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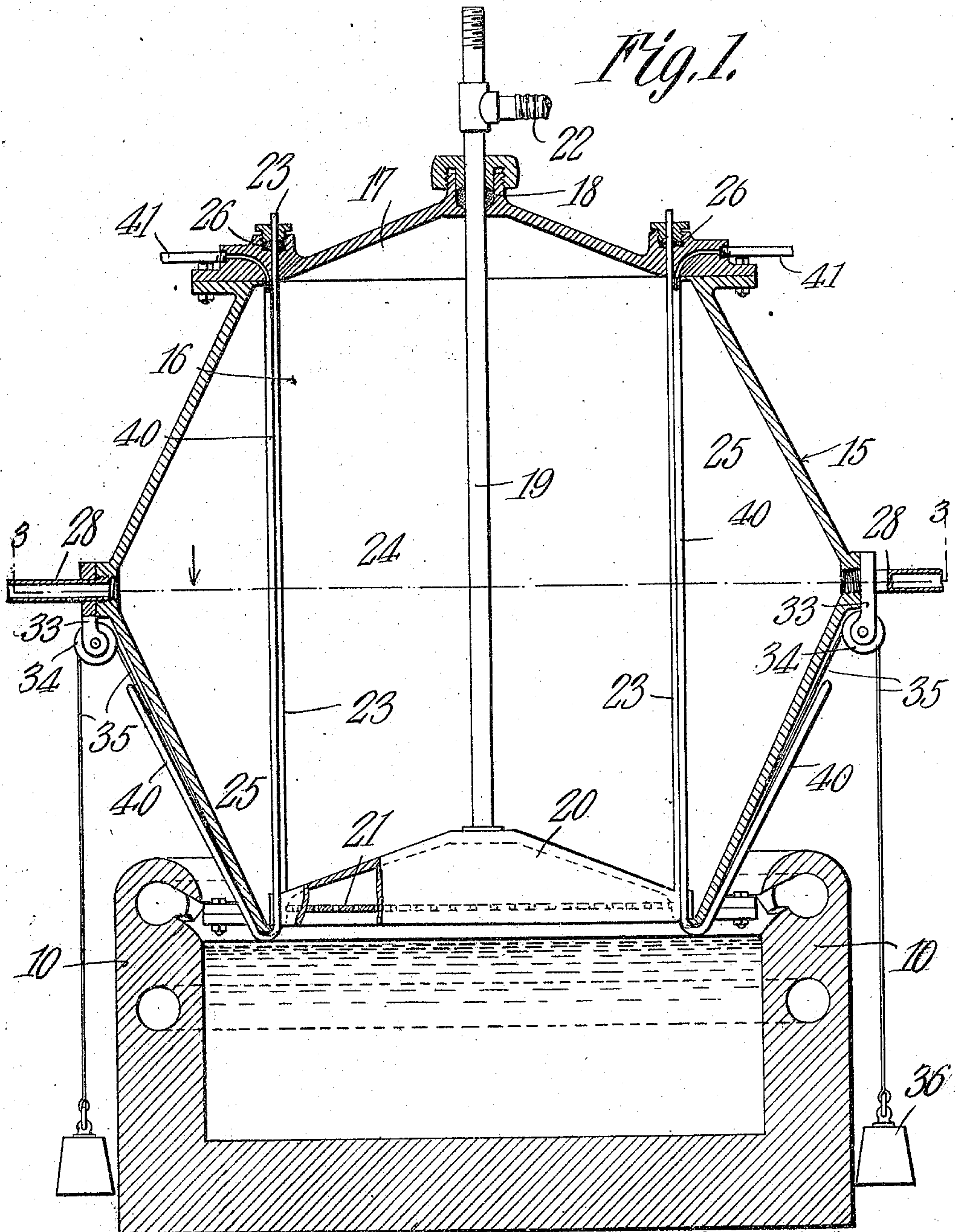
PATENTED APR. 28, 1908.

H. J. WALTER.

METHOD OF AND APPARATUS FOR DRAWING SHEETS OF GLASS.

APPLICATION FILED JUNE 26, 1907.

