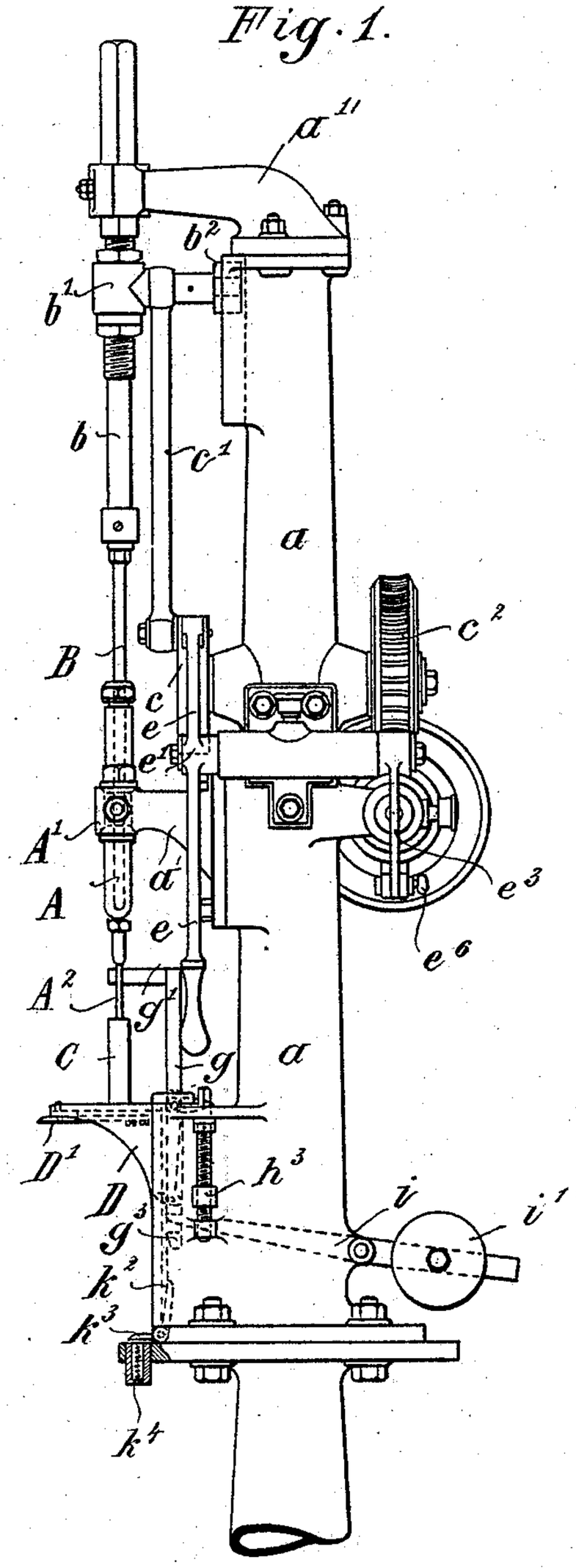
(No Model.) 17 Sheets—Sheet 1.

H. PLATZ & S. L. HUIZER.

APPARATUS FOR FILLING TUBES WITH VISCID OR SEMI-FLUID MATERIAL.

No. 578,944. Patented Mar. 16, 1897.

Fig. 1.



Witnesses:
J. B. Blaulice
M. F. Boyle

Inventors:
Hermann Platz
Samuel L. Huizer
By Thomas Drew Stetson
Attorney

(No Model.) 17 Sheets—Sheet 2

H. PLATZ & S. L. HUIZER.

APPARATUS FOR FILLING TUBES WITH VISCID OR SEMI-FLUID MATERIAL.

No. 578,944. Patented Mar. 16, 1897.

Fig. 3.

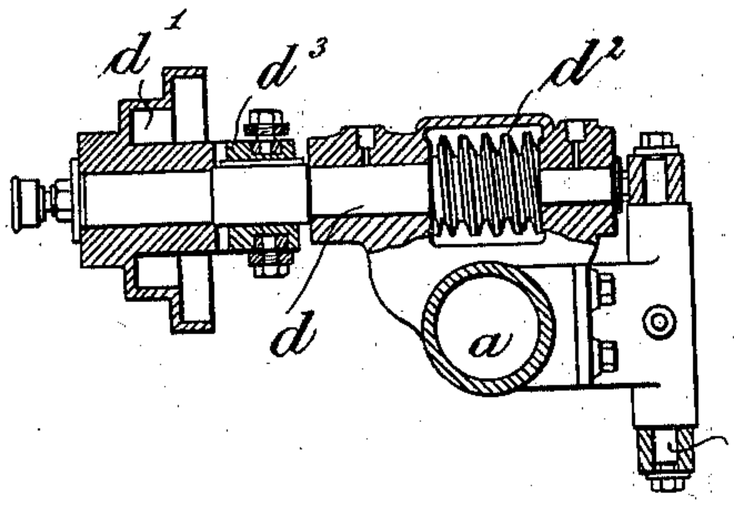


Fig. 2.

Witnesses:
J. B. Clautice
M. F. Boyle

Inventors:
Hermann Platz
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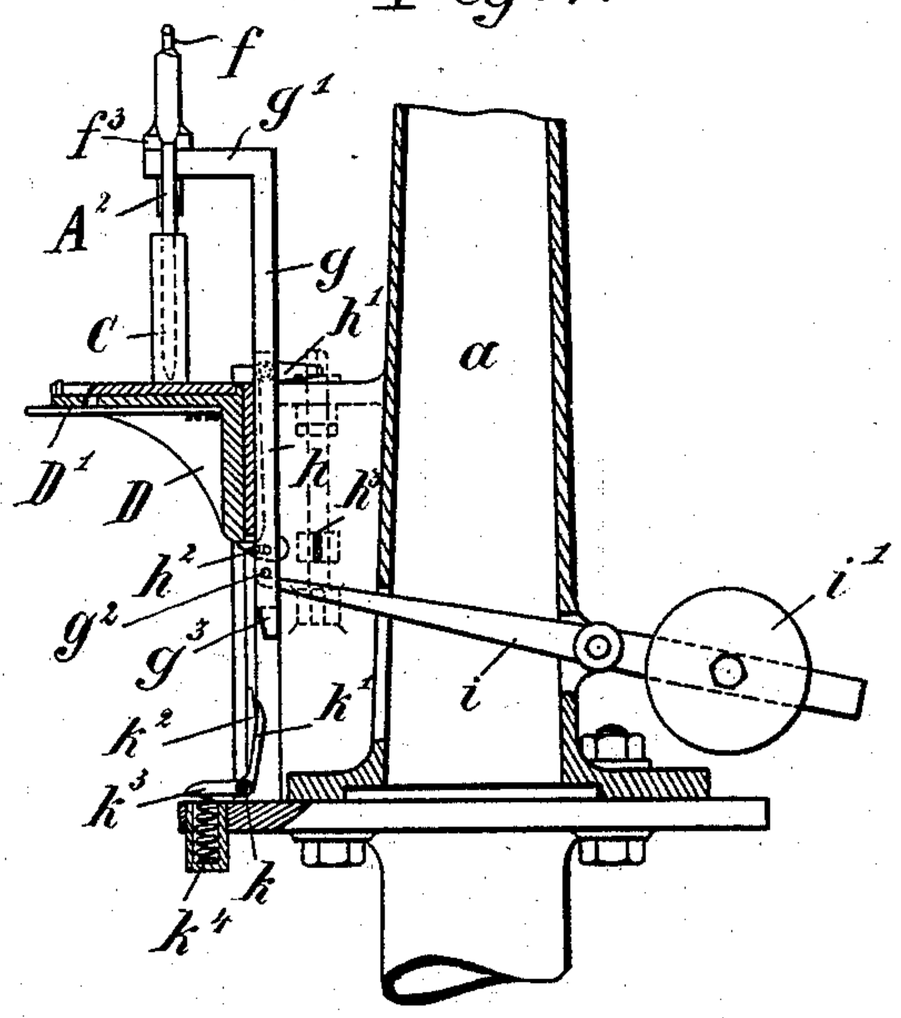
(No Model.) 17 Sheets—Sheet 3

H. PLATZ & S. L. HUIZER.

APPARATUS FOR FILLING TUBES WITH VISCID OR SEMI-FLUID MATERIAL.

No. 578,944. Patented Mar. 16, 1897.

Fig. 4.



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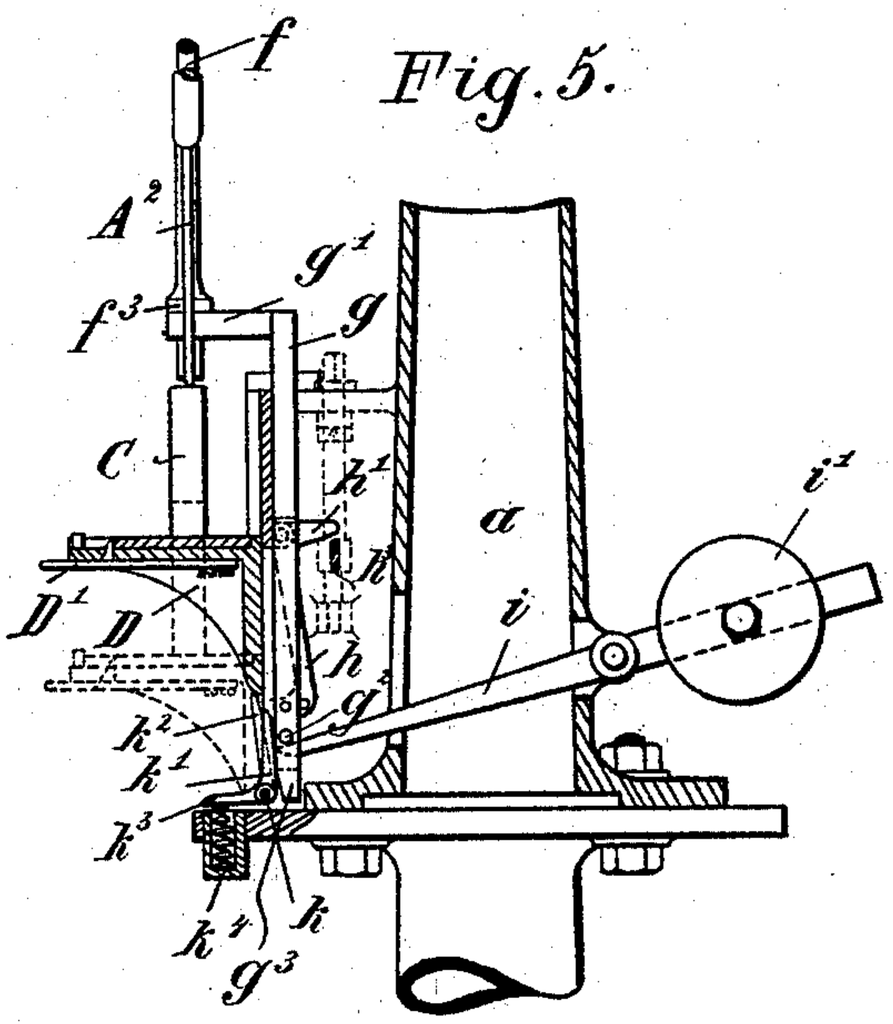


Witnesses:
J. B. Blaulee
M. F. Boyle

Inventors:
Hermann Platz
Samuel L. Huizer
By Thomas Drew Stetson
Attorney

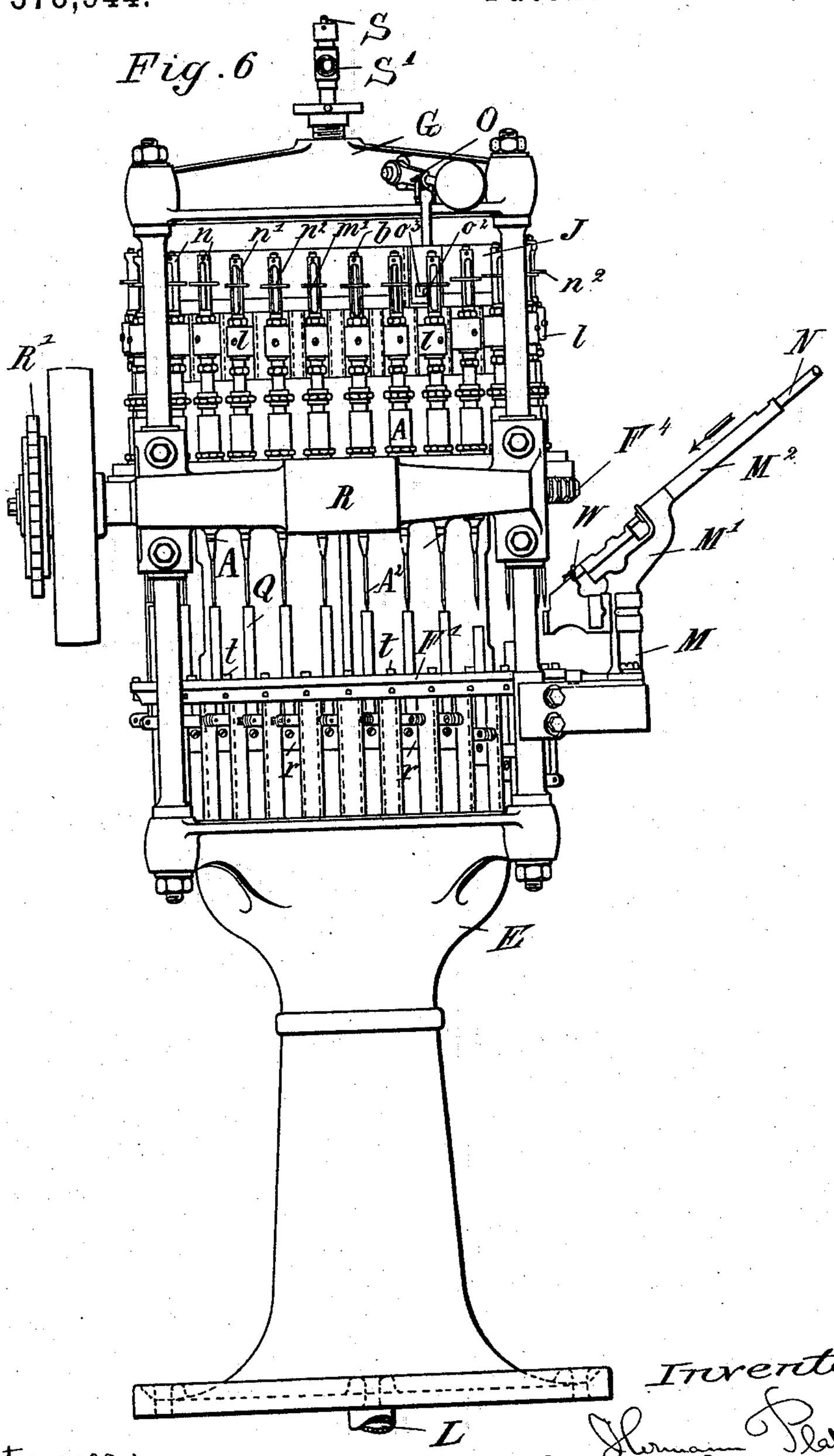
(No Model.) 17 Sheets—Sheet 4

H. PLATZ & S. L. HUIZER.

APPARATUS FOR FILLING TUBES WITH VISCID OR SEMI-FLUID MATERIAL.

No. 578,944. Patented Mar. 16, 1897.

Fig. 6



Witnesses:

J. B. Blantice

Inventors.

