

A. R. SMITH & J. F. AHLE.
ETCHING MACHINE.
APPLICATION FILED AUG. 22, 1906.

964,126.

Patented July 12, 1910.

2 SHEETS—SHEET 1.

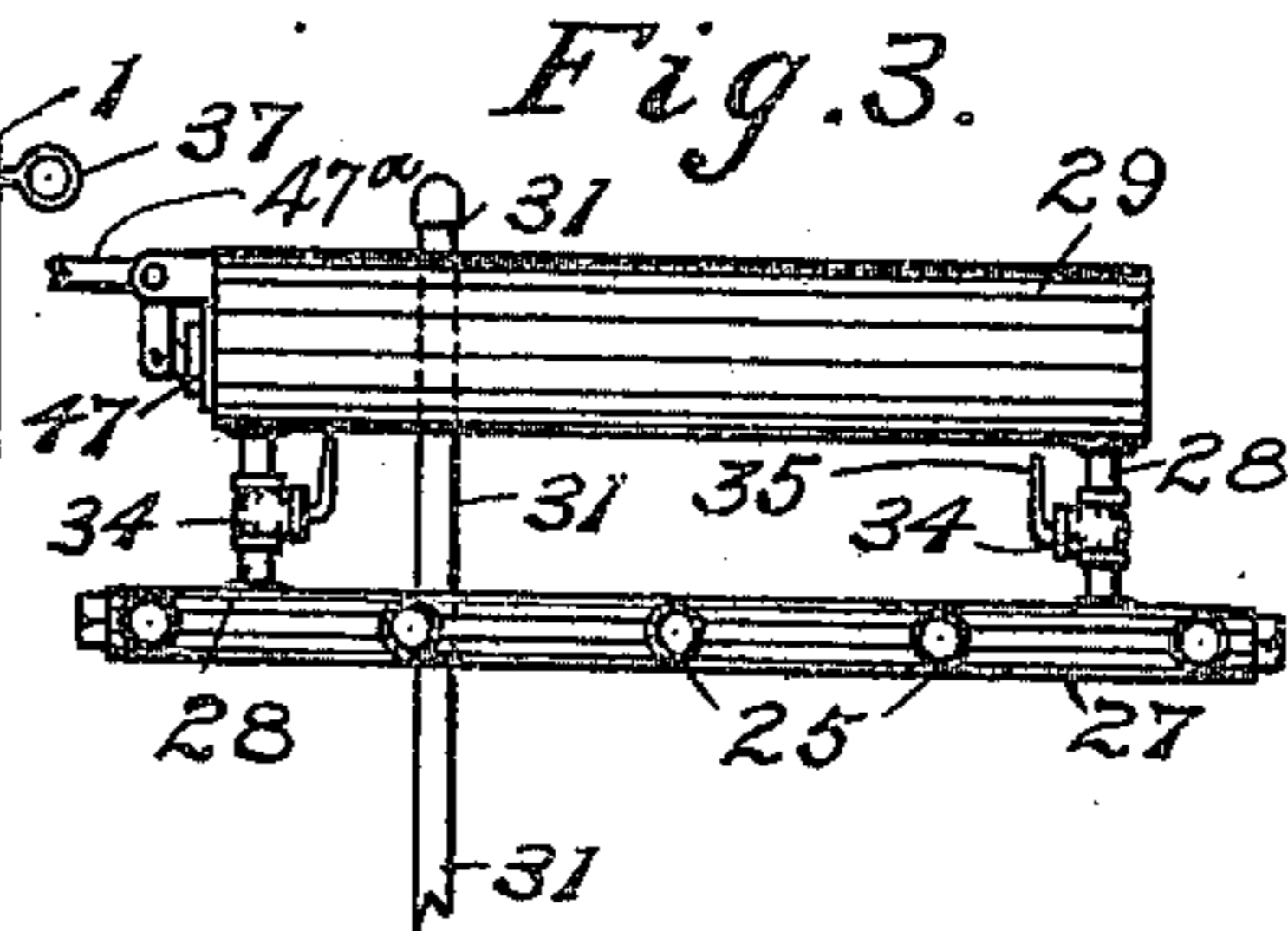
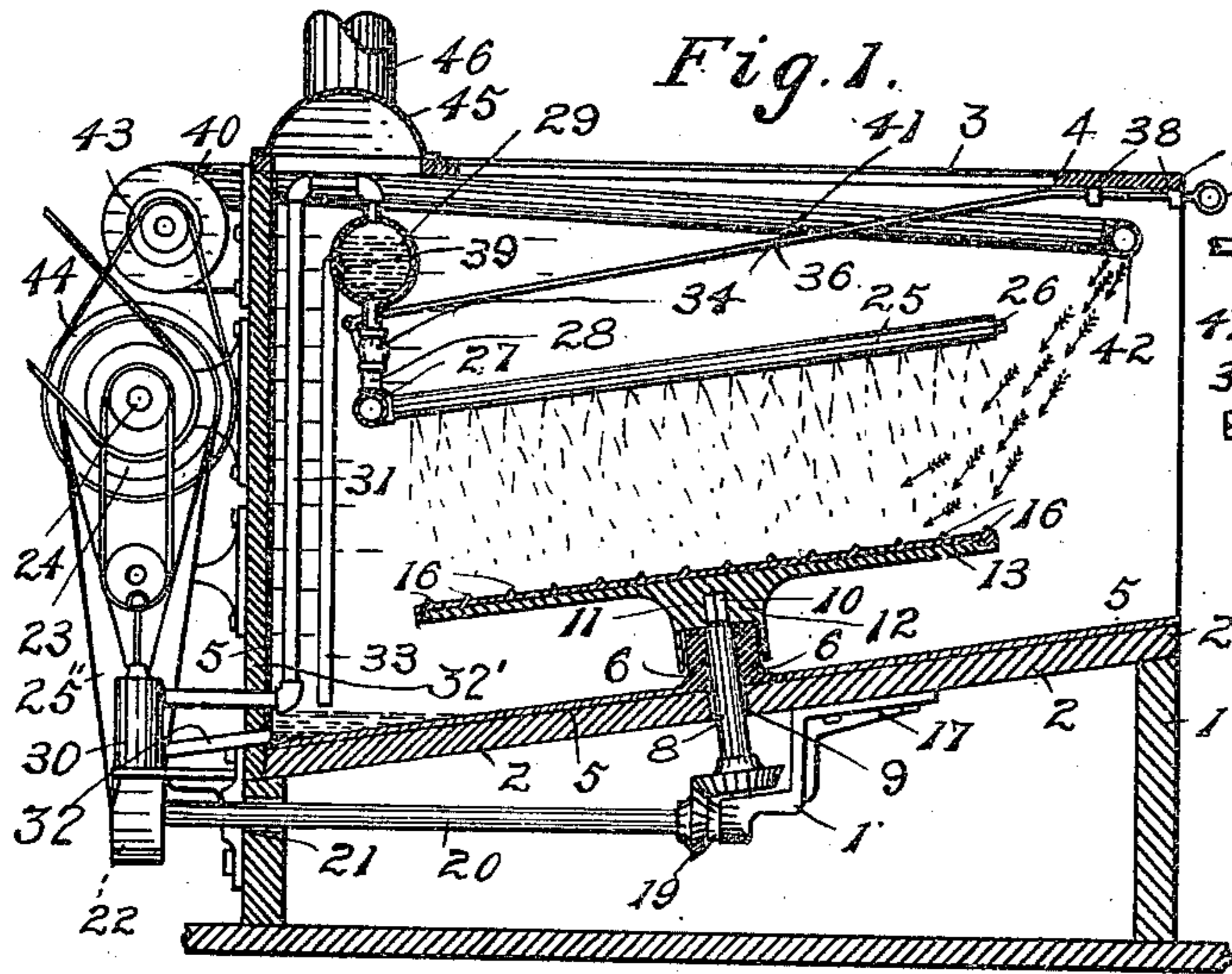
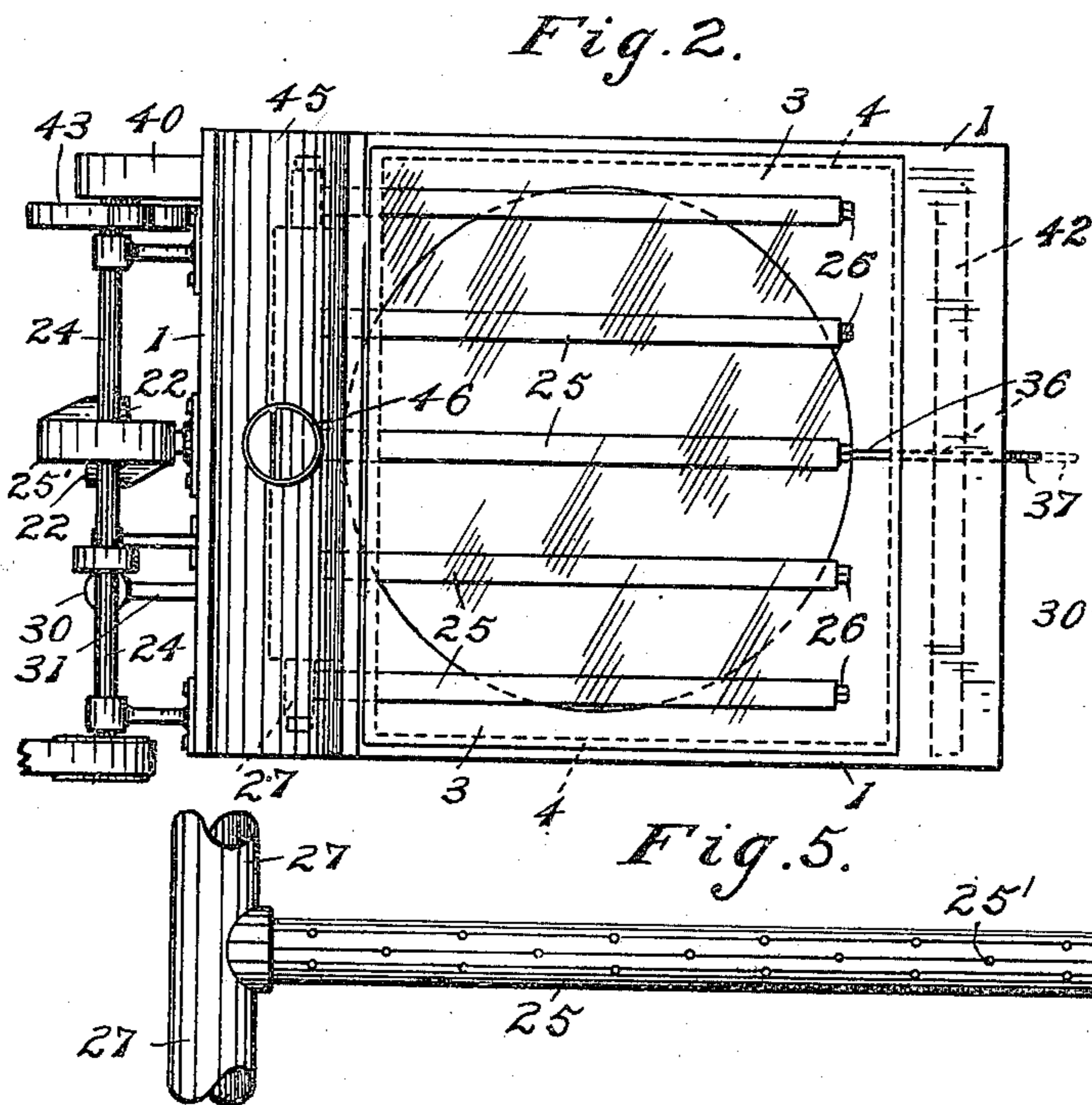
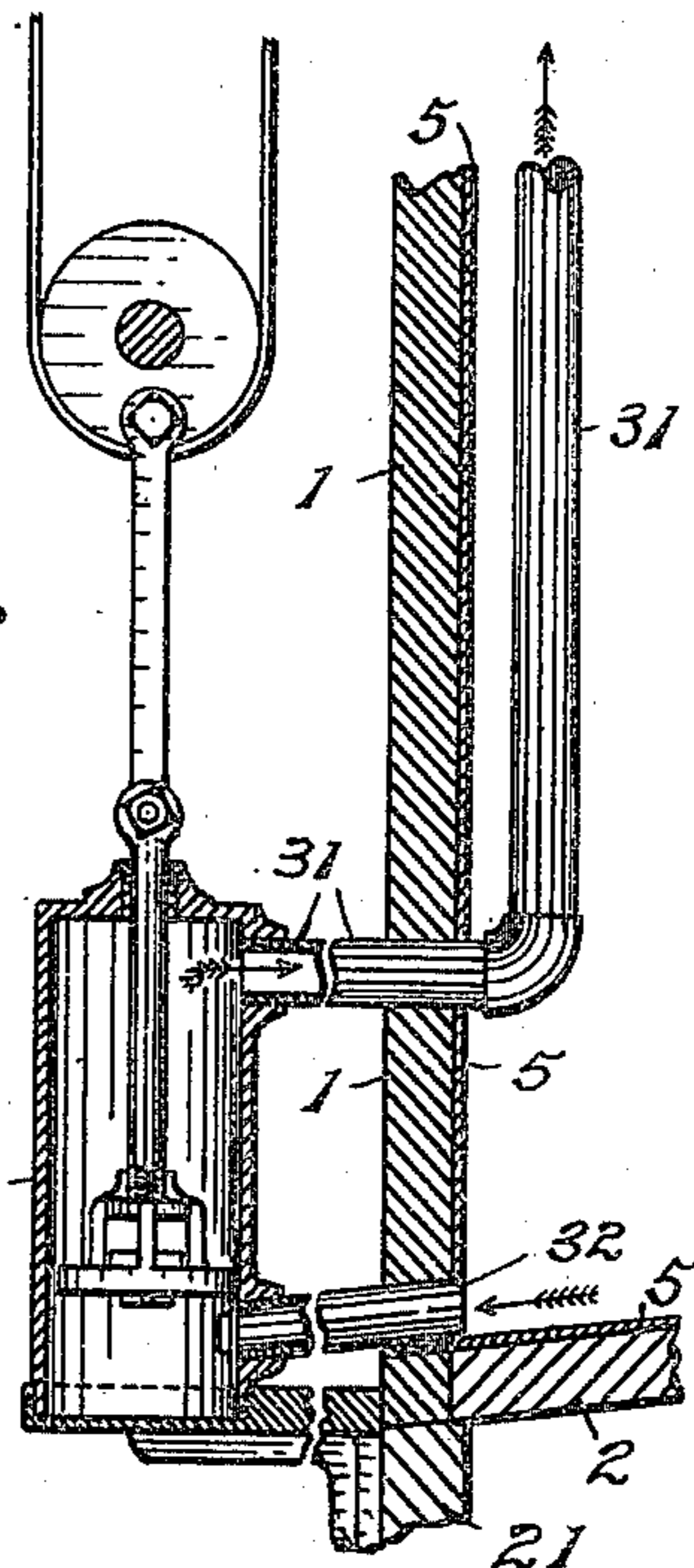