2 SHEETS—SHEET 1.



WITNESSES:

E. J. Hunt
John E. Parker

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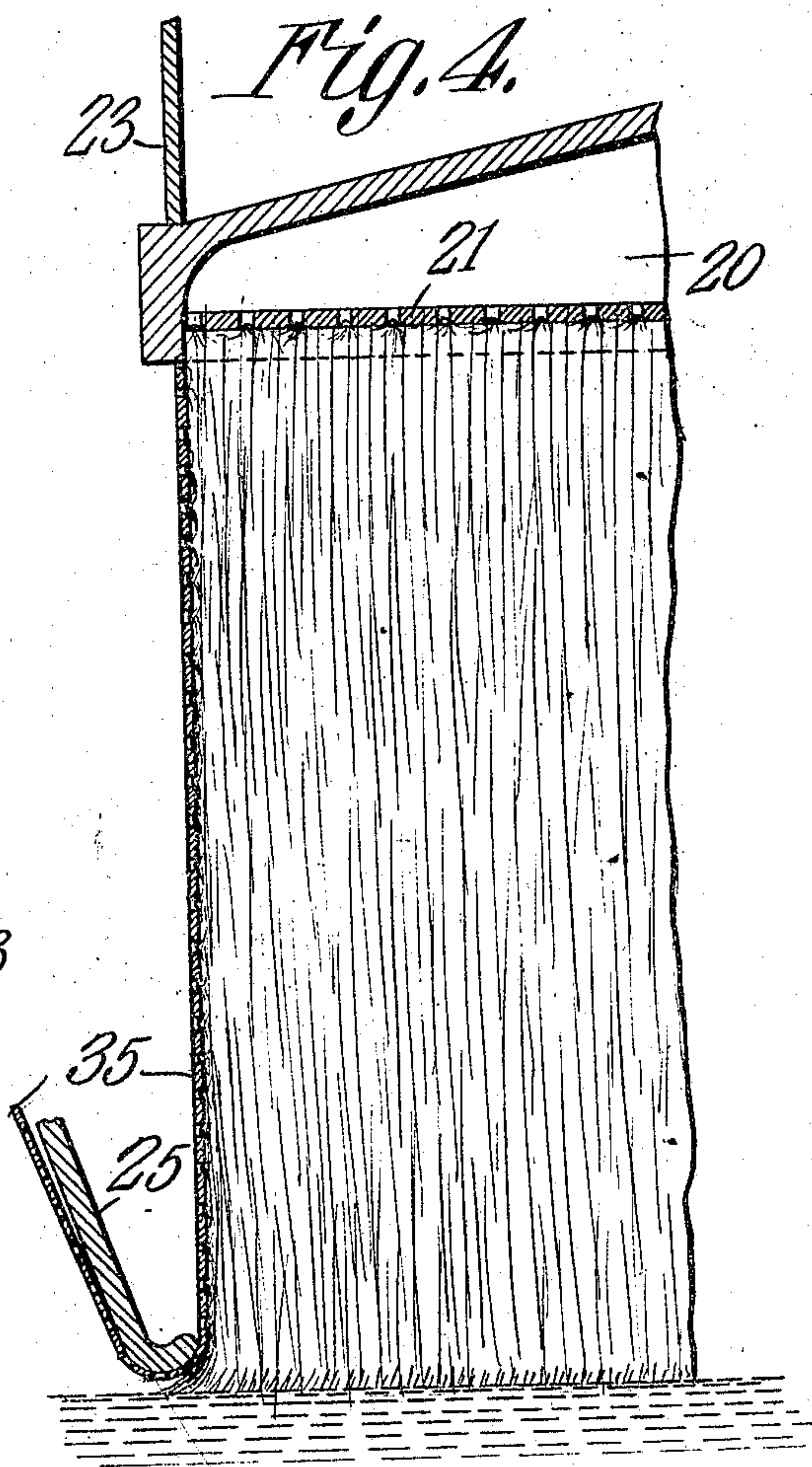
