted, a cover arranged to inclose said table and the glass poured on the same, means for packing said cover, supports for said cover, means
50 for lowering said supports, a roller carried thereby arranged to act upon the glass after the cover is lowered, means for operating said roller and for packing such operating mechanism, and means for introducing air under
55 pressure into the chamber formed by said cover.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES HIRST.

Witnesses:

MURRAY C. BOYER,
JAMES C. KRAYE.