Fig. 4.



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2 SHEETS—SHEET 2.

Fig. 7.

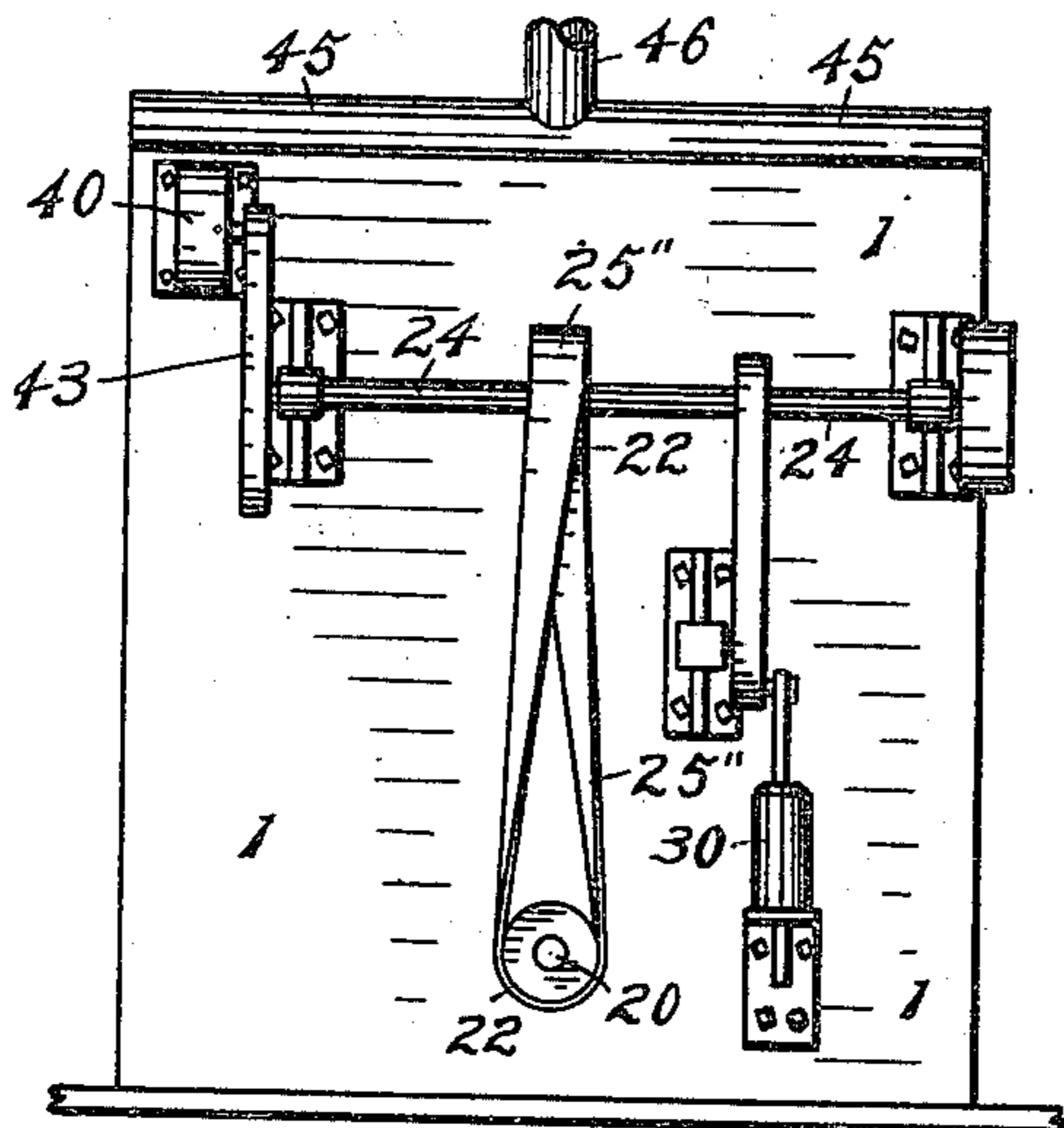


Fig. 6.