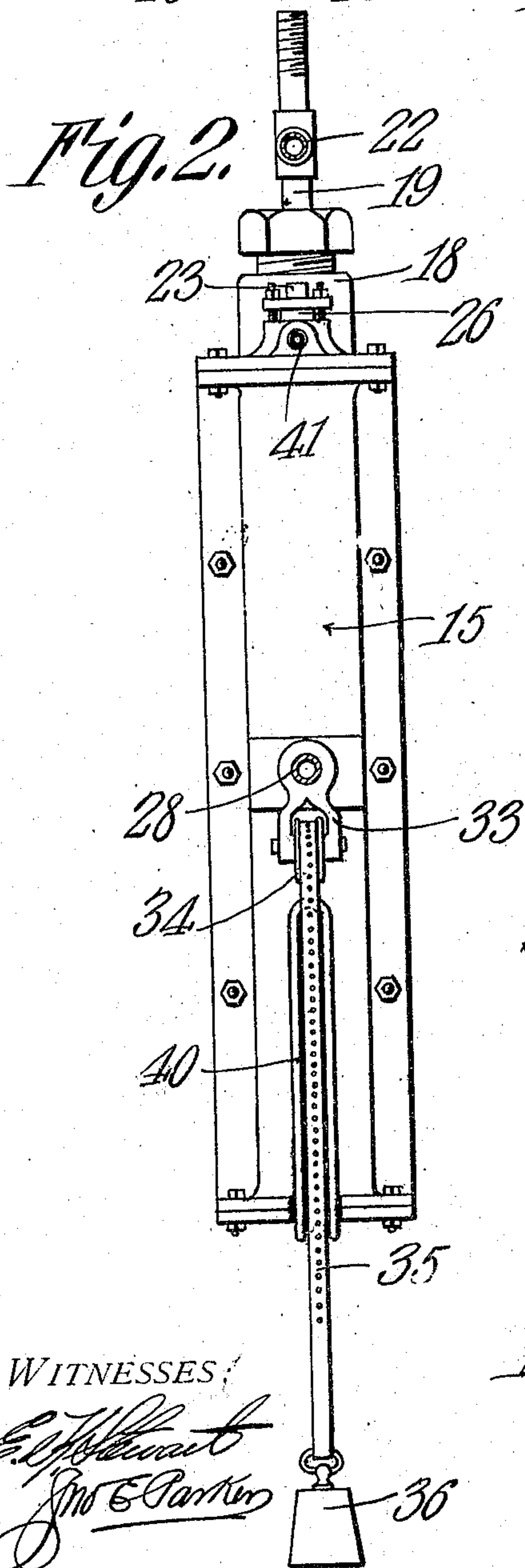
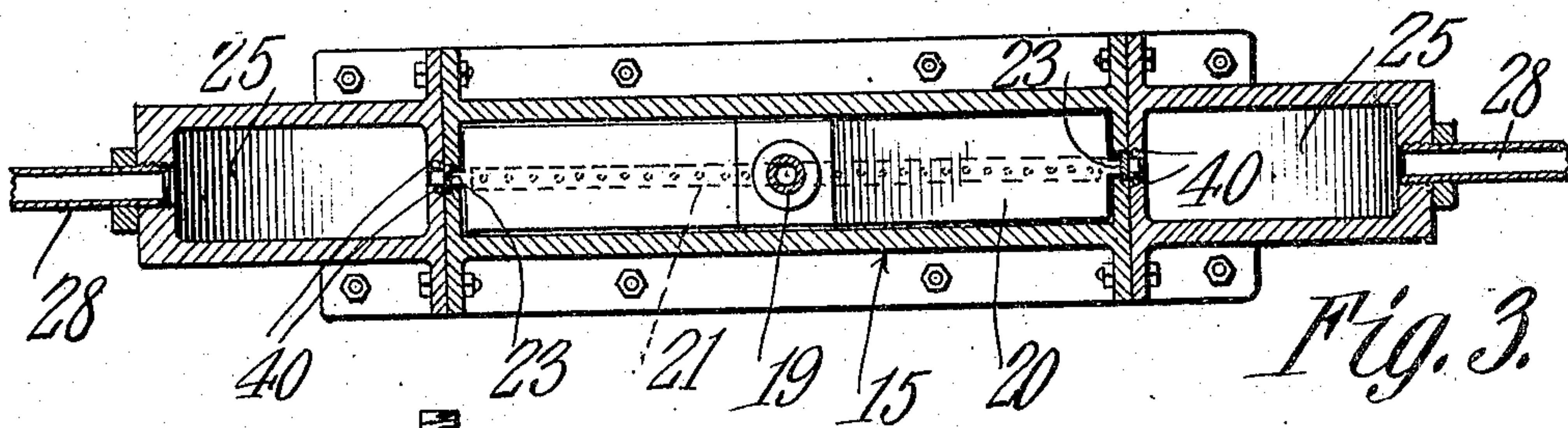
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2 SHEETS—SHEET 2.