Herman Platz

Samuel Leander Huizer

By Thomas Drew Stetson

Attorney

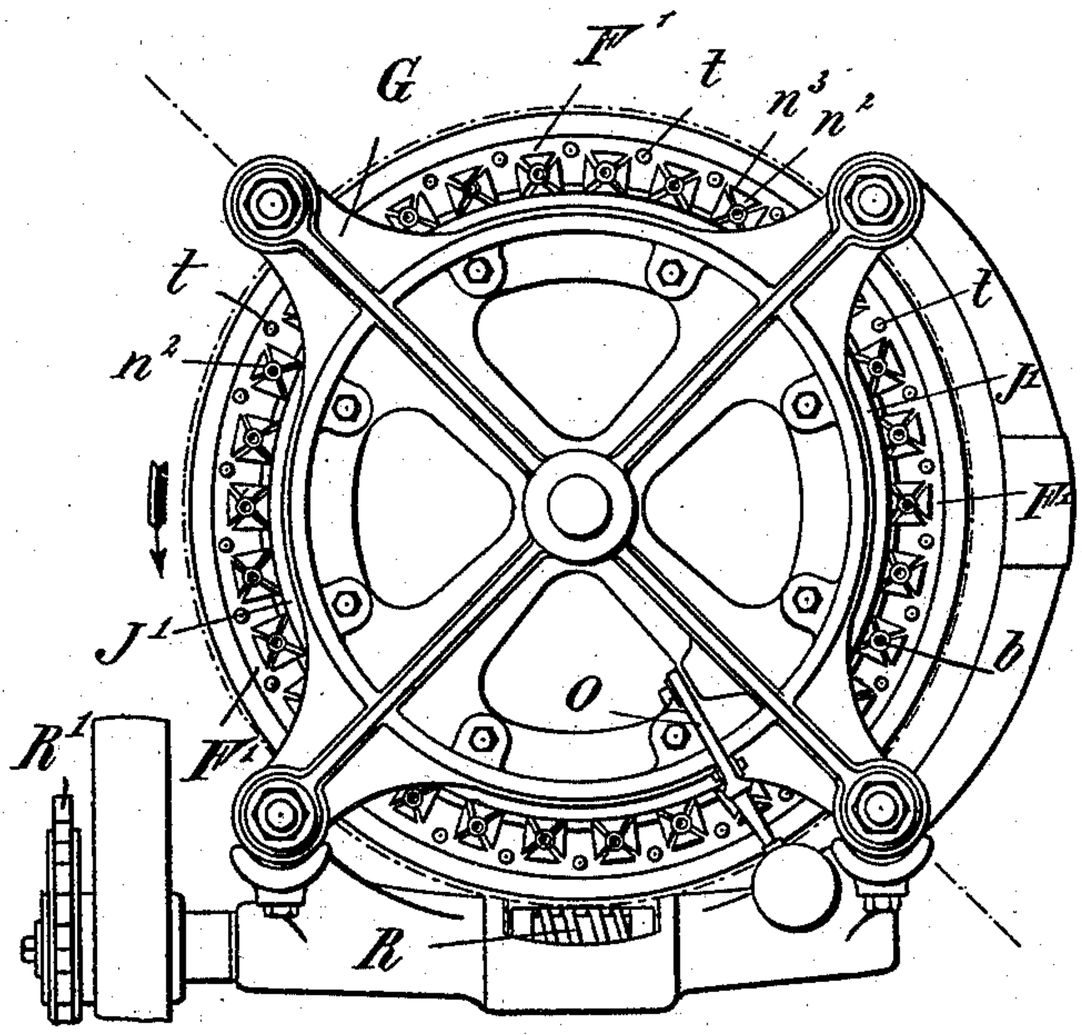
(No Model.) 17 Sheets—Sheet 5.

H. PLATZ & S. L. HUIZER.

APPARATUS FOR FILLING TUBES WITH VISCID OR SEMI-FLUID MATERIAL.

No. 578,944. Patented Mar. 16, 1897.

Fig. 7.



Witnesses:

William Seaton

J. B. Clautice

Inventors.

Hermann Platz,

Samuel Leendert Huizer

By Thos. Drew Sleeper

Attorney

(No Model.) 17 Sheets—Sheet 6

H. PLATZ & S. L. HUIZER.

APPARATUS FOR FILLING TUBES WITH VISCID OR SEMI-FLUID MATERIAL.

No. 578,944. Patented Mar. 16, 1897.

Fig. 8.

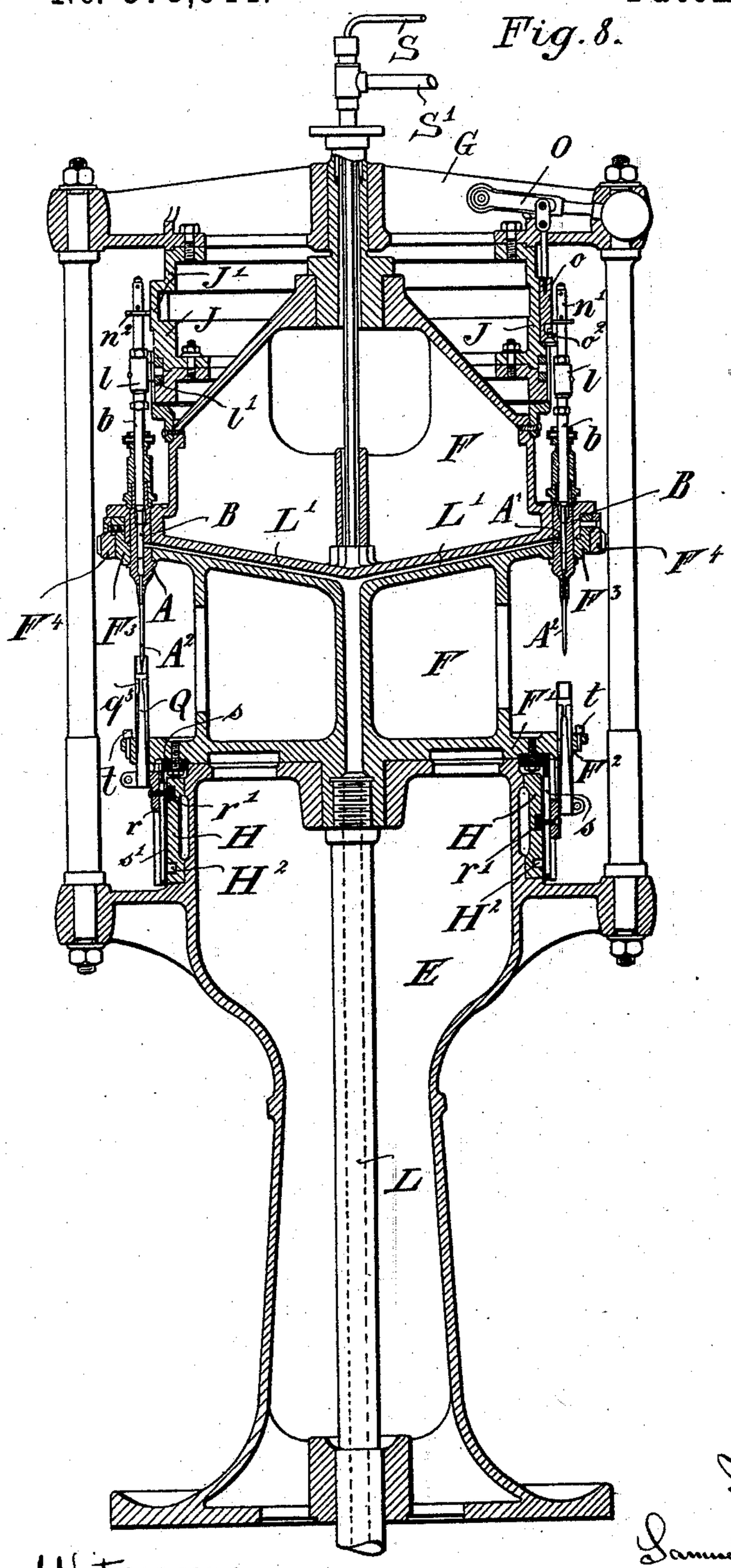
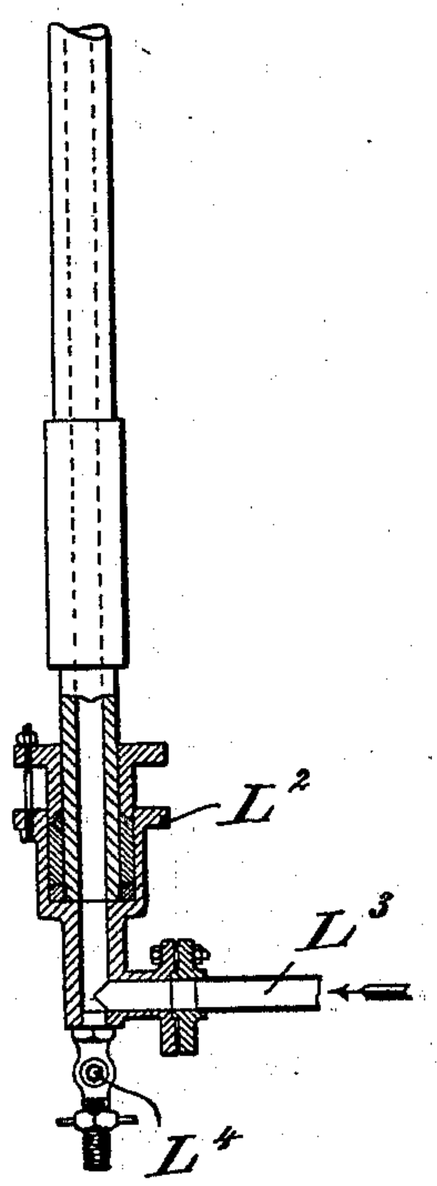


Fig. 8ª



Witnesses:
William Seaton
J. B. Clautice

Inventors.
Hermann Platz
Samuel Leudert Huizer
By Thomas Drew Steteon
Attorney

(No Model.) 17 Sheets—Sheet 7.

H. PLATZ & S. L. HUIZER.

APPARATUS FOR FILLING TUBES WITH VISCID OR SEMI-FLUID MATERIAL.

No. 578,944. Patented Mar. 16, 1897.

Fig. 11. Fig. 12.

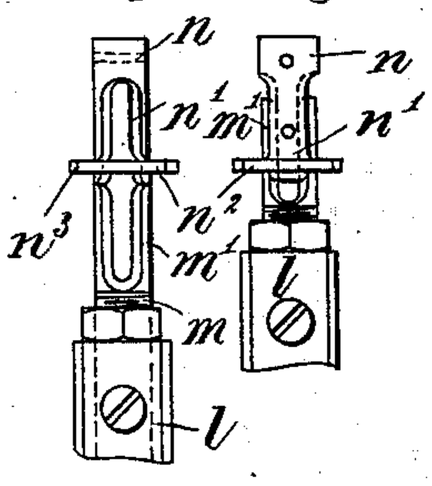
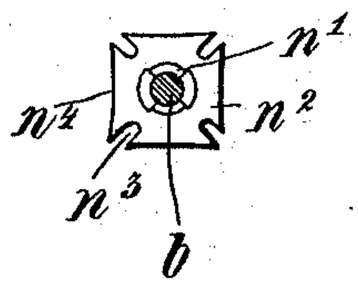


Fig. 13.



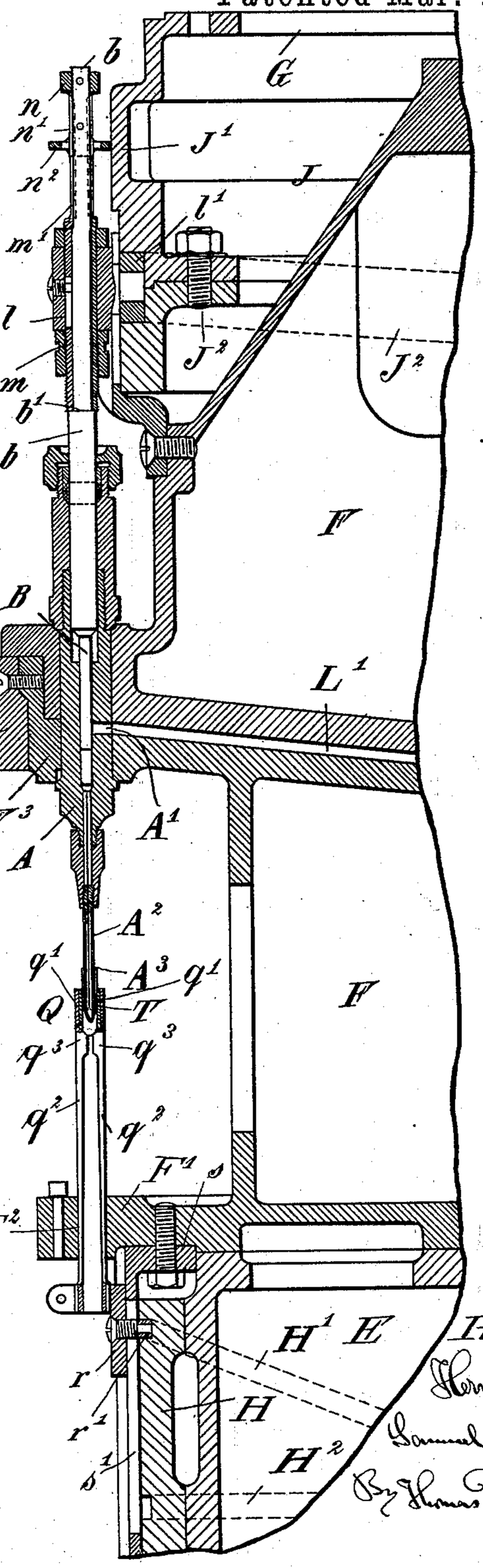


Fig. 9.

Witnesses:
William Stetson
J. B. Clautice

Inventors
Herman Platz
Samuel Lenert Huizer
By Thomas Drew Stetson
Attorney

(No Model.) 17 Sheets—Sheet 8

H. PLATZ & S. L. HUIZER.

APPARATUS FOR FILLING TUBES WITH VISCID OR SEMI-FLUID MATERIAL.

No. 578,944. Patented Mar. 16, 1897.

Fig. 10.

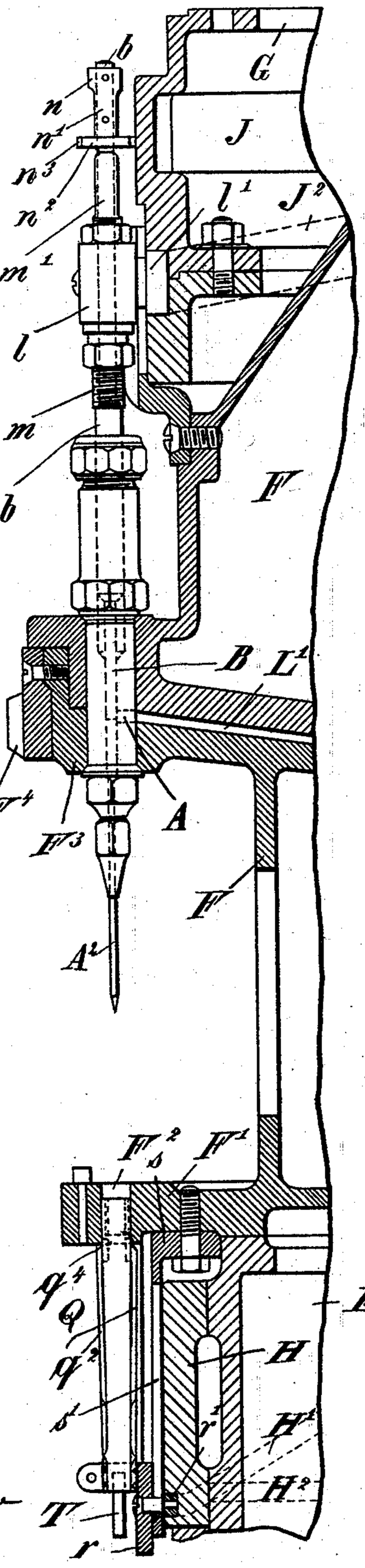
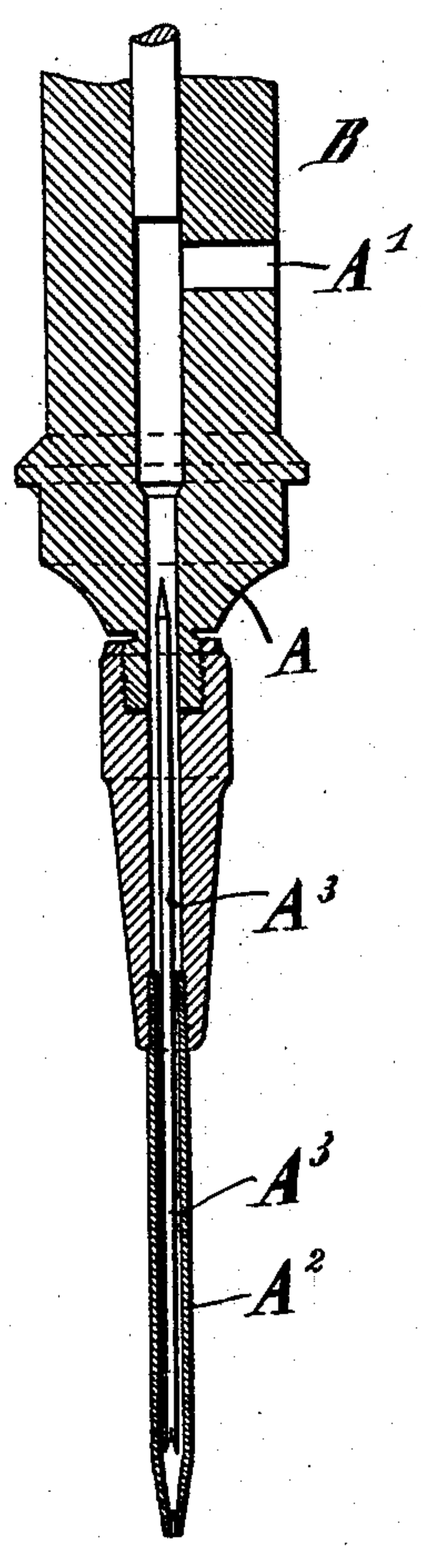


Fig. 14.