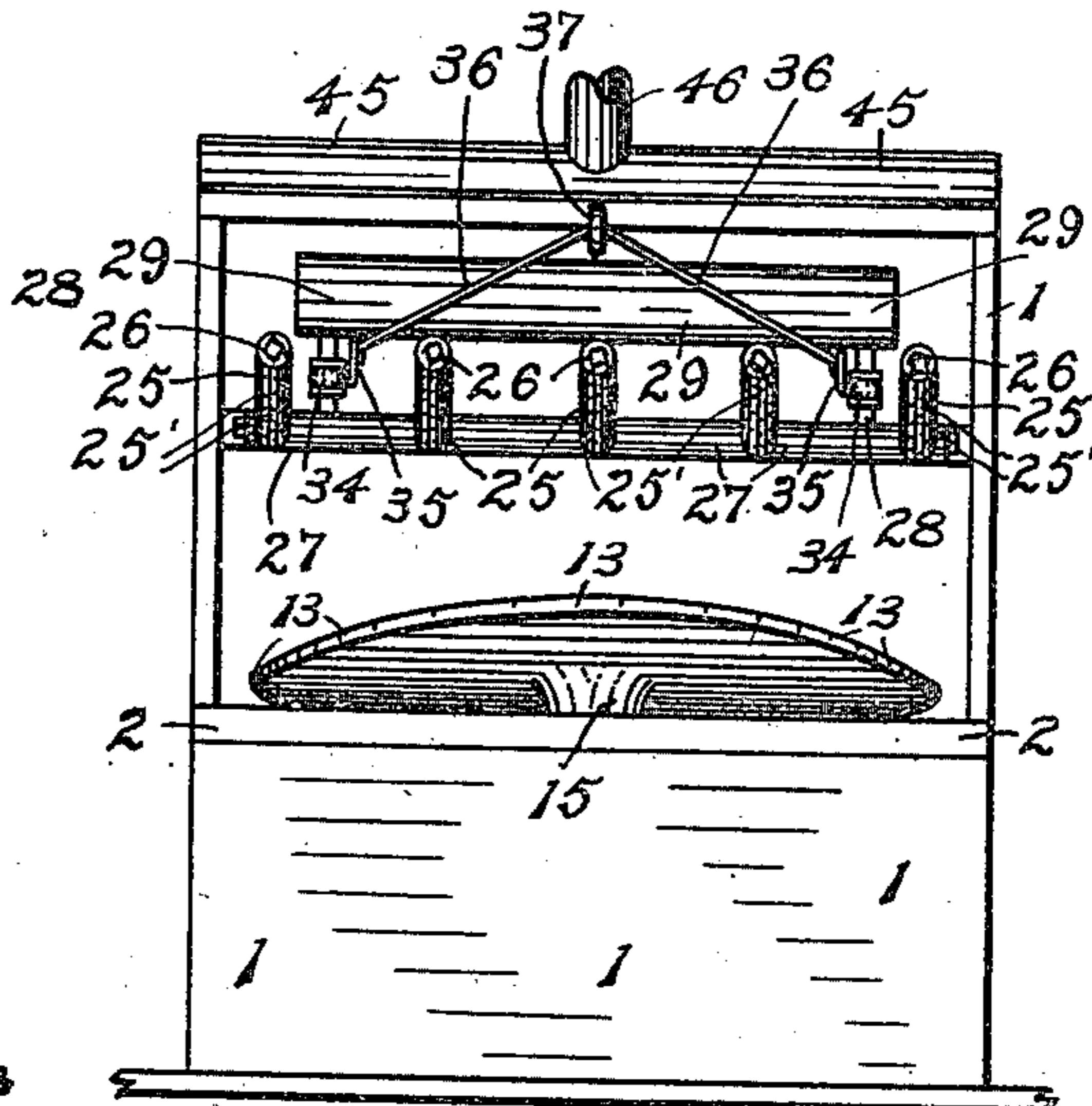


Fig. 8.