WITNESSES:

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36

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UNITED STATES PATENT OFFICE.

HUGO J. WALTER, OF KANE, PENNSYLVANIA.

METHOD OF AND APPARATUS FOR DRAWING SHEETS OF GLASS.

No. 885,896.

Specification of Letters Patent.

Patented April 28, 1908.

Application filed June 26, 1907. Serial No. 380,932.

To all whom it may concern:

Be it known that I, HUGO J. WALTER, a citizen of the United States, residing at Kane, in the county of McKean and State of Pennsylvania, have invented a new and useful Method of and Apparatus for Drawing Sheets of Glass, of which the following is a specification.

This invention relates to the manufacture of sheets of glass by the drawing process.

In the manufacture of sheets of glass in this manner it is usual to employ a bait of suitable size and shape which is lowered into a body of molten glass, and then raised in a vertical line, the molten glass clinging thereto in the form of a sheet. Owing to the nature of the material and the atmospheric pressure to which it is subjected, the sheet will gradually narrow in width and reduce in thickness until finally it becomes a mere thread at the center, and it has been found practically impossible to produce sheets of large size.

The principal object of the present invention is to prevent this gradual narrowing of the sheet and to form a sheet of uniform width and of any desired length.

A further object of the invention is to provide means for engaging and supporting the edges of a sheet of glass during and after its formation.

A still further object of the invention is to provide means for reducing the atmospheric pressure at the edges of the sheet, thus eliminating one of the factors which results in narrowing the sheet.

A still further object of the invention is to provide means which will tend to spread or stretch the sheet in the direction of its width during the drawing operation.

A still further object of the invention is to provide means for producing a partial vacuum at the edges of the sheet being formed.

A still further object of the invention is to provide a glass drawing mechanism in which supporting strips are arranged to engage with the edge of the sheet during the drawing process.

A still further object of the invention is to provide a mechanism in which the opposite edges of the sheet are engaged by perforated metallic strips which will permit of the exhausting of air at the edges of the sheet, so that the latter will tend to stretch laterally and will be made of uniform width throughout.

With these and other objects in view, as will more fully hereinafter appear, the invention consists in certain novel features of construction and arrangement of parts, hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings:—Figure 1 is a sectional elevation of a glass drawing machine embodying the invention. Fig. 2 is a side elevation of the same. Fig. 3 is a sectional plan view on the line 3—3 of Fig. 1. Fig. 4 is a sectional view illustrating the operation of drawing a sheet of glass.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

The machine is arranged to be moved over a dog house or extension 10 on the nose of a glass tank or furnace, any well known means being employed for maintaining a practically constant level of molten glass in the dog house, and the machine is preferably mounted on over-head rails or supports, so that it may be moved to clear the furnace in order to permit the convenient removal of the sheet or sheets of glass.

The mechanism comprises generally a casing or drum 15 which may be formed of cast metal and includes a body portion 16 and a top or cover 17, the central portion of the latter being provided with a stuffing box 18 for the passage of a hollow piston rod 19, any suitable means being employed for raising and lowering the piston rod.

To the lower end of the piston rod is secured a hollow piston bait 20 having a perforated bottom 21 which is lowered into contact with the molten glass, and to which the glass clings when a partial vacuum is created within the piston by drawing out the air through the hollow piston rod 19, the latter having a suitable nipple 22 which may be attached by a flexible pipe or hose to any suitable air exhausting apparatus.

Secured to the opposite ends of the piston 20 are vertically disposed rods 23 that are preferably of rectangular form in cross section, the opposite edges of the rod fitting within vertical grooves formed in the casing in order to divide the latter into a central

chamber 24 and two side chambers 25. The upper ends of the rods 23 pass through suitable stuffing boxes 26 carried by the cover, and these rods move up and down with the piston.

The two chambers 25 are placed in communication with any suction pump or air exhaustion apparatus through piping connections 28, and the central chamber 24 is also connected to an air exhausting apparatus, so that a partial vacuum may be created in all of the chambers, as well as in the hollow piston bait.

Secured to the opposite ends of the casing are hangers 33 in which are mounted sheaves 34 over which pass flat steel strips 35, one end of each strip being connected to the end of the piston, while the opposite end of the strip carries a weight or spring 36 which tends to hold the strip taut at all times.

Extending through the shoulders 25 in contact with the outer faces of the rods 23 are ammonia expansion coils 40 which may be connected at the top of the cover with circulating pipes 41. The lower ends of the coils bend around under the lower mouth of the casing and extend upward adjacent to and follow the lines of the inclined portions of the steel strips 35, these coils being for the purpose of cooling the strips to a certain extent for the purpose of preventing the fusion of the strips and their permanent attachment to the glass.

In operation, the bait is lowered until it engages with the body of molten glass, and then the air is exhausted in the bait and in the several chambers through the suction means referred to, after which the piston bait is drawn upward. The molten glass clings to the bait and is drawn upward in the form of a sheet. As the piston moves up the rods 23 travel with it and still form partitions which separate the central chamber 24 from the side chambers 25. At the same time the flexible perforated strips 35 are drawn upward with the bait and engage with the edges of the sheet being formed. As the perforations of the strip follow up between the chambers 24 and 25, the air will be drawn through the perforations and the glass will cling to the strips and will tend to stretch laterally, the body of glass being supported and held from running down to a central thread.