Witnesses:

William Baldwin

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Inventors.

Hermann Platz

Samuel Lollendert Huizer

By Thomas Drew Stetson

Attorney

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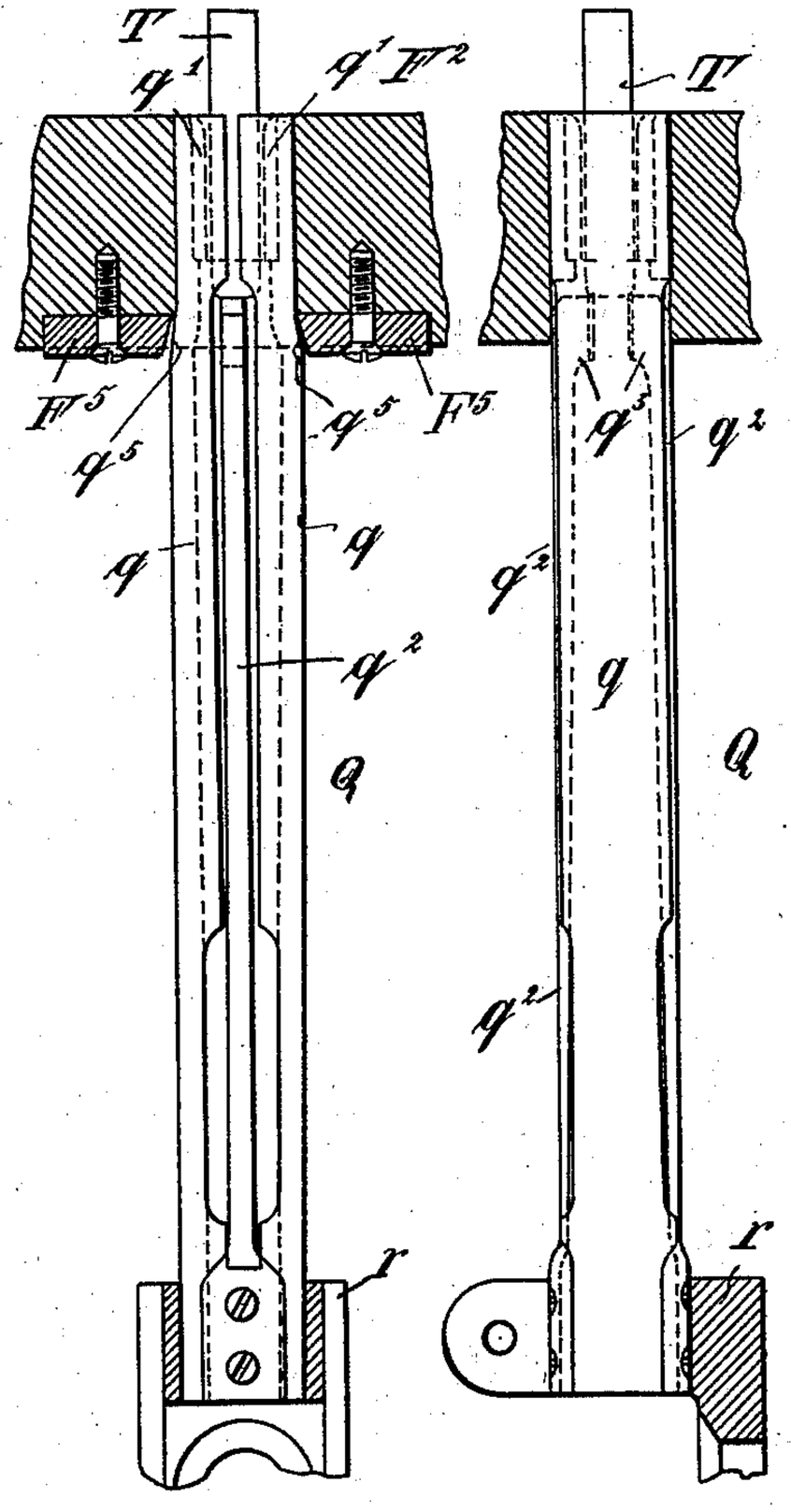
H. PLATZ & S. L. HUIZER.

APPARATUS FOR FILLING TUBES WITH VISCID OR SEMI-FLUID MATERIAL.

No. 578,944. Patented Mar. 16, 1897.

Fig. 15. *Fig. 16.*



Witnesses:

William Seton

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(No Model.) 17 Sheets—Sheet 10.

H. PLATZ & S. L. HUIZER.

APPARATUS FOR FILLING TUBES WITH VISCID OR SEMI-FLUID MATERIAL.

No. 578,944. Patented Mar. 16, 1897.

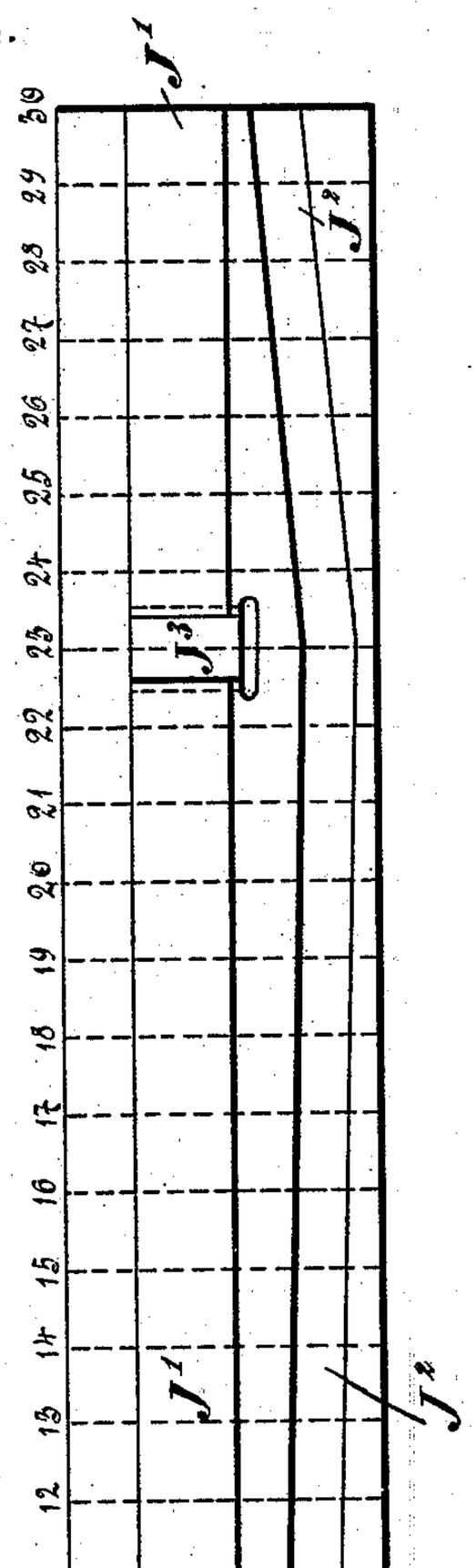


Fig. 17.

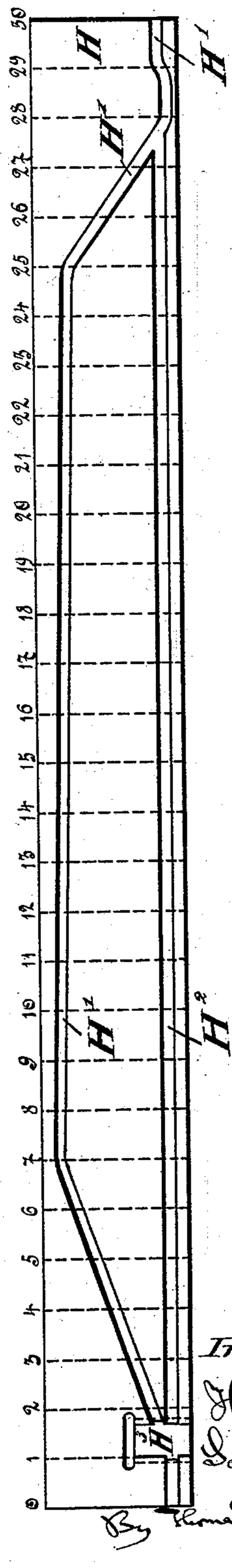


Fig. 18.

Witnesses:
William Dunn
J. B. Blanticce

Inventors
H. Platz
S. L. Huizer
By Thomas Drury Sutton
Attorney

(No Model.) 17 Sheets—Sheet 11.

H. PLATZ & S. L. HUIZER.

APPARATUS FOR FILLING TUBES WITH VISCID OR SEMI-FLUID MATERIAL.

No. 578,944. Patented Mar. 16, 1897.

Fig. 19.

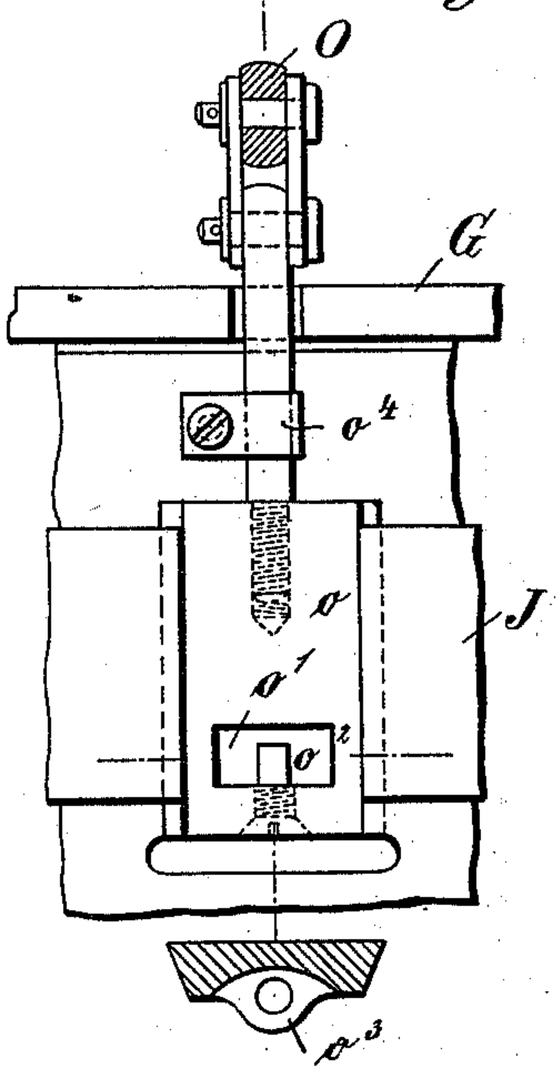


Fig. 20.

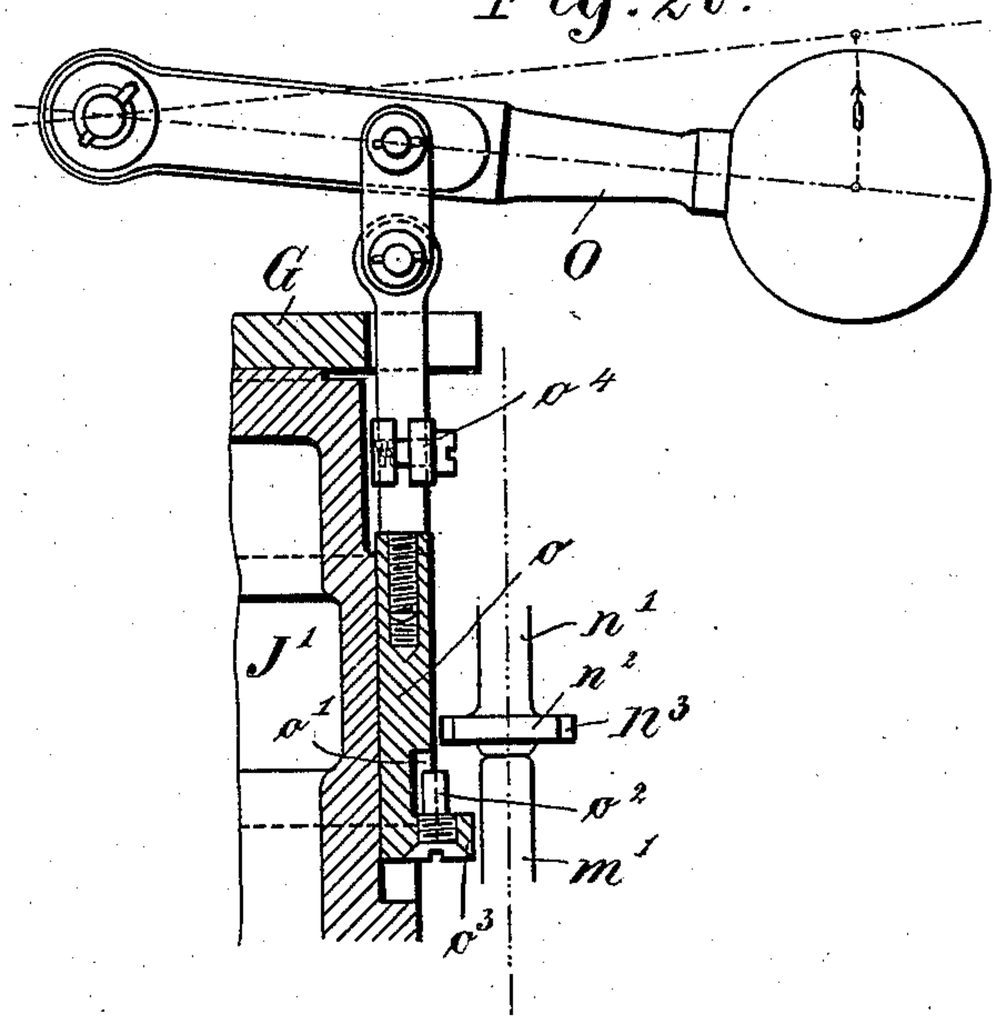
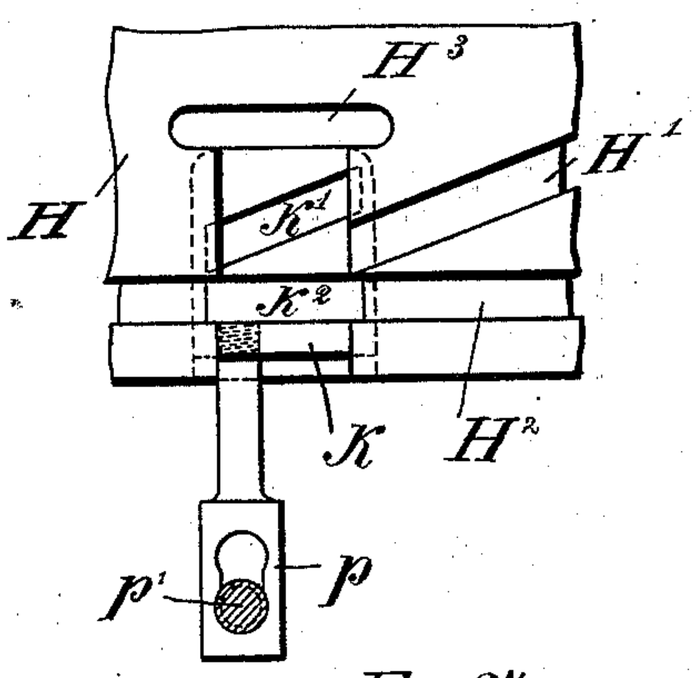


Fig. 21.