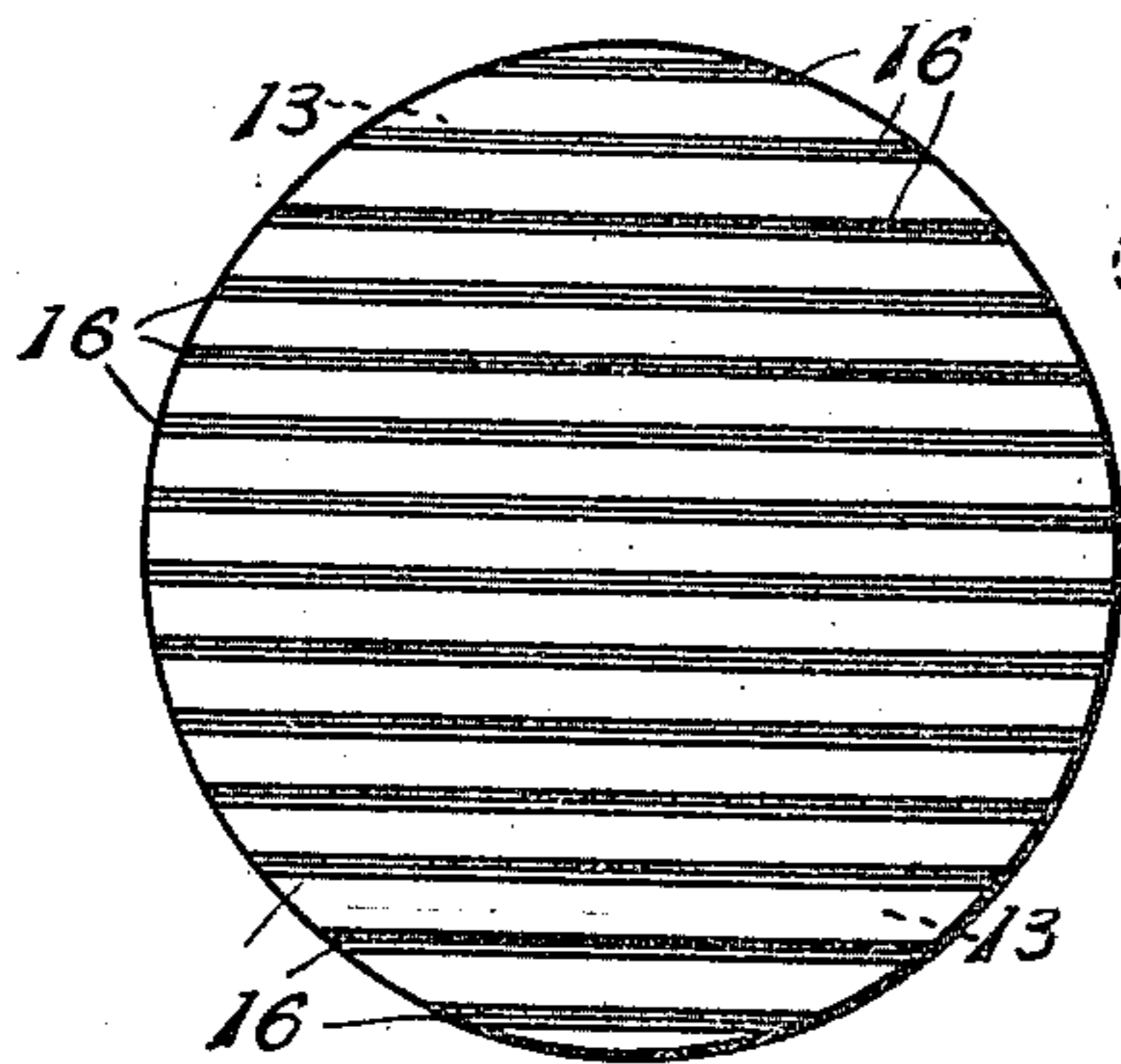


Fig. 11.

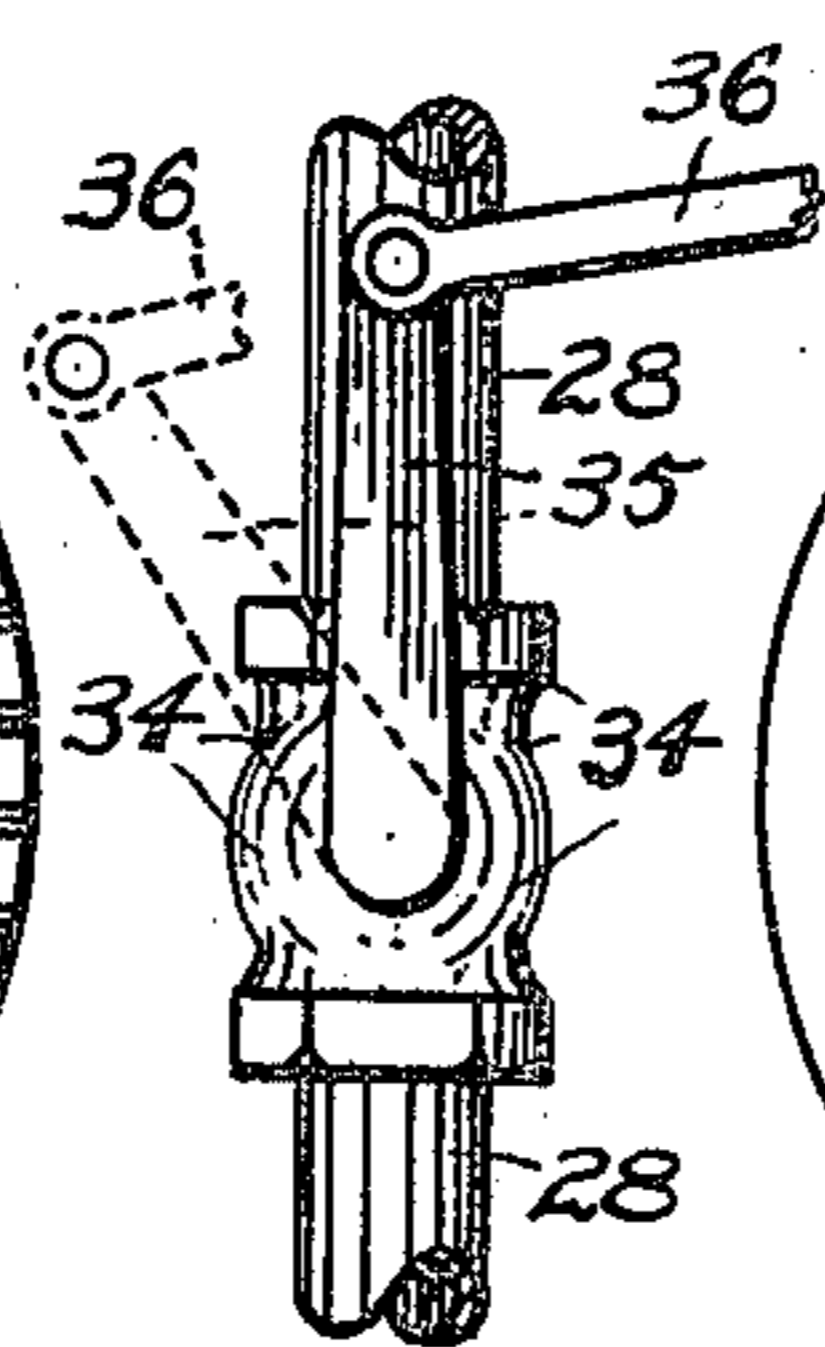


Fig. 9.