As the sheet is being formed successively fresh portions of the perforated strips become attached to the edges of the sheet, so that the latter is maintained at uniform width during the entire drawing operation and sheets of any length may be successfully drawn. After a sheet of the required length has been drawn, its lower end is severed by knives or other suitable means, and the machine may be shifted laterally on its support and remain idle until the sheet cools to

a sufficient extent to permit its removal. The piston bait may then be lowered, and as it moves down the steel strips will be gradually separated therefrom, so that the machine is in readiness for another drawing operation.

In certain of the claims the term "pneumatic means" or pneumatic supports is used for the purpose of designating the piston bait which acts by rarefaction of the atmosphere to partly draw the glass thereinto and the perforated side strips which by reduction of the air pressure on their outer faces act as pneumatic supports for the edges of the sheets.

I claim:—

1. That improvement in the art of drawing sheets of glass, which consists in engaging and holding the full length of the edges of the sheet from inward movement during and after the drawing operation by means applied exteriorly of said sheet.

2. That improvement in the art of drawing sheets of glass which consists in mechanically supporting the edges of the sheets and reducing the atmospheric pressure at the edges, and in a line parallel with the two surfaces of the sheet independently of any variations in pressure on said surfaces.

3. That improvement in the art of drawing sheets of glass which consists in applying a support exteriorly to the edges of the sheet as the drawing operation progresses, and continuously holding such supports from inward movement for the full length of the sheet during and after the drawing operation.

4. In a glass drawing machine, means for creating a vacuum at the opposite edges of the sheet during the drawing operation independently of any variations in pressure on the surfaces of the sheet, the suction force thereby created tending to spread the sheet on lines parallel with the surfaces thereof.

5. In a glass drawing machine, means for continuously supporting the edges of the sheets during the drawing operation, and continuous flanges of a length equal at least to the full length of the sheet and holding said supporting means from inward movement.

6. In a glass drawing machine, supporting strips arranged to engage the edges of the sheet during the drawing operation, and continuous supports with which such strips engage.

7. In a glass drawing machine, flexible strips for engaging the edges of the sheet during the drawing operation, and means for engaging and holding the strips from inward movement after the glass leaves the pot.

8. In a glass drawing machine, flexible strips for engaging the edges of the sheet during the drawing operation, and means coextensive with the length of the sheet for holding the strips from movement toward each other.

9. In a glass drawing machine, flexible perforated strips for engaging the edges of the sheet during the drawing operation.

10. In a glass drawing machine, flexible perforated supporting strips arranged to engage the edges of the sheet during the drawing operation, and a vacuum chamber into which the sheet and strips pass to thereby reduce atmospheric pressure on the edges of the sheet.

11. In a glass drawing machine, a bait, flexible perforated strips secured to and movable with the bait, and means for reducing atmospheric pressure on the outer faces of the strips.

12. In a glass drawing machine, a pneumatic bait, and pneumatic strips for engaging the edges of the sheet.

13. In a glass drawing machine, pneumatic supports for three edges of the sheet.

14. In a glass drawing machine, pneumatic supports for engaging a plurality of edges of the sheet.

15. In a glass drawing machine, a pneumatic bait piston, perforated flexible strips having one end secured thereto, and means for maintaining the strips taut.

16. In a glass drawing machine, a casing having side vacuum chambers, a piston bait movable through the casing, and flexible supporting strips carried by the opposite ends of the piston, said strips being perforated.

17. In a glass drawing machine, a casing having a central and side vacuum chambers, vertically disposed rods forming the partitions between such chambers, a piston carry-

ing said rod, and edge engaging strips carried by the piston and arranged to support the edges of the glass sheet.

18. In a glass drawing machine, a casing, a hollow piston bait movable therein and provided with a perforated bottom, a hollow rod carrying the piston and provided with a suction pipe connection, a pair of rods or bars secured to the piston, the side walls of the casing being grooved for the reception of such rods, and the rods dividing the casing into a central and side compartments, suction pipe connections for the several compartments, flexible perforated strips having one end secured to the piston, guiding sheaves for said strips, and weights connected to the free ends of said strips.

19. In a glass drawing machine, supporting means for engaging the edges of the sheet, and means for cooling said supporting means.

20. In a glass drawing machine, edge supporting strips for the sheet, and cooling means for the supporting means.

21. In a glass drawing machine, edge supporting strips, and cooling devices therefor.

22. In a glass drawing machine, edge supporting strips, and coils or tubes arranged adjacent thereto for the circulation of a refrigerant.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

HUGO J. WALTER.

Witnesses:

J. E. MULLIN,

J. T. TUOHY.