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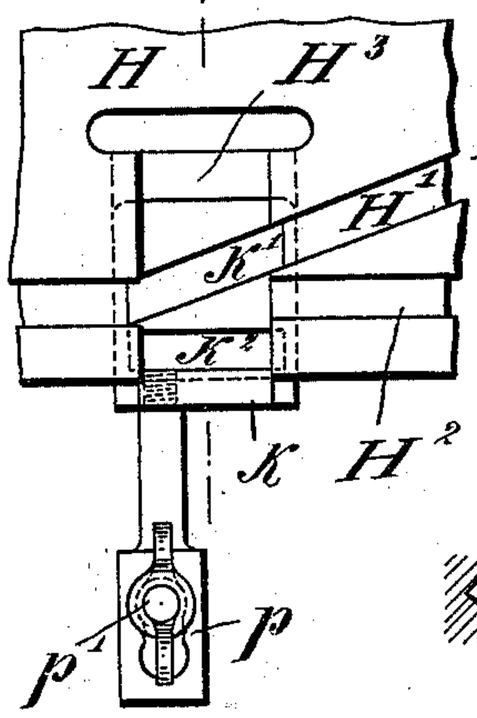
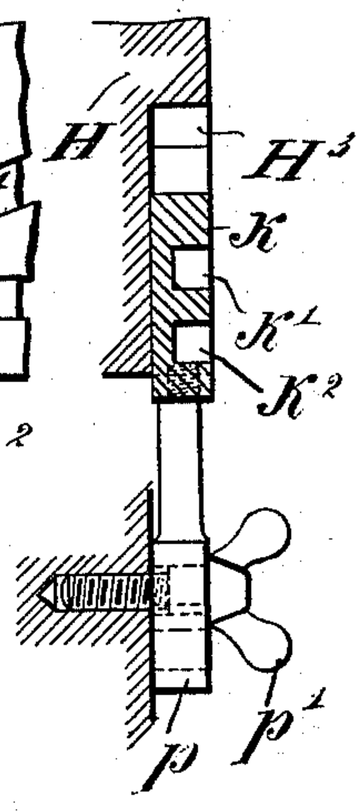


Fig. 23.



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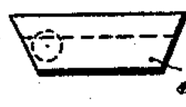

Witnesses:

Williamson

J. B. Clautice

Inventors.

Hermann Platz

Samuel Leander Huizer

By Thos. Dyer Stetson

Attorney

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H. PLATZ & S. L. HUIZER.

APPARATUS FOR FILLING TUBES WITH VISCID OR SEMI-FLUID MATERIAL.

No. 578,944 Patented Mar. 16, 1897.

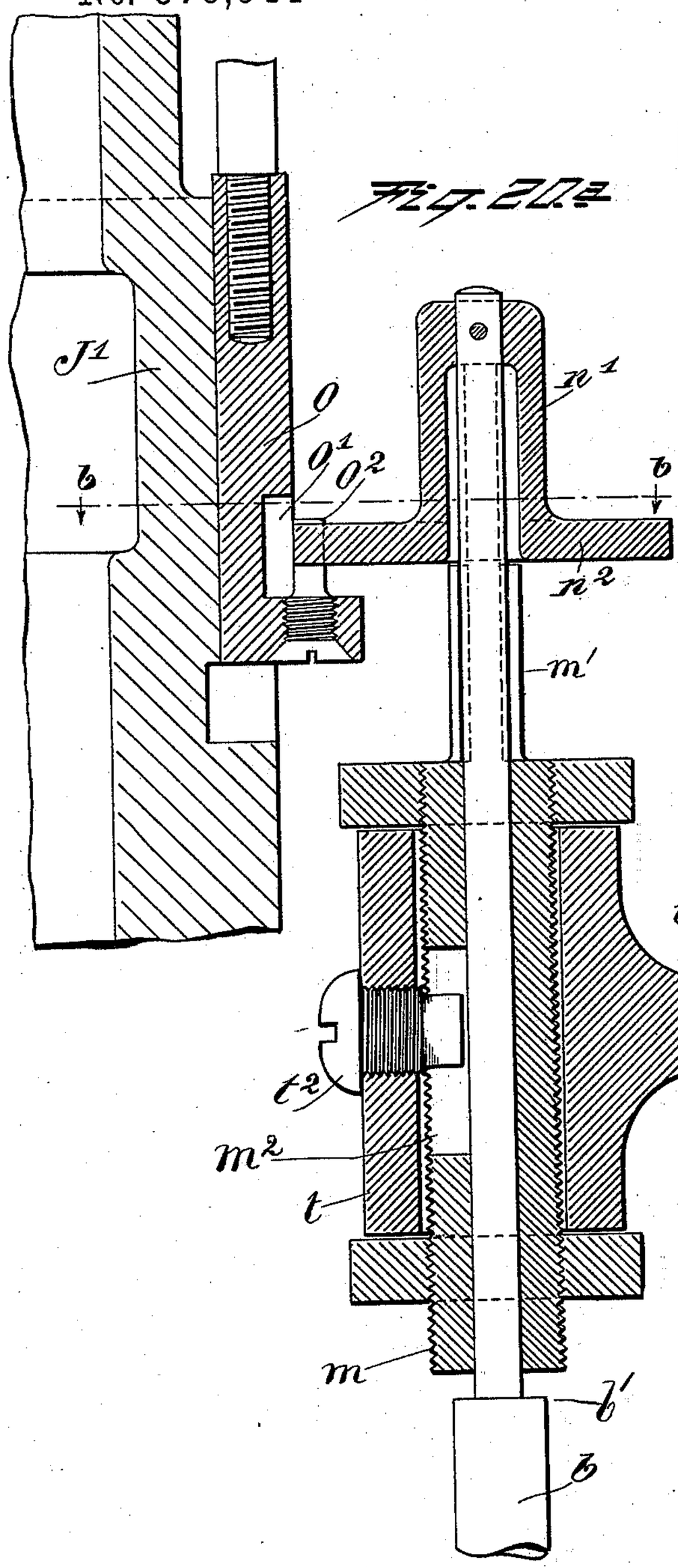


Fig. 2a.

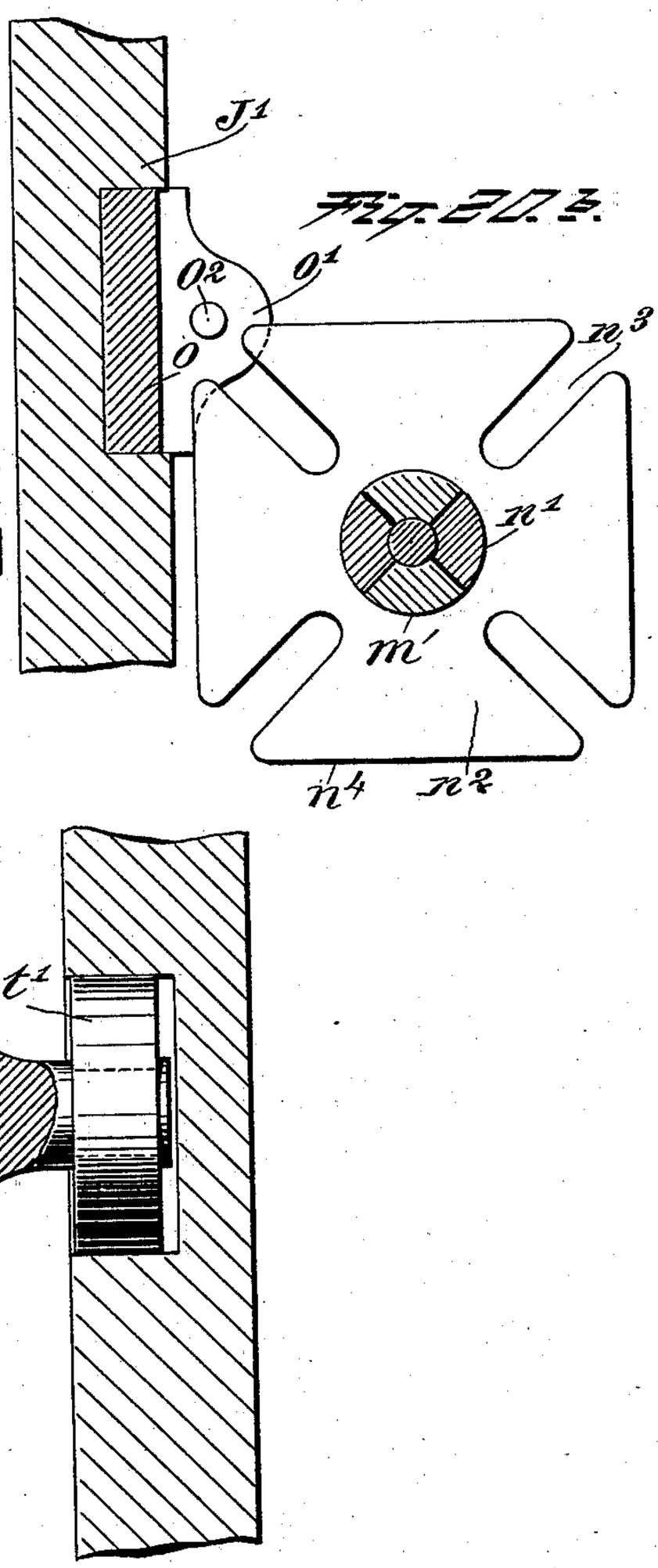


Fig. 2b.

WITNESSES:
Henry T. Hirsch.
M. F. Boyle.

INVENTORS
H. Platz and S. L. Huizer
BY
Thomas Drew Stetson
ATTORNEY.

(No Model.) 17 Sheets—Sheet 13

H. PLATZ & S. L. HUIZER.

APPARATUS FOR FILLING TUBES WITH VISCID OR SEMI-FLUID MATERIAL.

No. 578,944. Patented Mar. 16, 1897.

Fig. 25.

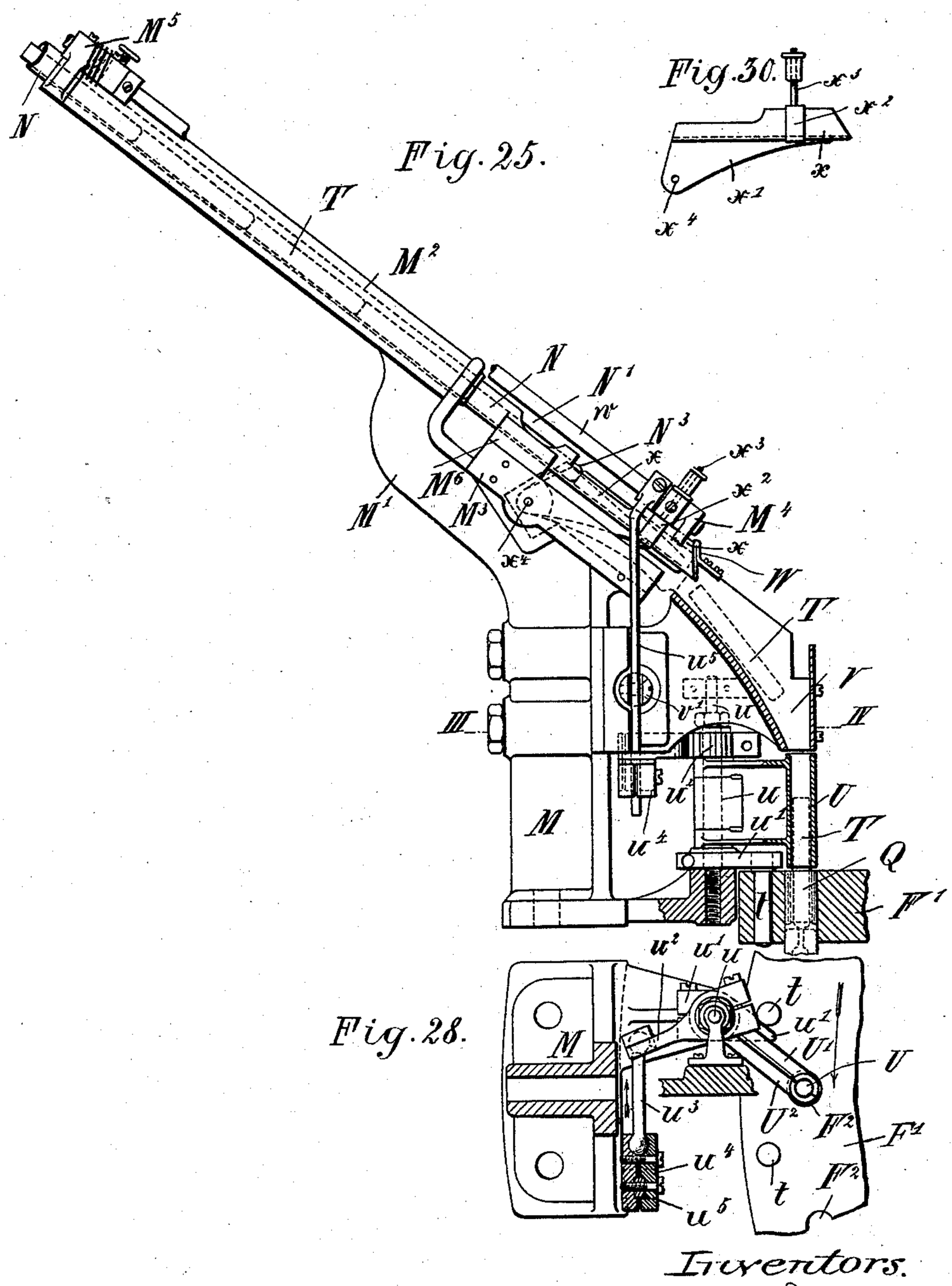


Fig. 28.

Fig. 30.

Witnesses:
William A. Brown
J. B. Clautice

Inventors.
Hermann Platz
Samuel Leander Huizer
By Thomas Dyer Stetson
Attorney

(No Model.) 17 Sheets—Sheet 14

H. PLATZ & S. L. HUIZER.

APPARATUS FOR FILLING TUBES WITH VISCID OR SEMI-FLUID MATERIAL.

No. 578,944. Patented Mar. 16, 1897.

Fig. 26.