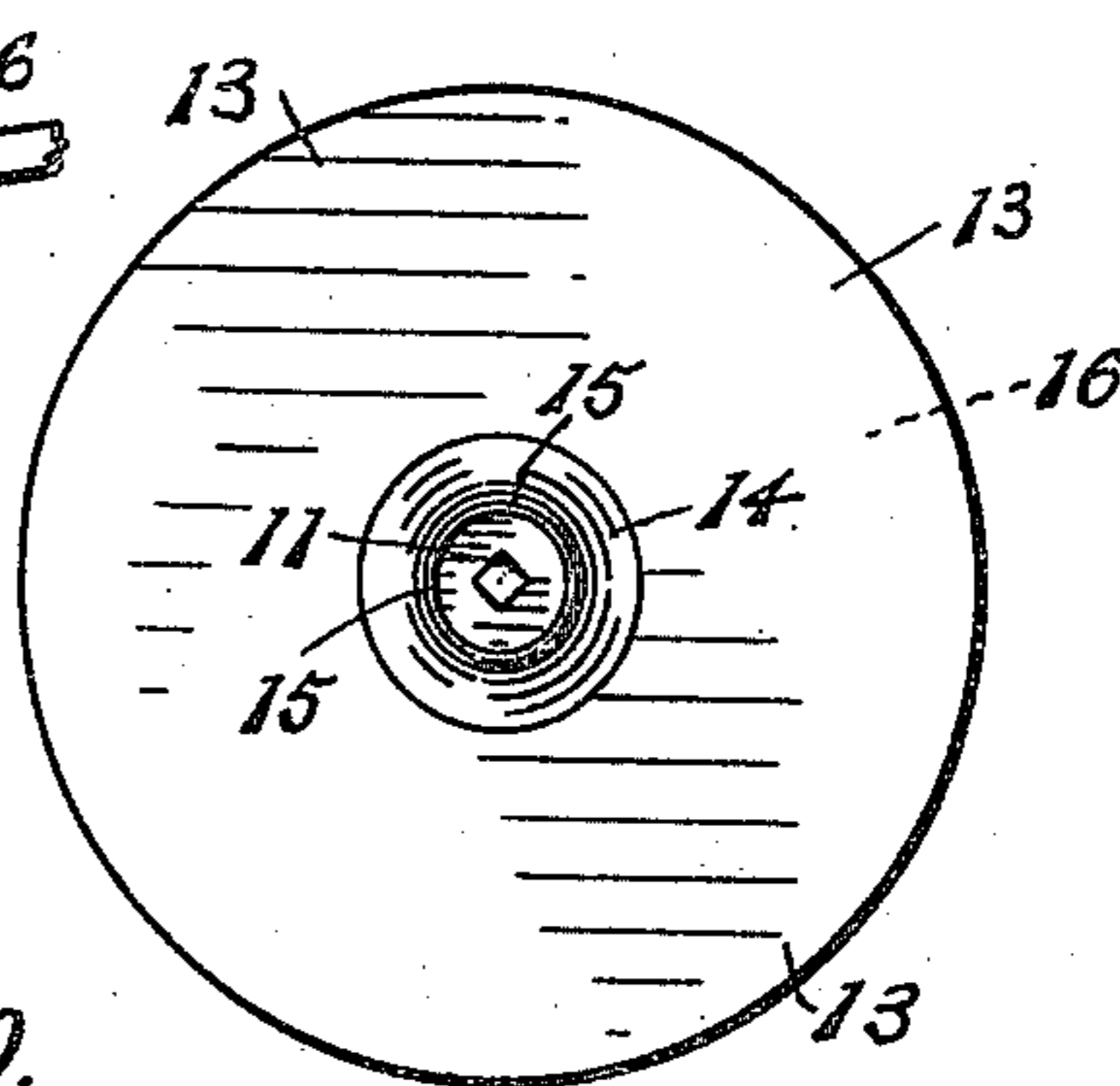
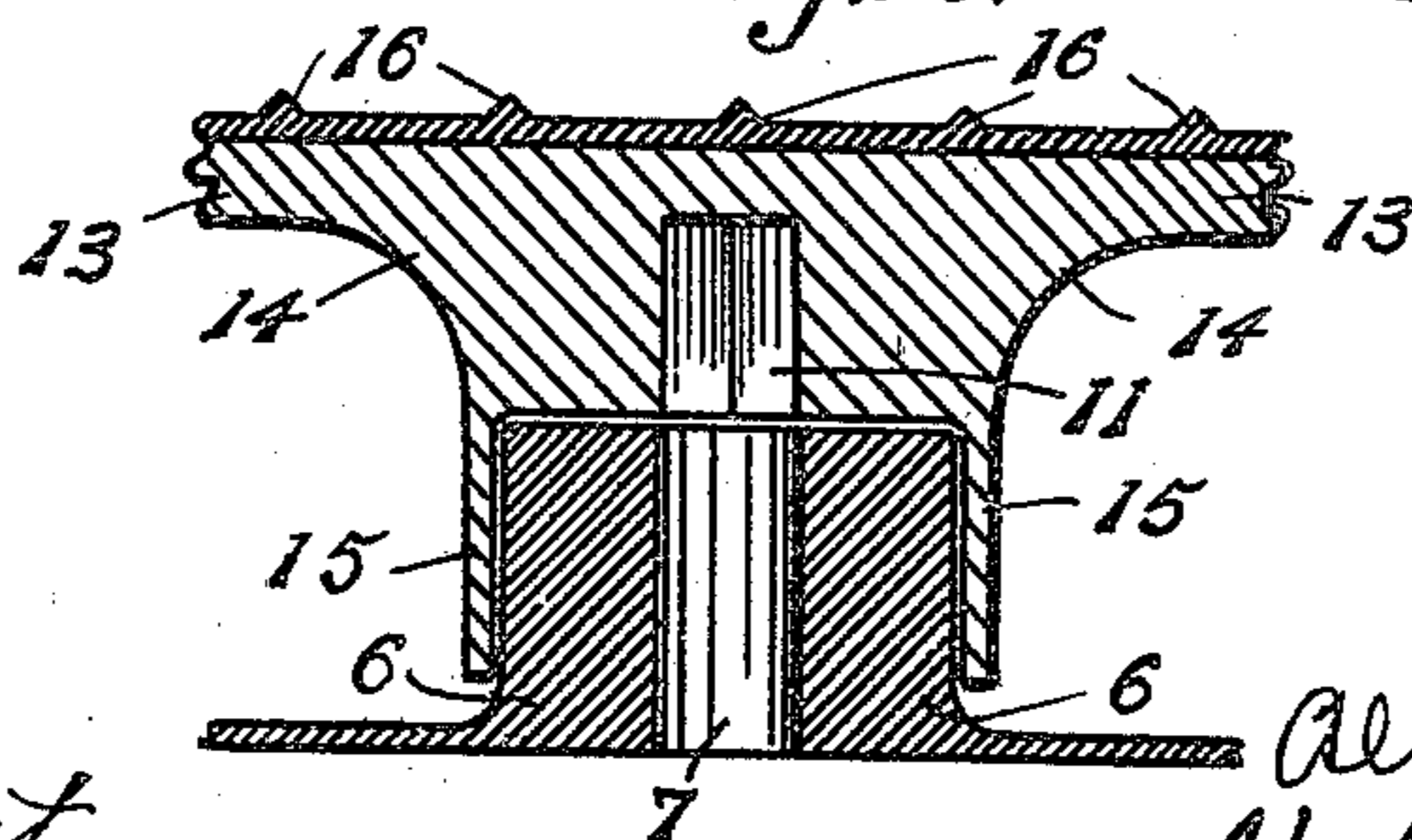


Fig. 10.



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UNITED STATES PATENT OFFICE.

ALBERT R. SMITH AND JOHN F. AHLE, OF LOS ANGELES, CALIFORNIA.

ETCHING-MACHINE.

964,126.

Specification of Letters Patent.

Patented July 12, 1910.