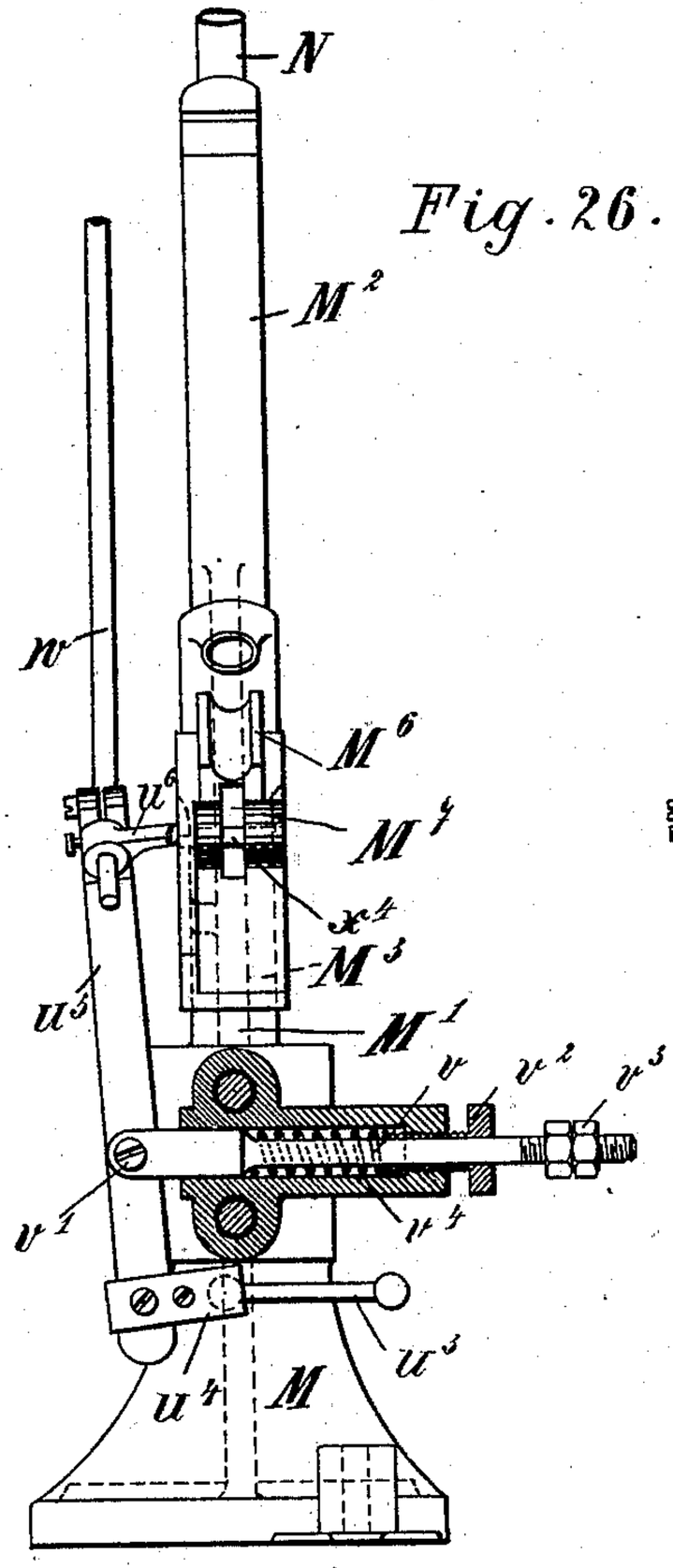


Fig. 29.

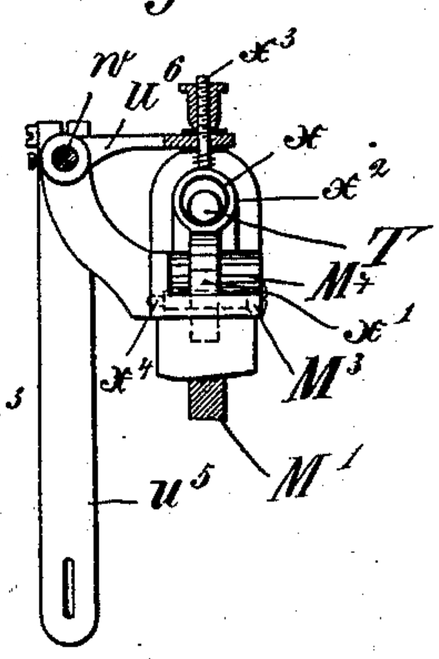
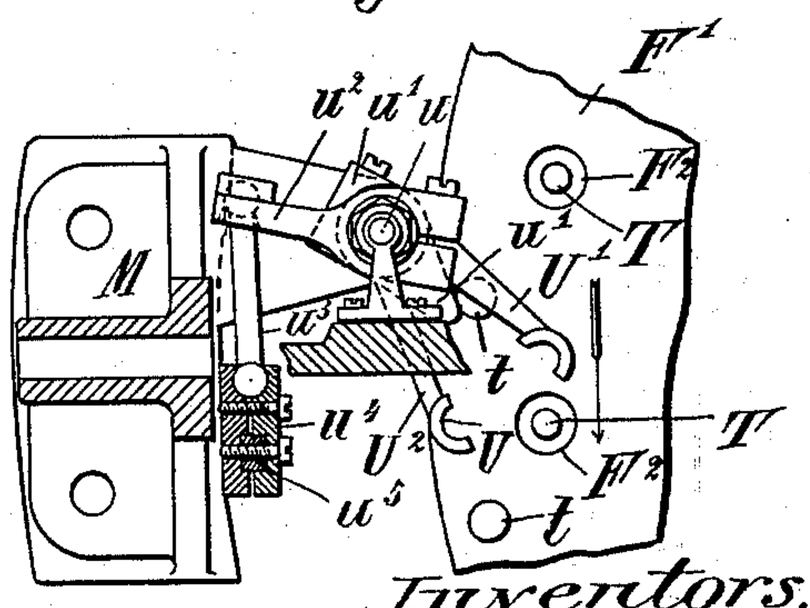


Fig. 28a.



Witnesses:
William Keenan
J. B. Clautice

Inventors.
Hermann Platz
Samuel Leendert Huizer
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(No Model.) 17 Sheets—Sheet 15.

H. PLATZ & S. L. HUIZER.

APPARATUS FOR FILLING TUBES WITH VISCID OR SEMI-FLUID MATERIAL.

No. 578,944. Patented Mar. 16, 1897.

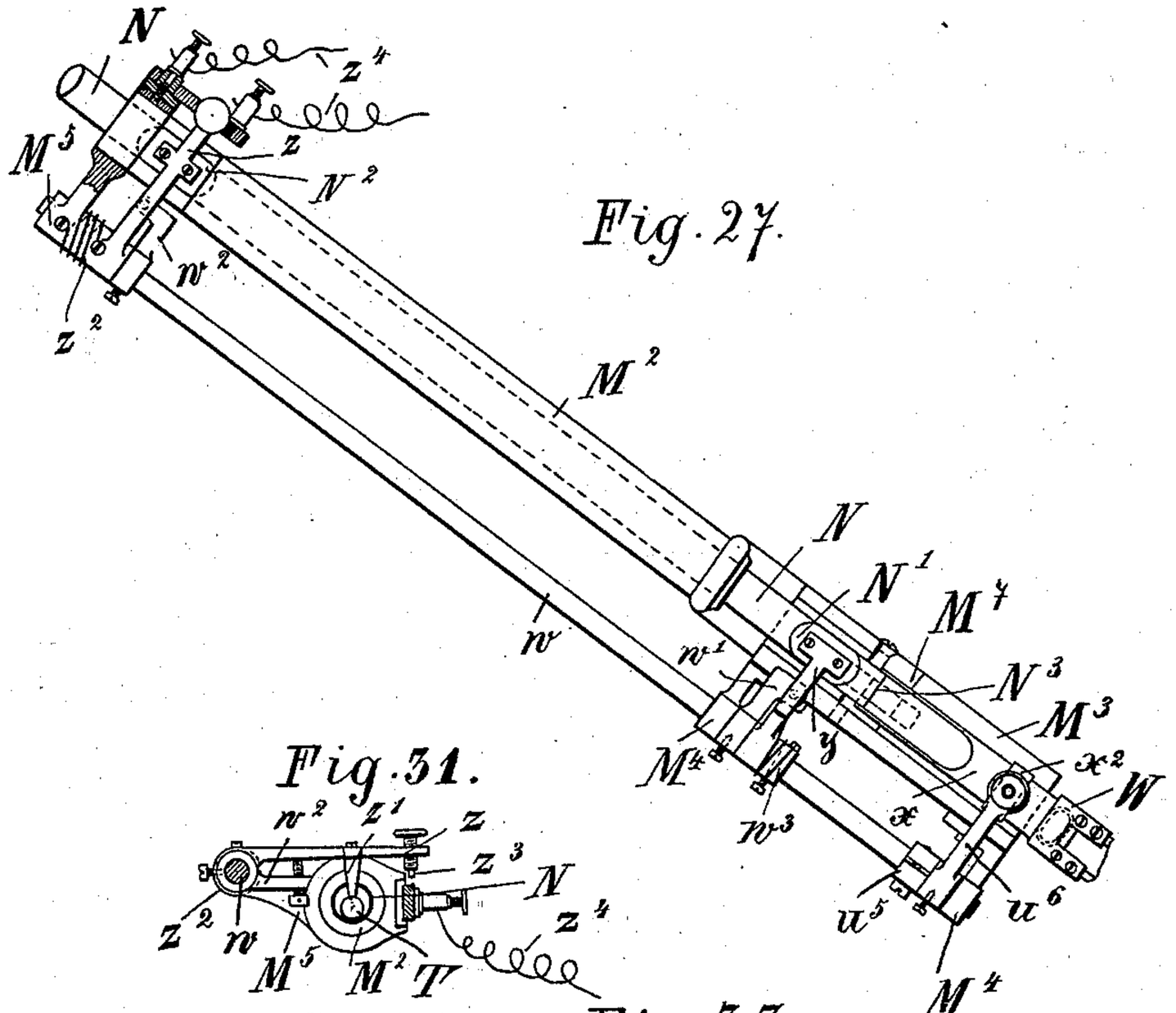

Fig. 27.

Fig. 31.

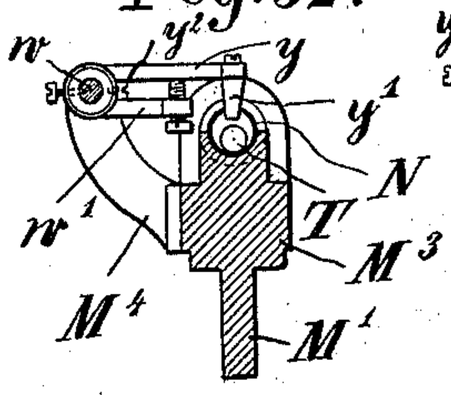

Fig. 32.

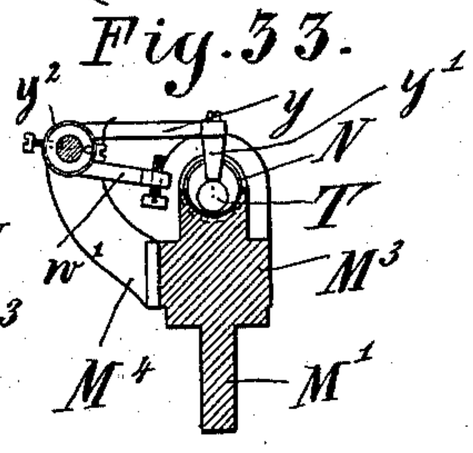

Fig. 33.

Inventors.

Witnesses:

Williamson

J. B. Clautice

Hermann Platz

Samuel Leendert Huizer

By Thomas Drew Stetson

Attorney

(No Model.) 17 Sheets—Sheet 16.

H. PLATZ & S. L. HUIZER.

APPARATUS FOR FILLING TUBES WITH VISCID OR SEMI-FLUID MATERIAL.

No. 578,944. Patented Mar. 16, 1897.

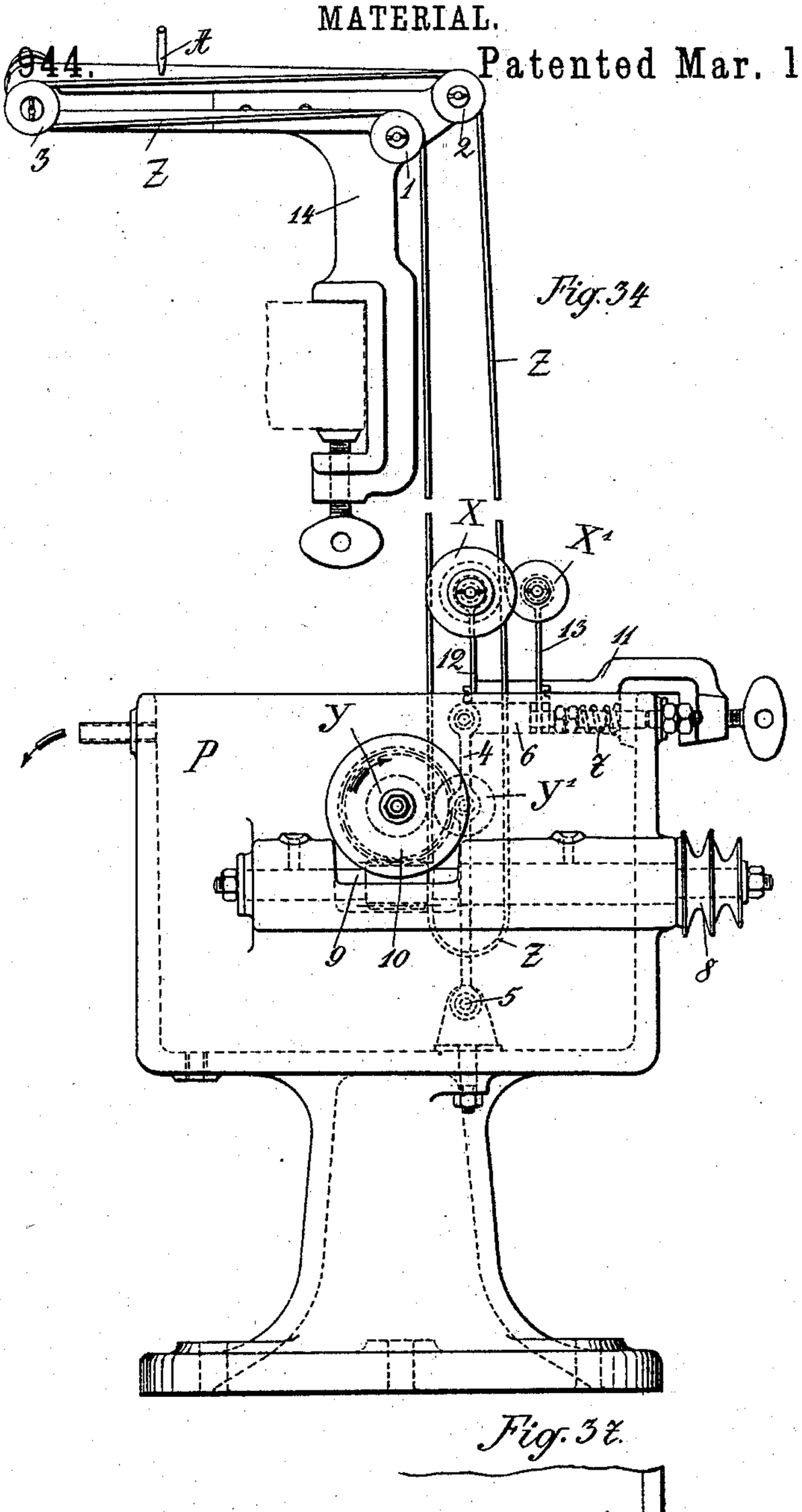

Fig. 34

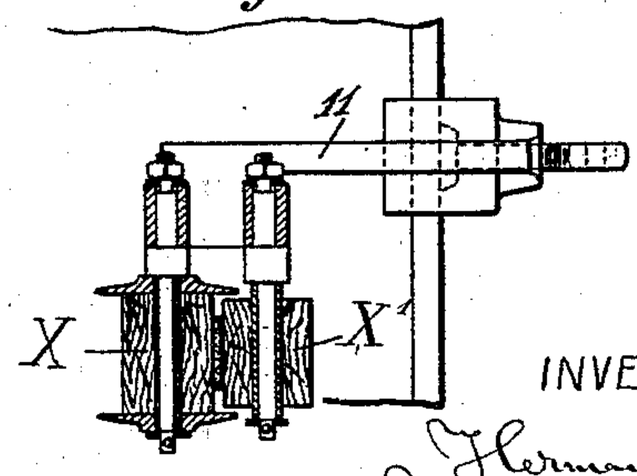

Fig. 3z.

WITNESSES

D. C. Giles

M. F. Boyle

INVENTORS

Hermann Platz

Samuel L. Huizer

By Thomas Drew Sexton

Attorney

(No Model.) 17 Sheets—Sheet 17.

H. PLATZ & S. L. HUIZER.

APPARATUS FOR FILLING TUBES WITH VISCID OR SEMI-FLUID MATERIAL.

No. 578,944. Patented Mar. 16, 1897.