Application filed August 22, 1906. Serial No. 331,597.

To all whom it may concern:

Be it known that we, ALBERT R. SMITH and JOHN F. AHLE, citizens of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Etching-Machines, of which the following is a specification.

This invention relates to improvements in apparatus for etching, and has for its principal objects to provide a device for successfully and quickly etching a plate by causing the plate to continually alter its position while being subjected and exposed to the action of dilute nitric acid.

In the course of our experiments we have discovered that a plate, upon the face of which is imprinted a design, or a number of designs, after undergoing continuous treatment and subjection to an erosive medium, either in the form of a rain or in a bed supplied with acid, which is caused to rock to and fro, invariably shows material defects. These defects produce usually a picture or reproduction, which appears and in fact is blurred and marred, and close scrutiny of the treated plate discloses a ragged and rough etching of the metal in and about the stipples and lines of the design thereupon. Such a condition of the plate after treatment is attributable solely to the uneven and forcible application of the acid to the face of the plate. If the liquid is allowed to fall in jets upon the face, even though the angle of the jets is changed in its descent relatively to the plate, or if the subjection of the same occurs in a rocking tub, the corrosive action of the liquid upon the plate is in no manner uniform, because the full impact of the fluid upon any particular part of the plate causes a promiscuous distribution, inasmuch as some parts of the plate receive the full force of the descending stream, while the remaining portions receive only that amount of force which is disseminated and spattered about by the first impact of the stream. Thus we have found that by this method, an undercutting in and about the lines and stipples of the design is an unavoidable result of the processes and devices hitherto employed; and in the apparatus we are about to describe these disadvantages have been overcome.

We place the plate on a slight incline and cause the revolution of the same, whereby the entire face of the plate receives a uni-

form application of the nitric acid, and forestalls any uneven distribution of the same. The acid is forced under pressure upon the face of the plate at an angle. It is never allowed to strike the face of the plate in bulk. The drops of the dilute acid are broken up previous to striking the plate, that is to say, the acid strikes the plate in the state of a diffused liquid, after being impregnated with atmospheric air under pressure. This increases the erosive action of the liquid to such an extent that less than one half the time usually required is expended in the completion of the work. By this construction no accumulation of acid on the surface face results, which is usually the cause of undercutting.

The inclination of the table within the casing prevents the accumulation of any acid upon the face of the plate to be etched. The acid is allowed to fall off the revolving table at the lowermost point, which is always changing when the machine is in operation. The horizontal application of liquid upon a plate which is likewise horizontal, causes the water to run off from the center to all four sides of the plate provided with the resist, whereby undercutting of the metal in and about the stipples is the result, especially if the plate which is subjected to the treatment of dilute nitric acid in the process of etching, is not frequently changed. In known devices of similar kinds, now employed for this purpose, the unevenness of the acid upon the face of the plate is productive of the same undesirable results, because more acid is allowed to take effect on the edges than on the center, consequently producing an uneven distribution of the liquid. We have also discovered that devices used for the accomplishment of this purpose have been costly and difficult of construction. The great cost of machines has been the most serious disadvantage to their marketable value, chiefly on account of the highly expensive material used in their assembling. Acid resisting material of known kinds, such as porcelain, china, rubber or the precious metals, are so costly as to make the sales of many machines thus fitted out almost prohibitive. We propose to employ a metal in the construction of our device, with which to line the entire interior mechanism forming part of the invention. This metal is aluminum. It is inexpensive, easy to handle, and non-corrosive to the ac-

tion of nitric acid, either concentrated or dilute.

With these and other objects in view, our invention consists in the features, details of construction and combination of parts, as will be described in connection with the accompanying drawings, and then be more specifically pointed out in the claims.

In the drawings: Figure 1, a longitudinal vertical section. Fig. 2, a top plan view showing the glass cover. Fig. 3, a fragmentary detail of the supply tank, spray pipes and valves assembled. Fig. 4, an enlarged sectional, side elevation of a fragment of the casing showing the pump, in section, and the inlet and outlet pipes partly in section. Fig. 5, a bottom plan view on an enlarged scale, showing the perforations and the attachment to the supply pipe, which is shown broken. Fig. 6, a front elevation with the air supply pipe omitted. Fig. 7, a rear end elevation. Fig. 8, a plan of the table detached from the balance of the mechanism. Fig. 9, a bottom plan view, showing the rectangular socket for engagement with the stud. Fig. 10, a fragmentary enlarged detail of the table and its mountings, and Fig. 11 is an enlarged fragmentary detail of the valve for controlling the flow of liquid to the spray pipes.

Specific reference being had to the drawings, 1 represents a casing having an inclined bottom 2. The upper portion of the casing is provided with a glass cover 3, resting on offsets 4 in the frame work of the casing, in order to allow the operator to conveniently view the progress of the work within.

5 is an acid resisting lining, preferably aluminum, with which the interior of the casing is fitted out. On the bottom of the casing and approximately centrally thereof, the said lining terminates in a solid boss seen at 6, having a bore 7, arranged to accommodate a pin or stud 8, extending through an opening 9 in the bottom of the casing. This pin or stud 8 has on one end a squared or nut portion 10, and is arranged to loosely fit in a socket 11, provided in a boss 12 of the table 13.

As seen at 14, the boss 12 is for a part of its distance solid and terminates in a shell or sleeve 15, loosely fitting over the boss 6, on the bottom of the casing. This provision prevents the entrance of any acid to the support for the table and the consequent corrosion thereof. Said table 13 is inclined in a plane parallel to the bottom of the casing. Its face is aluminum and provided with rifles or corrugations 16. The other end of the stud or pin 8 is carried by the bracket 17, and has rigidly mounted thereon, a bevel pinion with which a similar bevel pinion 19 meshes. Said pinion 19 is fixed on a shaft 20 extending through one wall 21 of the

casing and has one end journaled in the bracket 17, fixed to the bottom of the casing. The other end has a pulley 22, which is connected with the pulley 23, fixed on the line shaft 24, by belt 25", and through which motion is transmitted to the table 13.

25 is a plurality of perforated spray pipes located above the table 13, and at the same angle to the horizontal. The perforations are seen at 25'. These pipes are provided with screw plugs 26, at the end, to permit cleansing of the interior of the pipes, when necessary, and are screwed into a supply pipe 27, connected by pipe 28, with a tank or reservoir 29. The tank is supplied with etching fluid from the pump 30, through the pipe 31.