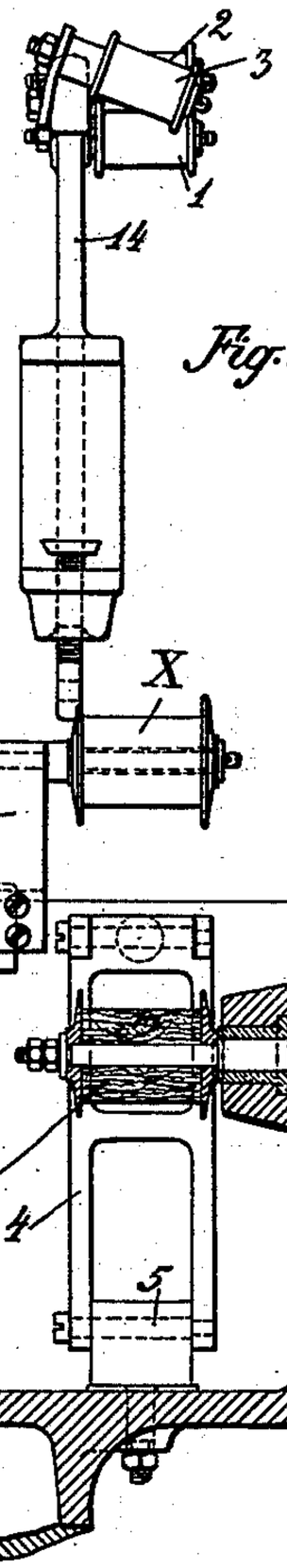

Fig. 35.

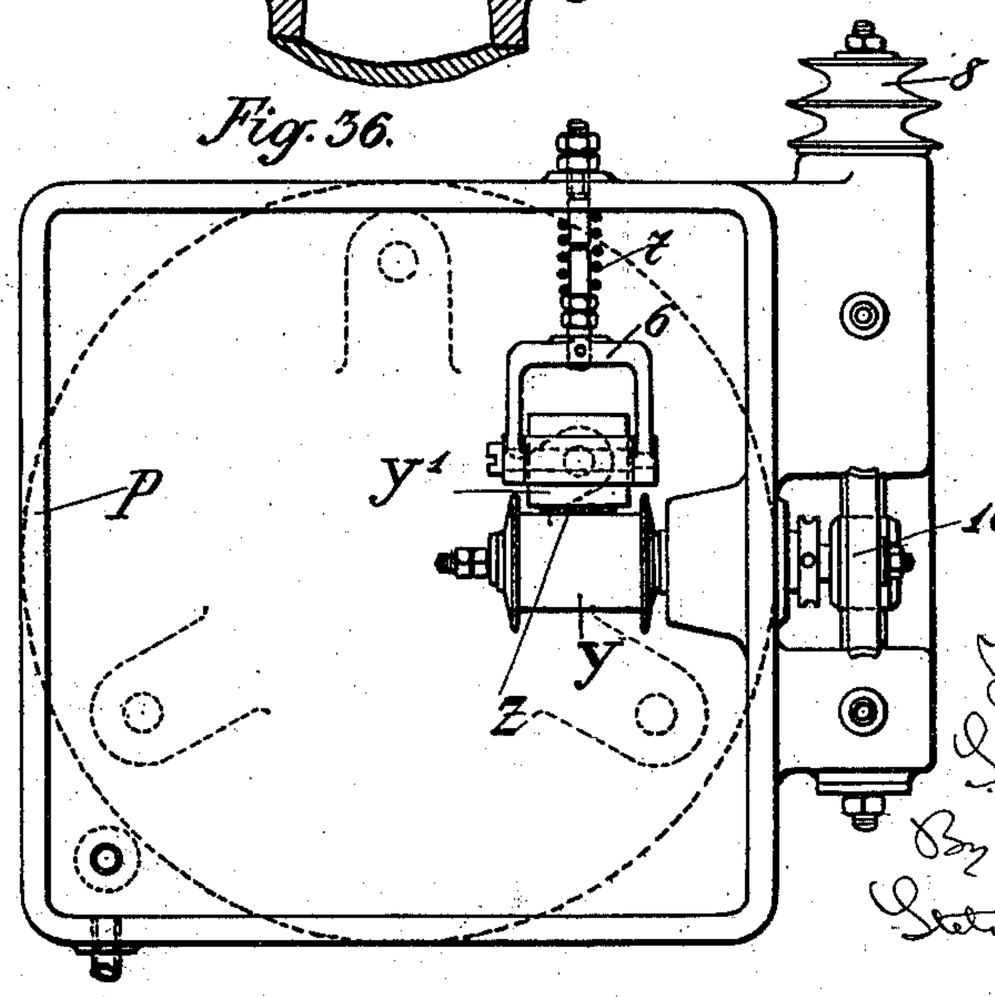

Fig. 36.

Witnesses
T. G. Wilkes
M. F. Boyle

Inventors
H. Platz
S. L. Huizer
By
Stetson & Bonnell
Attorneys

UNITED STATES PATENT OFFICE.

HERMANN PLATZ, OF CARLSRUHE, GERMANY, AND SAMUEL LEENDERT HUIZER, OF GRAVENHAGE, NETHERLANDS, ASSIGNORS TO THE DEUTSCHE METALLPATRONENFABRIK, OF CARLSRUHE, GERMANY.

APPARATUS FOR FILLING TUBES WITH VISCID OR SEMIFLUID MATERIAL.

SPECIFICATION forming part of Letters Patent No. 578,944, dated March 16, 1897.

Application filed April 24, 1895. Serial No. 547,033. (No model.) Patented in Germany December 9, 1894, No. 84,754; in England January 19, 1895, No. 1,321; in France January 19, 1895, No. 244,465; in Belgium January 19, 1895, No. 113,708; in Switzerland January 19, 1895, No. 9,894 and No. 9,966; in Hungary February 8, 1895, No. 2,138; in Austria June 9, 1895, No. 45/2,079; in India August 22, 1895, No. 2,417; in Straits Settlements August 30, 1895, No. 320; in Ceylon September 18, 1895, No. 482, and in Hong-Kong October 1, 1895.

To all whom it may concern:

Be it known that we, HERMANN PLATZ, a subject of the Emperor of Germany, residing at Carlsruhe, Grand Duchy of Baden, Germany, and SAMUEL LEENDERT HUIZER, a subject of the Queen of the Netherlands, residing at Gravenhage, in the Kingdom of the Netherlands, have invented a certain new and useful Improvement in Apparatus for Filling Tubes with Viscid or Semifluid Material, (for which we have obtained Letters Patent in the following countries: Austria, dated June 9, 1895, No. 45/2,079; Belgium, dated January 19, 1895, No. 113,708; Ceylon, dated September 18, 1895, No. 482; France, dated January 19, 1895, No. 244,465; Germany, dated December 9, 1894, No. 84,754; Great Britain, dated January 19, 1895, No. 1,321; Hong-Kong, dated October 1, 1895; Hungary, dated February 8, 1895, No. 2,138; India, dated August 22, 1895, No. 2,417; Straits Settlements, dated August 30, 1895, No. 320, and Switzerland, dated January 19, 1895, No. 9,894 and No. 9,966,) of which the following is a specification.

This invention relates to machinery or apparatus for automatically filling tubes with a viscid or semifluid mass, such, for instance, as opium. For the filling cylindrical syringes or syringes with long nozzles are employed. The main point to be observed is that the tubes shall be very uniformly filled and that there shall be no cavities or air-bubbles in the charges. For this purpose the tube is so placed under the syringe that the nozzle reaches almost to the bottom, and then as the tube fills either this is lowered or the syringe is raised or both motions are effected, so that the discharge-openings shall follow the level of the mass during the entire filling. On the removal of the filled tube care must be taken that the viscid thread of semiliquid material hanging down from syringe shall not be drawn out considerably in length and thus cause the soiling of the tube. This is prevented by causing the said thread to be broken by a sudden moving apart of the tube and syringe. In this operation account must be taken of the fact that the viscid mass is compressed somewhat by the pressure of the piston or plunger of the syringe and expands again on being released from such pressure. On this account, after the filling has been effected, the further operation must be suspended until the mass remaining in the syringe has expanded again, and has thereby ejected a further quantity into the tube, or the capacity of syringe must be so adjusted that it is practically emptied at each filling operation, so that no expanding action occurs. Furthermore, it is of advantage to wait a little with the breaking action of the thread after the filling in order that the thread may become somewhat attenuated by sinking down, whereby the breaking is facilitated.

We will describe the construction of machinery for carrying out the above-described process with reference to the accompanying drawings, which show a machine in which the syringes are fixed to the framing, while the tubes are movable.

Figures 1, 2, and 3 show, respectively, a side view, front view, and section on line I II, Fig. 2, of a machine with a single syringe for filling a single tube at a time. Figs. 4 and 5 show on a larger scale the single tube table or holder in various positions. Figs. 6 to 8 show a side view, plan, and section of a filling-machine with a number of syringes. We esteem this the preferable construction, showing the single machine mainly to illustrate the action. Fig. 8ª is a view showing detached the loose connections for the supply of viscid material. Figs. 9 and 10 show on a larger scale vertical sections of part of the more efficient machine, with a syringe and a tube-holder in two positions. Figs. 11 to 16 show on a larger scale details of the construction, Figs. 11 to 13 showing the coupling device for throwing the syringe in and out of action, Fig. 14 the nozzle of the syringe, and Figs. 15 and 16 the tube-holder in two views at

right angles to each other. Figs. 17 and 18 represent developments of the cam-grooves for regulating the motions of the plungers and tubes. Figs. 19 and 20 show in two views the arrangement for connecting and disconnecting the coupling of the plunger-rods of the syringe. Fig. 20^a is a vertical section through a portion on a larger scale. Fig. 20^b is a horizontal section on the line *b b* in Fig. 20^a. Figs. 21 to 24 show the arrangement for disconnecting the tube-holders. Figs. 25 to 33 show the arrangement for the automatic feed of the tubes, Fig. 25 showing the side view, Fig. 26 the front view, and Fig. 27 a plan view, of the tube-feed channel with closing device. Figs. 28 and 28^a show a horizontal section on line III IV, Fig. 25, with two positions of the parts. Fig. 29 is a section through the tube-ejector, while Figs. 30 to 33 show separate details. Figs. 34 to 37 show an apparatus for cleansing the syringe-nozzles, Fig. 34 showing a side view, Fig. 35 a cross-section, Fig. 36 a plan view, and Fig. 37 a detached detail.

In general similar letters of reference indicate like parts in all the figures where they appear. Any exception will be plainly designated.

In the machine shown at Figs. 1 to 5 the syringe A is fixed in a vertical position to the arm a' of the standard *a*. The viscid mass is supplied to it by means of a channel connected to the branch pipe A'. The plunger B, moving in the syringe, forms the lower end of a rod *b*, that is guided in its up-and-down motion by the arm a' of the framing. The motion of the rod *b* is effected by the crank *c*, the rod c' from which imparts an up-and-down motion to a slide b^2, working between guides on the framing and to which the rod *b* is attached at b'. Below the syringe A is a table D, on which the tube to be filled is accurately held in with the axis of the syringe by a suitable socket. The table with the socket also has an up-and-down motion simultaneously with the plunger of the syringe, the downward motion being effected by the plunger-rod *b*, while the upward motion is effected by the balance-weight i'. The mode of moving the tube is of great importance for effecting the filling of the tubes in a proper manner. In particular no bubbles or cavities must be produced. In order to prevent this, the table with the tube is, at the commencement of the filling, held so high that the long nozzle A^2 of the syringe reaches nearly to the bottom of the tube. The table D then moves with the tube in proportion to the descent of the plunger, that is to say, so that the mouth of the syringe is always at about the same level as that of the mass.

When the tube is filled to the extent required and the plunger has completed its downward motion, the thread of the mass hanging down from the nozzle must be broken off, in order that the tube may be removed from its holder without soiling the same. This tearing off of the viscid thread is effected by the sudden lowering of the tube by causing the table to fall. It is shown from experience to be of advantage for the breaking of the thread to have the sudden downward motion of the tube delayed a little for two reasons. In the first place, in consequence of the considerable pressure exercised by the plunger upon the viscid and more or less elastic mass, this is compressed to a certain extent in the syringe, owing to its resistance to flow through the very narrow channel of the nozzle, and as soon as the pressure ceases after the completion of the plunger's stroke the mass in expanding again causes a further quantity to flow out of the nozzle. Although this may be prevented by an arrangement of the plunger, to be presently described, whereby practically the whole mass is expelled from the syringe, yet the delay of the downward motion of the tube is nevertheless of advantage, because the viscid thread has time to stretch and thereby to become thinner, which facilitates the breaking thereof. The said motion is effected automatically as follows:

In a projection of the column *a* there is a vertically-movable rail *g*, as shown at Figs. 4 and 5. At about the middle it carries the lever *h* with the two beaks h' and h^2. On the lower beak h^2 rests, during the filling, the table D, carrying the tube, which table also slides vertically in guides on the projection of the column. At the commencement of the filling the lever *i*, loaded with the weight i', holds the rail *g* in the raised position by pressing against a stop g^2 thereof, while the table D rests on the beak h^2. At top the rail *g* has an arm g', that lies in the path of rod *f*, connected to the rod *b*. Both rods are connected at top by a transverse piece f', Fig. 2. The rod *f* is also guided at f^2 on the arm a^2 of the column and has at bottom a collar f^3. During the descent of the plunger the mass in the syringe is in the first instance compressed. At the moment afterward, when the mass begins to flow out, the rod *f* bears with the collar f^3 against the arm g^3 of the rail *g* and moves this downward, together with the table D, carried thereby. After the complete descent of the table this is released by causing the beak h' to strike against a stop h^3, in consequence whereof the lever *h*, Fig. 5, turns so that its beak h^2 moves from under the table, but as the table, as before explained, is not to drop at once, but it is to remain a certain time at rest, a locking device is provided whereby the rail *g* is put in and out of action. This device consists of two upright fingers k' and k^2, that are fixed on a spindle *k*, which carries a horizontal arm k^3, which is pressed upward by a spring k^4, so that the fingers are thereby pressed with spring action against the rail *g*. On the downward motion of *g* the tapered lower end g^3 thereof pushes the one finger k' back and thereby causes the other one k^2 to move into

a position in which it stops the downward motion of the table, as at Fig. 5, until, on the reascent of the plunger-rod, the rail is raised to such an extent by the weighted lever *i i'* that its end g^3 releases the locking device again, so that the fingers k' and k^2 are forced back again by the spring k^4. The table then suddenly sinks into the lowest position, (shown in dotted lines in Fig. 5,) thereby causing the viscid thread to be broken, as before described.

The stop h^3 is preferably made adjustable, as shown, so that the moment at which the table is liberated can be accurately adjusted to the moment when the plunger-rod has completed its downward stroke.

After the table D has sunk the filled tube is removed and replaced by an empty one. To facilitate the removal and introduction of the tubes, the tube-holder C rests on a slide that can be drawn forward on the table D when the spring-catch D' is pressed downward.

The machine is not actuated directly by the shaft carrying the crank *c*, but by the shaft *d*, the arrangement of which is shown in the section, Fig. 3. It transmits its motion by means of the worm d^2 to a worm-wheel c^2 on the crank-shaft. *d'* are the driving-pulleys. The putting in and out of action is effected by the lever *e*, fixed on a shaft *e'*, connected by the arm e^3, the rod e^4, and lever e^5 with the coupling d^3. The spring acting on the arm e^3, Fig. 2, holds the lever *e*, with the beak e^2, pressed continuously against the periphery of the crank-plate *c*. The latter has a notch, and as soon as the lever falls with its beak e^2 into this the coupling is thrown out. The throwing out of action is effected automatically after each operation, the notch of *c* being so placed that the throwing out of gear is effected at the moment when the syringe-plunger has passed slightly up from its lowest position to such an extent as to suck back the mass still contained in the syringe in order to prevent any dropping. The throwing in gear is effected by pressing down the lever *e*, which must be kept down until the crank-plate *c* has turned to such an extent that the beak e^2 is no longer situated over the notch. If the machine is to work uninterruptedly, it is only necessary to secure the stopping mechanism in the starting position, Fig. 2, this being effected by a nipping-screw *e'* or by other means.