32 is a pipe extending through the wall 32', of the casing and arranged to serve as an intake for the pump 30, which forces the acid into the tank 29, continuously during the operation of the machine, thereby avoiding waste of the acid and allowing the full strength to be extracted.

33 is an overflow pipe communicating with the tank 29 and having its free end extending down to near the bottom of the casing, the object of this pipe being to permit the acid to return to the bottom of the casing when the etching of plates is temporarily interrupted as when new plates are to be placed on the table. The supply of acid is cut off from the spray pipes 25 by valves 34, provided on the pipes 28, which connect the tank with the supply pipe 27. Links 35 are connected with the valves 34, onto which are pivotally secured rods 36, which are joined to an operating handle 37, secured by hangers 38 to the under side of the upper portion of the casing, and by means of which the flow of acid through the spray pipes 25 can be cut off by the operator. This action, however, in no manner interrupts the continued operation of the pump, since the valve 39 in the overflow pipe immediately opens and allows the fluid to escape to the bottom of the casing where it is again sucked in by the pump and delivered to the tank.

To regulate the pressure in the tank 29, which may be necessary when the mordant does not pass through the spray pipes sufficiently fast, we provide on one end of the tank 29, a valve or plug 47, fastened to one end of a bell crank lever 47^a, which is provided with a threaded shank to receive a counter weight, not shown in Fig. 3, by the movement of which the amount of pressure actually needed in the reservoir may be regulated. This valve or plug 47 fits in an opening 48 provided therefor in the tank 29. Thus if the pressure of the liquid in the tank 29 exceeds a predetermined amount, the excess pressure will force the valve 47 out of its seat and allow the liquid to escape.

40 is a rotary fan attached to the upper

end of the casing. A pipe 41 is connected with said fan and extends forwardly in the casing.

42 is a perforated pipe fixed to said pipe 41, and extending at substantially right angles thereto. It is slightly in advance of the terminus of the spray pipes, and serves to direct air jets upon the face of the plate to be etched, in order to increase the oxidizing action of the acid. The fan is rotated by belt 43, connected with pulley 44 on the line shaft 24.

The upper rear end of the frame of the casing is open and over the opening provided therein, is a hood 45, having a vent 46, which communicates with the atmosphere. The fumes arising from the acid are caused to escape into said hood and out through said vent. Inhalation of the injurious fumes is therefore avoided and the work of etching carried on with perfect safety to the operator.

The machine may be flushed with fresh water to remove zinc particles from the casing or to cleanse the same of any old acid. This cleaning can be done through the same pipes which convey the acid to the tank and spray pipes.

The used acid may be drawn off in any manner as by providing connections directly with the pump whereby the fluid is sucked out of the casing and discharged into a sewer.

Having thus fully described and ascertained the nature of our invention, what we claim and desire to secure by Letters Patent of the United States is:—

1. The combination with a casing having mounted therein a table inclined to the horizontal and means for revolving said table, spray pipes in said casing, a tank for supplying etching fluid to said spray pipes, automatic means for regulating the pressure in said tank, a pump for supplying said tank, and means for projecting a blast of air upon the face of said table.

2. The combination with a casing, of a table mounted in said casing, and inclined to the horizontal, means for spraying etching fluid upon the face of said table and means for projecting a blast of air upon the face of said table and at angle thereto.

3. The combination with a casing having a metallic acid-resisting lining, of a table inclined to the horizontal mounted therein, means for revolving said table, spray pipes parallel with said table, means for supplying fluid to said pipes, and means for projecting a blast of air upon the face of said table.

4. An etching device comprising a casing, having an aluminum lining, an aluminum table inclined to the horizontal, mounted in said casing, means for revolving said table, spray pipes parallel with said table, a source

of supply for said pipes, and means for projecting a blast of air upon the face of said table, and at an angle thereto.

5. The combination with a casing, having an aluminum lining and a bottom inclined to the horizontal, of a table inclined to the horizontal mounted in said casing, spray pipes parallel with said table, a tank for supplying fluid to said spray pipes, connections between said tank and spray pipes, valves on said connections for cutting off the supply from said spray pipes, means for controlling said valves, means for projecting a blast of air upon the face of said table at an angle thereto, and means for carrying off the fumes.

6. An etching machine comprising a casing having an inclined bottom, a table in said casing, and means for revolving said table, a plurality of spray pipes in said casing and above said table, means for supplying fluid under pressure to said pipes, means for projecting a blast of air upon said table, and an outlet for the air.

7. In an etching machine, the combination with a casing having an inclined bottom, of a table in said casing, means for revolving said table, a plurality of spray pipes in said casing, means for supplying fluid thereto, a transparent cover in the top of said casing, and means for controlling the supply of etching fluid from the forward end of the machine.

8. In an etching machine, the combination with a casing having an inclined bottom, of a table mounted on said bottom, means for revolving said table, a plurality of spray pipes in said casing and above said table, means for supplying fluid to said pipes, means for creating a forced draft in said casing and a hood on said casing having a vent for carrying off the fumes from said casing.

9. In an etching machine the combination with a casing having an inclined bottom, and a transparent cover, of a table revolvably mounted on said inclined bottom, means for revolving said table, a plurality of spray pipes in said casing, and above said table, means for supplying fluid to said pipes, means for cutting off the supply from said pipes, and an overflow for said supply.

10. In an etching machine, the combination with a casing, having a transparent cover, and an interior aluminum lining, said lining terminating on the bottom in a boss having a bore, of an aluminum table inclined to the horizontal and provided with a sleeve arranged to fit over said boss, said table having a socket, a pin extending through said bottom, and the bore of said boss and arranged to engage the socket in said table, a bearing for said pin, and means for revolving said pin, spray pipes parallel with said table, means for continuously sup-

plying fluid to said spray pipes from the bottom of the casing, and means for projecting a blast of air upon the face of said table.

5 11. In an etching machine, the combination with a casing, having a bottom inclined to the horizontal and an aluminum lining, of an aluminum table mounted loosely on said bottom and inclined to the
10 horizontal, means for revolving said table, means for spraying etching fluid upon the face of said table, and means for projecting a blast of air upon the face of said table.

12. An etching machine, comprising a

casing having a metallic acid-resisting lining, a table inclined to the horizontal mounted therein, and means for spraying etching fluid and air upon the face of said table at an angle thereto. 15

In testimony whereof we affix our signatures, in presence of two subscribing witnesses. 20

AL. R. SMITH.
JOHN F. AHLE.

Witnesses:

F. J. BATZER,
ALFRED LEEBALDT.