The machine may of course be modified in its details, particularly as regards the stopping mechanism and the locking device for the table. The essential feature is the relative motion between the syringe-plunger and the tube.

Figs. 6, 7, and 8 show a machine for filling tubes in which a number of syringes are made to operate simultaneously, the operation being effected in stages, the separate tubes being not all filled simultaneously, but consecutively, so that there is always a filled tube being removed and replaced by an empty one, whereby the machine is rendered capable of giving a large yield of filled tubes with little labor. The speed with which the machine operates is still further increased by arranging in combination therewith an automatic feed of the empty tubes and removal of the filled ones. In the reciprocal action of the syringes and the tubes each tube is first made to descend gradually during the filling and then to drop suddenly for breaking the viscid thread. The construction of the machine will be readily seen in Fig. 8. The framing consists of the base E and the upper part G, which two parts are firmly connected by columns. The base is surrounded by a ring H, which has guiding cam-grooves that, as will be presently explained, effect the up-and-down motion of the tubes. A similar ring J, with cam-groove, is provided at the upper frame O for actuating the syringe-plungers. These rings are fixed and are situated one above the other. Between them is the frame F, which revolves upon its vertical axis and carries the syringes and the tube-holders. This frame in the arrangement shown rests upon the base E and is in part guided in the base and also in the upper framing G by means of a central shaft L, made hollow, so that the supply of viscid mass to the syringe may be effected through it, as also the supply of steam for heating it. This arrangment is shown at Figs. 9 and 10, the frame and parts that partake of its motion being indicated by the closer-hatched sections.

The frame F is provided with two flanges F' and F^3. The lower one, F', has holes F^2, in which the tube-holders Q slide up and down. To the upper one, F^3, the syringes are attached. The rotation of the frame F can be effected by any suitable means. The ring F^3 may advantageously be formed as a toothed ring F^4, with which gears a worm or pinion at R, Figs. 6 and 7, the shaft of which is suitably driven at R'. The supply of viscid material for the syringes is effected, as shown at Fig. 8, by means of the radial passages L', arranged within the frame in a transverse partition, which passages all radiate from the hollow shaft of the frame F, with which the pipe L is connected, the same being also connected by a stuffing-box L^2 with the fixed supply-pipe L^3, so that no escape of material can take place at the point. By means of the cock L^4 (shown in Fig. 8) the pipe L and the passage L' can be emptied when the machine is put out of action. The passages L' are advantageously heated from the outside, in order to maintain the viscid mass flowing through them somewhat more liquid and thus facilitate its flow into the syringes. For this purpose a pipe S', Fig. 8, is arranged to lead steam over the partition containing the passages L'. The water of condensation is led off by means of the conduit S, the funnel shape of the partition facilitating the collection thereof. As the frame F with the syringes rotates the plungers are moved continuously up and down

by means of the cam-groove J^2 in the ring J, while at the same time the viscid mass is continuously supplied to the syringes. The cam-groove does not act directly, but indirectly, upon the plungers, these being provided with a carrier *t*, having a roller *t'*, (see Fig. 8,) that runs in the cam-groove. These carriers are coupled to the plunger-rods in such manner that they can be connected thereto or disconnected therefrom, so that in the first case the plungers and carriers are moved up and down by their rotation around the ring J, while in the latter case only the carriers move up and down, sliding upon the plunger-rods without actuating these. These carriers are formed with sockets, which are lined or double, as shown at Figs. 9 and 10 and 20^a and 20^b. The socket *m*, fitted directly upon the rod *b*, is loose in the second one *t*, to which the guide-roller *t'* is connected, both sockets being secured together by means of nuts screwed onto the ends of the inner socket *m*. According as the inner socket is adjusted higher or lower in the outer one the plunger will be adjusted in a correspondingly higher or lower position. This adjustment is facilitated by arranging the inner socket so that it can slide longitudinally in the outer one, but is prevented from revolving in it by means of groove m^2 and stud t^2. (See Fig. 20.)

The arrangement for coupling the carrier *t m* with the plunger-rod is shown at Figs. 9 to 13. The inner socket *m* terminates at the upper end in a fork *m'*, and a similar fork *n'* is fixed in an inverted position on the upper part of the plunger-rod *b*.

In the position shown in Figs. 9 and 11 the forks rest upon each other with their prongs, and the socket *m* fills the space between the fork *n'* and the shoulder *b'* of the rod *b*, so that the carrier must move the plunger-rod up and down with it. If, on the other hand, the coupling is to be disconnected, the plunger-rod, with the upper fork *n'*, is turned around ninety degrees. The one fork then fits with its prongs into the spaces between the prongs of the other one, as shown in Figs. 12, 20^a, and 20^b, so that in this position the carrier *l m* can slide on the plunger-rod without moving it.

Fig. 11 shows the same condition as Fig. 9, the coupling connected, but the view is quartering to that in Fig. 9, so that the effect is plainly apparent.

It is necessary to secure the coupling-fork *n'* in the one or the other position, so that the coupling may not be shifted unintentionally. For this purpose the upper fork *n'* is fixed to a square plate n^2, having star-shaped notches n^3. The edges n^4 of this star are slightly curved to fit the curve of the smooth projecting surface J' of the ring J. The star n^2 is of such size as to accurately fill the space between the fork and the surface J', Figs. 9 and 10, when one of its edges lies against the said surface. By this means the star is prevented from turning, and consequently it keeps the fork *n'* in the same relative position to *m'* during the entire rotation of the frame. The edges n^4 of the star n^2 and the guide-surface J' must of course be worked very accurately and smoothly, and the surface J' must be of such a height that the star does not pass beyond it in its up-and-down motion with the plunger.

The turning of the star through ninety degrees for putting the plunger in or out of action is effected at a point where the guide-surface J' is formed with a recess J^3, as shown at Fig. 17. This recess is situated at the divisions 22 to 24, in which the cam-groove J^2 is at its lowest point, and consequently where the plungers are at the end of their down-stroke, as will be seen in the developed view of the cam-groove at Fig. 17. Thus it is only after the syringes have been emptied that the coupling devices can be disconnected, and in like manner they can only be connected again at the same point before the commencement of the suction stroke. In order to enable the syringes, at will, either to be thrown out of action at the said point or to continue in action, there is provided in the said recess a slide *o*, as shown at Figs. 19 and 20 and on a larger scale in Figs. 20^a and 20^b. This slide is generally held in its lowest position by means of the weighted lever O, in which position its flat upper surface is flush with the surface J', so that the stars n^2 can slide uninterruptedly over it. If, however, the lever O is raised, a pin o^2, situated at the lower part of the slide, in front of a recess *o'* in a projection o^3, is brought into the path of the stars n^2, so that in the passing of these the pin o^2 enters one of the notches n^3 at the corners thereof, and thereby effects the turning of the star, together with the plunger-rod and fork *n'*, through ninety degrees, by which means the coupling-forks are either thrown into gear or out of gear, according to which was the position that they previously occupied, and the syringes are thus either put in or out of action. For facilitating this action the points of the star are preferably rounded off. Thus by merely raising the lever O while the apparatus continues in motion one or more or all the syringes can be thrown consecutively out of or into action. In Figs. 19 and 20 the slide-rod has, furthermore, a stop o^4, which prevents the slide from being raised too high, so as to insure its proper position relatively to the stars.

The details of the above-described construction can of course be variously modified. Thus in place of the slide may be employed any efficient device for turning the coupling-forks *n'*, as described.

It is of importance that the syringe shall be emptied as completely as possible at the downstroke of the plungers, for the purpose before mentioned; but as the long nozzles A^2 prevent the complete attainment of this end the capacity thereof is reduced as much as possible by the introduction into them of a

rod A^3. These rods form in the nozzle an annular channel of so small a sectional area that the viscid mass can only just pass through it. Thus at the end of the downstroke of the plunger very little material remains in the nozzle and the before-mentioned necessity for delay due to expansion is avoided. The lower end of the rod A^3 is formed with a V-groove, as shown at Fig. 14, so as to leave a clear space at the mouth of the nozzle in order not to interfere with the outflow.

While the frame F, Fig. 14, with the syringes A revolves and the plungers perform their up and down strokes, the tubes also have to be moved up and down in a corresponding manner, as before described. For this purpose they are carried in vertically-sliding tube-holders Q, that move in holes F^2, Fig. 10, of the ring F′ of frame F. The arrangement of the tube-holders is shown at Figs. 9, 10, 15, and 16. They are fixed with their lower ends in slides *r*, which slide in vertical guides S′, extending downward from the ring *s*, which is fixed to the frame F, so that these parts revolve with the latter. The vertical motion of the slides *r* with the tube-holders is effected by means of the cam-groove H′, formed in the ring H, in which groove run the rollers *r*′, carried by the slide. The form of the cam-groove is shown in the developed view at Fig. 18.

The tube-holders Q are constructed as follows: They consist of four long spring bars or limbs $q\ q\ q^2\ q^2$, which are arranged opposite each other in pairs and form between them a cylindrical passage open at bottom, their lower ends being fixed in an eye or opening of the slide *r*. The limbs *q q* are longer at the upper end than $q^2\ q^2$ and form there two cheeks $q'\ q'$, between which the tube T is held. The limbs $q^2\ q^2$ have at their upper end inward projections $q^3\ q^3$, which serve as abutments to the bottom of the tube T. Each tube-holder is opened and closed by causing its limbs to be alternately pressed together and allowed to expand as they move up and down through the holes F^2, so that in the first case they grip the tube, and in the second they set it free, so that it can fall down through the holder. For this purpose the limbs *q* are formed with enlargements $q^5\ q^5$, while the tops of the limbs $q^2\ q^2$ are formed with rounded edges at $q^4\ q^4$, Fig. 10. In the position shown in this figure, being the lowest position of the tube-holder, this is expanded. When it is moved slightly upward into position Figs. 15 and 16, the limbs q^2 are first pressed together, so that the projections q^3 are in position to support the tube T. After this has been inserted into the holder the latter in moving farther upward is entirely closed in, the limbs *q* being pressed together by the cheeks F^5 acting on the enlargements q^5 as they pass through into F^2, as at Fig. 15, and the cheeks *q*′ are thus made to grip the tube, so as to hold it securely in position as it performs its up-and-down motion, being released again when the holder arrives at its lowest position, Fig. 10, and again when the tube falls down through it.

The motions of the syringe-plungers and of the tubes and their holders take place accurately in relation to each other, as will be seen on comparing the developed forms of the cams at Figs. 17 and 18. These are so drawn that the corresponding separate divisions of the two cam-grooves lie exactly over each other, as in the actual machine, so that these views show a diagram of the relative motions of the above parts. The lower ring H has two cam-grooves H′ and H^2, of which the one is straight and horizontal, while the other rises and falls. The parts in the divisions 28 to 30 and 0 to 1 are common to both grooves. By means of a switch arranged in the recess or groove H^2 in divisions 12, which is shown to an enlarged scale at Figs. 21 to 23, the rollers of the tube-holders can be made to travel either in the lower groove H^2 or in the upper one H′. If they travel in H^2, the tube-holders are not made to move up and down and are consequently out of action. This is, for example, necessary when the tube-holders have to be cleansed or repaired. Ordinarily the putting out of action is effected by controlling the syringes alone, as above described.

The switch, Figs. 21 to 24, consists of a slide *k*, with two grooves $k'\ k^2$, so arranged that according as the slide is brought into the position Figs. 21 or 22 the rollers of the tube-holders are caused to travel either in the lower groove H^2 or in the upper one. The syringe-plungers move slowly downward at the divisions 0 to 23 of the cam-groove. From 23 to 30 they move at a quicker speed upward, so that the forcing motion of the plungers for filling the tubes is effected during a longer space of time than the return motion. The tube is raised rapidly in the divisions 1 to 7, Fig. 18, during the first part of the descent of the plunger. During this raising of the tube no forcing out of the viscid mass takes place, as this is first compressed by the motion of the plunger. Only when the tube has reached its highest position the mass begins to issue from the syringe. The tube is then gradually moved downward in proportion as it is filled, so that the mouth of the syringe is always situated at the level of the mass in the tube. The filling is completed as soon as the plunger arrives at the division 23 of the groove, and the refilling of the syringe then commences. The slight farther downward motion of the tubes in the divisions 23 25 of the groove H′ corresponds to the expansion of the small quantity of material remaining in the nozzle of the syringe. At the end of the period the rapid downward motion of the tubes takes place in order to break the viscid thread of the material. The groove H′ reaches its lowest point at the divisions 28 29, which corresponds to the position of the tube-holders in Fig. 10, in which they are entirely opened, so that the tube can fall out freely.

In the divisions 29, 30, and 0 1 the groove rises slightly, corresponding to the position of the tube-holder in Figs. 15 and 16, where the limbs q^2 are already pressed inward, so that the next empty tube can be inserted. When this has been effected, the above-described operation is repeated.

For introducing and removing the tubes special devices may be employed. At the place where the filled tubes drop out a tubular conduit may be provided, which leads them to a place where they can be readily removed, or to a machine that effects the automatic closing of the tubes.

The feed of the empty tubes is effected automatically by means of the apparatus shown at Figs. 25 to 33. It is fixed to the filling-machine, as shown at Fig. 6, by screwing on the base M or in any other suitable manner. The base M carries by means of the upper part M′ the inclined channel M^2, in which is a tube N, through which the tubes are led into the machine, Figs. 25 to 27.

The upper end of the tube N can be extended to any length, so that a greater number of the tubes T may be contained therein, one behind the other.

At the lower mouth N^3, Fig. 25, is provided an ejector x. (Shown separately at Fig. 30.) This ejector consists of a socket or trough having a downwardly-directed rib x', which is pivoted at x^4 to the part M^3 of the base. The two positions of the ejector x are shown at Fig. 25 in full and dotted lines. When the ejector is in the upper full position, the channel thereof lies in the continuation of the channel N, so that the lowest tube can slide into the ejector. The mouth of the latter is in this position closed by a fixed flap W. If the ejector then moves into the lower dotted position, the tubes can fall out freely, as the flap W no longer prevents this. The tube then slides into the funnel V and thence into the feed-channel U, from which it passes directly into the tube-holder Q which is passing at the time. As, however, the tube is generally longer than the tube-holder and projects above the top edge of the ring F′, and in order that the channel U may not obstruct the further motion of the tube, this channel is formed of two parts U′ and U^2, of which the one part is fixed, while the other can turn on the pivot u. At the moment when the tube has fallen into the holder Q the part U^2 is turned back, so as to open the channel U and thus allow the tube to move onward.

The opening of the channel U and the actuation of the ejector is effected as follows by pins or studs t, which are applied to the ring F′ in definite positions relatively to the openings F^2, in which the tube-holders work. These pins bear at the moment when the corresponding tube-holder arrives under the channel U and the tube falls into it against a lever u', that is attached to the part U^2, so that this is pressed backward thereby, so as to allow the tube to proceed. The part U^2 is connected at the top to a second lever u^2, which is turned with it and is thereby made to actuate the ejector x through other lever connections as follows: The lever u^2 is connected by a rod u^3, having universal joints, with a piece u^4, fixed to the lower end of the lever u^5, Figs. 26 and 29. The lever u^5 is fixed with its upper end upon a shaft w, rotatably carried parallel to the tube-channel in the base-arms M^4 M^4 M^5, Fig. 27. On the shaft w is fixed the lever u^6, the outer end of which is connected to the ejector x, Fig. 29. If, therefore, the lever u^2 is pushed back by the stop t, Fig. 28, the rod u^3 will move in the direction of the arrow. By this means the levers u^5 and u^6 are so turned that the ejector is raised thereby and thus brought into the position in which the flap W prevents the discharge of a tube. In this position the bottom tube passes into the ejector, this motion being controlled as will be presently described. As soon as the tube has been carried beyond the reach of the pivoted part U^2 of the tube-channel the pin t also liberates the arm u', and this, together with the part U^2 and the parts u^2 u^3 u^4 u^5, can then be moved back into their original positions, this being effected by means of the spring v^4, which acts upon a rod v, connected to lever u^5 at v', Fig. 26. In order to adjust all the said parts accurately in their original positions and also to enable the spring v^4 to be regulated, the rod v is provided with adjustable abutment screw-nuts v^3 and an adjustable stop v^2, by which latter the tension of the spring v^4 can also be regulated. By the said return of the parts into their original positions the ejector x is also brought into the dotted position, Fig. 25, in which it delivers an empty tube into the tube-channel U at the same time the next tube-holder approaches the latter, and at the moment when the tube falls into it the next pin t comes in contact with the arm u' and the above-described action is repeated.

The connection of the lever u^6 is not rigid, but elastic, as shown at Figs. 29 and 30, a ring x^2 being provided with a pin x^3 with a screw-nut passing freely through a hole in levers u^6, and a spring, Fig. 29, introduced between the ejector and the lever holds the parts in position without looseness.

The screw-nut on the pin x^3 is adjustable for rendering the connection more or less yielding.

In connection with the ejector x is a further device whereby the last tube in the feed-channel N is held back as long as the ejector is in the lowered position. This is effected by means of a spring-lever y, mounted loosely on the spindle w, as shown at Fig. 27, and in the sections shown in Figs. 32 and 33. The last two figures show the lever in the two positions in which the tube T is on the one hand held back and is on the other hand released. The lever y is held down by a spring y^2, attached to the collar w^3, so that the pressing-piece y'

at its extremity passing through an opening N′ in the channel N is pressed against the tube. At the side of this loose lever *y* an arm *w′* is fixed in the spindle *w*, which bears with a screw or stud against the lever *y*. When the spindle *w* is turned so as to raise the ejector into the position in which it receives the next tube, the arm *w′* in rising raises the arm *y* somewhat, as shown at Fig. 32, so that the tube T is released and can consequently slide down. During the injection the arm *w′* descends again and allows the arm *y* to press upon and hold the next tube, as at Fig. 33.

In order that the operations may take place uninterruptedly, care must be taken that a supply of tubes is always contained in the channel N. In order to insure this, a device is provided for giving a signal as soon as there are only a few tubes left in the channel N, so that a fresh supply may be introduced. This device consists in a spring-lever *z*, which similarly to the last-described arrangement is pressed by a spring z^2 so as to bear with a pressing-piece *z′*, projecting through an opening N^2 of channel N, against the tubes as they pass. In like manner to the arm *y* this arm *z* is raised by means of the screw or stud of a lever w^2 on the spindle *w* while the ejector is in the raised position, so that all the tubes can then slide forward the length of one tube. If now at any time there should be no tube under lever *z*, it is moved to a greater extent downward and thereby closes an electrical contact z^3, Fig. 31, on a circuit z^4, including an audible or visible signal which indicates that a fresh supply of tubes has to be introduced into the channel N.

Figs. 34 to 37 show the means for cleansing the nozzles of the syringes. This is effected by causing the syringes while rotating with the frame F to pass in contact with an endless moistened band that is continuously in motion, so that this removes any drop of the viscid mass that may adhere to the nozzle after the thread has been broken, as described. The cleansing is effected at that part of the machine where the tube-holders are situated in the lowest position, thus leaving the nozzles accessible. The endless cleansing-band Z hangs with its lowest part in a vessel P, filled with water. At the top it is led in a horizontal position by means of the rollers 1, 2, and 3, and this part of the band is brought in the path of the passing syringe-nozzles. The rollers 1 2 3 are carried by a support 14, that can be secured in any convenient manner, such as by a thumb-screw, to any part of the framing of the machine. The front roller 3 is placed obliquely, so that the band Z also lies transversely in an oblique position. By this means the cleansing of the nozzle-mouths A, which are led transversely across the band, is facilitated and they are prevented from striking against the edge of the band Z. The two sides of the pendent loop of the band are led between two pairs of rollers. The one pair Y Y′ serves for driving the band, the one roller Y being mounted with its axis in the side of the vessel P, Fig. 35, and carrying a worm-wheel 10, with which gears a worm *q* on the driving-shaft 8. The roller Y′, against which Y bears as it rotates, has its axis carried by a vertical frame 4, pivoted at 5. To the upper end of the frame is connected a fork 6, Fig. 36, which is pressed in the direction toward the rollers by a spring 7, so that the roller Y′ is thereby pressed against Y, and consequently the band passing between them is caused to travel by the rotation of Y. The second pair of rollers X X′ serves to keep the band stretched, this being necessary, as the bottom loop is not held, but hangs free in the water. The two rollers X X′ have their axes held by two vertical spring-bars 12 13, that are fixed to the bracket 11, secured to the side of the vessel P, Figs. 33 and 37. The spring-bars 12 and 13 press the rollers together with sufficient pressure to nip the band, from which they also express the superfluous moisture. The vessel P is provided with a continuous supply of water and an overflow.

As before stated, the various above-described constructions can be modified in detail so long as the essential feature be maintained whereby the tubes and the syringes receive the herein-described vertical motion relatively to each other.

The upper ring J may be made to serve as the guide for the frame. The indicating device, to show when the tubes are too far away, may be replaced by any other suitable arrangement, or it may be entirely dispensed with. The arrangement for holding back the tube can also be otherwise arranged, but it is necessary for it to act independently of the motion of the ejector.

The multiple filling-machine may be so constructed that the frame carrying the syringes remains stationary while the rings with the cam-grooves are rotated. The arrangement for throwing the syringe-plungers in and out of action, as also for supplying the tubes and for cleansing the syringe-nozzles, may be differently constructed.

The above-described process is particularly adapted for filling tubes with opium, and the machines described for carrying out the process are capable of producing a maximum of yield with a minimum amount of manual labor.

We claim as our invention—

1. The combination in a machine for filling tubes, of a syringe A, adapted to be supplied with the viscid mass, and having a reciprocating plunger a tube-holder in line with the discharge of said syringe, and provisions for effecting a receding movement relatively between the syringe and the holder, and for rupturing the thread or filament of material after the descent of the plunger, substantially as herein specified.

2. The combination in a machine for filling

tubes, of a syringe A, adapted to be supplied with the viscid mass, a tube-holder in line with the discharge thereof, and means for first effecting a comparatively-moderate receding movement relatively between the syringe and holder and thereafter abruptly increasing such movement, substantially as herein specified.

3. In a machine for filling tubes, the combination with a frame, of a syringe and a tube-holder adapted to hold a tube to receive the discharge therefrom, and both supported by said frame, and means such as the cam-grooves J^2, H^2, carriers l having roller l', slide r and its roller r', for effecting the vertical movement of the syringe-plunger and variable descending movement of the tube-holder, substantially as herein specified.

4. In a machine for filling tubes a number of syringes and corresponding number of tube-holders arranged around a revolving frame such as F, and means such as the cam-grooves J^2, H^2, carriers l having rollers l', slides r and their rollers r' for progressively depressing the syringe-plungers and variably lowering the tube-holders, substantially as herein specified.

5. In a machine for filling tubes, the combination with a plurality of syringes and independently-movable tube-holders, adapted to hold tubes to receive the discharge therefrom, of means such as the cam-grooves J^2 and H^2 carriers l having rollers l' and slides r and their rollers r' for successively operating the syringe-plungers, and for lowering the tube-holders, passages or conduits for supplying a viscid material to the syringes, and provisions for heating the walls of the passages or conduits, substantially as herein specified.

6. In a machine for filling tubes, the combination with a plurality of syringes and independently-movable tube-holders adapted to hold tubes to receive the discharge therefrom, of means such as the cam-grooves J^2, H^2, carriers l, having rollers l' and slides r and their rollers r' for successively operating the syringe-plungers and for lowering the tube-holders, channels or ducts connected with the syringes for supplying viscid material, and a stationary spindle located within the discharge-nozzle of each syringe and having its lower end notched, substantially as herein specified.

7. The combination in a tube-filling machine, of a piston and its plunger, means for vertically moving the latter, together with a tube-holding support and devices for imparting a variably-descending movement to the same to release the tube, substantially as herein specified.

8. The combination in a tube-filling machine, of a piston and its plunger, a moving part provided with a cam-groove, devices such as a roller engaging the same, for vertically reciprocating said plunger, and means for throwing said roller and plunger out of operation, substantially as herein specified.

9. The combination in a tube-filling machine, of a piston and its plunger, plunger-actuating means, and a coupling device for imparting the motion of the same to the plunger, said coupling device including a notched plate n^2, adapted to be turned to disengage the coupling, substantially as herein specified.

10. The combination in a tube-filling machine, of a piston and its plunger, plunger-actuating means, a coupling including a notched plate n^2, adapted to intermittently contact with a stop and be turned, and thereby successively disengage and restore the coupling connection, substantially as herein specified.

11. In a machine for filling tubes, the combination with a frame, of a plurality of syringes and tube-holders and means such as the cam-grooves J^2, H^2, for successively effecting the vertical movements of the syringe-plunger and tube-holder, together with a tube-feeder for delivering a tube to each holder as it becomes empty, substantially as herein specified.

12. The combination in a machine for filling tubes of a revolving frame carrying a plurality of syringes containing movable plungers, a corresponding number of tube-holders, and a fixed part of the frame provided with cam-grooves and connections traveling therein for successively depressing the plunger and tube-supports, together with a tube-feeder for delivering a tube to each holder as it becomes empty, substantially as herein specified.

13. The combination in a tube-filling machine, of a syringe and its movable plunger, plunger-actuating devices, and a coupling for imparting the motion to said plunger, the coupling device including a double socket of the syringe-carrier, the inner end m of which carries the fork m', and is vertically adjustable in the outer socket l, whereby the position of the syringe-plunger may be regulated, substantially as herein specified.

14. The combination in a tube-filling machine, of a syringe and its plunger-rod with the vertically-actuated carrier-sockets l, m, therein, of a device for coupling the plunger-rod with said sockets, consisting of two fork-shaped parts m' and n', connected to the carrier and rod respectively, and adapted to be relatively turned so that the prongs have mutual end bearings or interlock, substantially as herein specified.

15. The combination in a tube-filling machine including a syringe and plunger-rod movable therein, of a device for coupling the plunger-rod with its actuating means, and comprising the rotatable fork n', together with a plate n^2, which is held in position by a guide-surface J' so as to be prevented from turning and a recess in the said guide-surface provided with a slide o in one position of which the said plate passes over the recess without turning while in another position of the slide the plate and its fork are enabled

to turn one-quarter around in the recess, substantially as herein specified.

16. The combination in a tube-filling machine including a movable syringe, its plunger-rod and its actuating means, of a device for coupling said rod to the actuating means and including a notched plate n^2, of a slide o, a pin o^2 adapted to engage one of its notches, whereby the plate will be turned as it runs past said slide, substantially as herein specified.

17. In a multiple filling-machine, the combination with the revolving frame F having the perforated ring F′, of the tube-holder Q, movable vertically in said perforations, a slide r supporting each tube-holder and a cam-groove H′ in the frame for actuating said slide, substantially as herein specified.

18. The combination in a tube-filling machine, of a syringe and its movable plunger-rod, the perforated ring F′, a tube-holder Q, having two or more spring-limbs guided through an opening in the ring, and adapted when compressed to support a tube, together with connections for lowering said tube-holder to permit the release of the limbs and the fall of the tube, substantially as herein specified.

19. The combination in a tube-filling machine, of a syringe and its movable plunger-rod, a tube-holder Q guided in an opening and having the limbs q, and shorter spring-limbs q^2, the latter when contracted serving as an abutment for an inserted tube, and the former adapted to grip said tube by means of cheeks q', substantially as herein specified.

20. In a machine for filling tubes, a revolving frame, a series of syringes and tube-holders arranged around the same, one above the other, means such as the cams J^2, H^2, carrier l having rollers l', and slides r and their rollers r' for operating the syringe-plungers, and for effecting a variable descent of the tube-holders to automatically release the tubes when full, in combination with a tube-feeding device, the operation of the parts being so timed that each holder will release its tube as it approaches the feeder to secure another tube therefrom, substantially as herein specified.

21. In a machine for filling tubes, the combination of a revolving frame, a series of syringes and tube-holders arranged around the same, one above another, means such as the cams J^2, H^2, carrier l having rollers l', slide r and their rollers r', for operating the syringe-plungers and for effecting a variable descent of the tube-holders to automatically release the tubes when full and a clamp for guiding a tube to each tube-holder when empty, substantially as herein specified.

22. In a machine for filling tubes, a revolving frame, a series of syringes and tube-holders arranged around the same, one above another, means such as the cams J^2, H^2, carrier l having rollers l', slide r and their rollers r', for operating the syringe-plungers and for effecting a variable descent of the tube-holders to automatically release the tubes when full, a clamp for guiding a tube to each tube-holder when empty, in combination with a tube-feeding device, the operation of the parts being so timed that the device will deliver a tube to a clamp as an empty holder approaches the feeder, substantially as herein specified.

23. In a multiple tube-filling machine, the combination of two cam-grooves H′, H^2, for actuating the tube-slide, one of which grooves effects the up-and-down motion of the tubes, while the other serves to hold the tubes in the lowered position, the guide-roller of the tube-slide being made to pass into one groove or the other according to the position of the switch K, substantially as described.

24. In combination with a tube-filling machine, such as herein referred to, of an apparatus for automatically feeding the empty tubes to the tube-holders and comprising a feed-channel N provided with an ejector x, a system of levers in operative relation thereto, and a revolving frame having pins or stops for actuating said lever system, whereby the ejector when in a raised position receives a tube from the tube-channel and when in a lowered position it delivers the tube into a channel leading to a passing tube-holder, substantially as herein specified.

25. The combination with a tube-filling machine, of a tube-feed apparatus including the feed-channel N, ejector x and an appliance for holding back the last tube in the feed-channel while a tube is being delivered by the ejector x, said appliance consisting of a spring-lever y adapted to press against the last tube and be moved away from such tube when the ejector is in a raised position, together with a spindle w having an arm w', and lever system actuating the ejector and for partly rotating the spindle, substantially as herein specified.

26. The combination with a frame, of a syringe and tube-holder adapted to hold a tube to receive the discharge therefrom, and both supported by said frame, and means such as the cam-grooves J^2, H^2, carrier l having roller l', slide r and its roller r', for effecting the vertical movement of the syringe-plunger and descent of the tube-holder, together with a feed-controlled channel, a device including a movable arm extending above the channel to be held elevated by the presence of the tubes, and a suitable indicating electric circuit adapted to be closed by the descent of the arm, substantially as herein specified.

27. The combination with a tube-feed apparatus for filling-machines, provided with a feed-channel and tube-ejector, of a spring-lever z, adapted to close an indicating-circuit, and normally held in an open position by the tubes in the feed-channel, together with a spindle w having an arm w^2, and adapted to move the lever z, outward when the tube-ejector is in a raised position, substantially as herein specified.

28. The combination in a tube-feed device

for filling-machines, of the tube-channel U in two parts, the part U^2 of which is pivoted a revolving frame having pins or studs *t* for moving the part U^2 outward, after a tube has passed into the holder Q in order to allow of the free onward motion of the tube in said holder, substantially as herein specified.

29. The combination with a multiple tube-filling machine, of an apparatus for cleansing the nozzles thereof, and including a vessel *p* and an endless traveling band Z, having a loop passing through water in the vessel P, while another part travels in the path of the nozzles whereby the mouths thereof pass in contact with the moistened band and are thus freed from the adhering viscid material, substantially as herein specified.

30. The combination in cleansing apparatus for tube-filling machines, of the endless traveling band having a loosely pendent loop, a driving-roller Y and a spring-pressing roller Y′ gripping one side of said loop and for imparting the traveling motion to the band, and two spring-rollers X, X′, nipping the other side of the loop, for maintaining the band in a stretched condition substantially as herein specified.

In testimony whereof I have hereunto set my hand, at Mannheim, Germany, this 25th day of February, 1895, in the presence of two subscribing witnesses.

HERMANN PLATZ.

Witnesses:
MARTIN FISCHER,
THEOD. JACOB.

In testimony whereof I have hereunto set my hand, at Rotterdam, Netherlands, this 6th day of March, 1895, in the presence of two subscribing witnesses.

SAMUEL LEENDERT HUIZER.

Witnesses:
AIRE H. VOORWINDEN,
HERMAN A. REQUE.