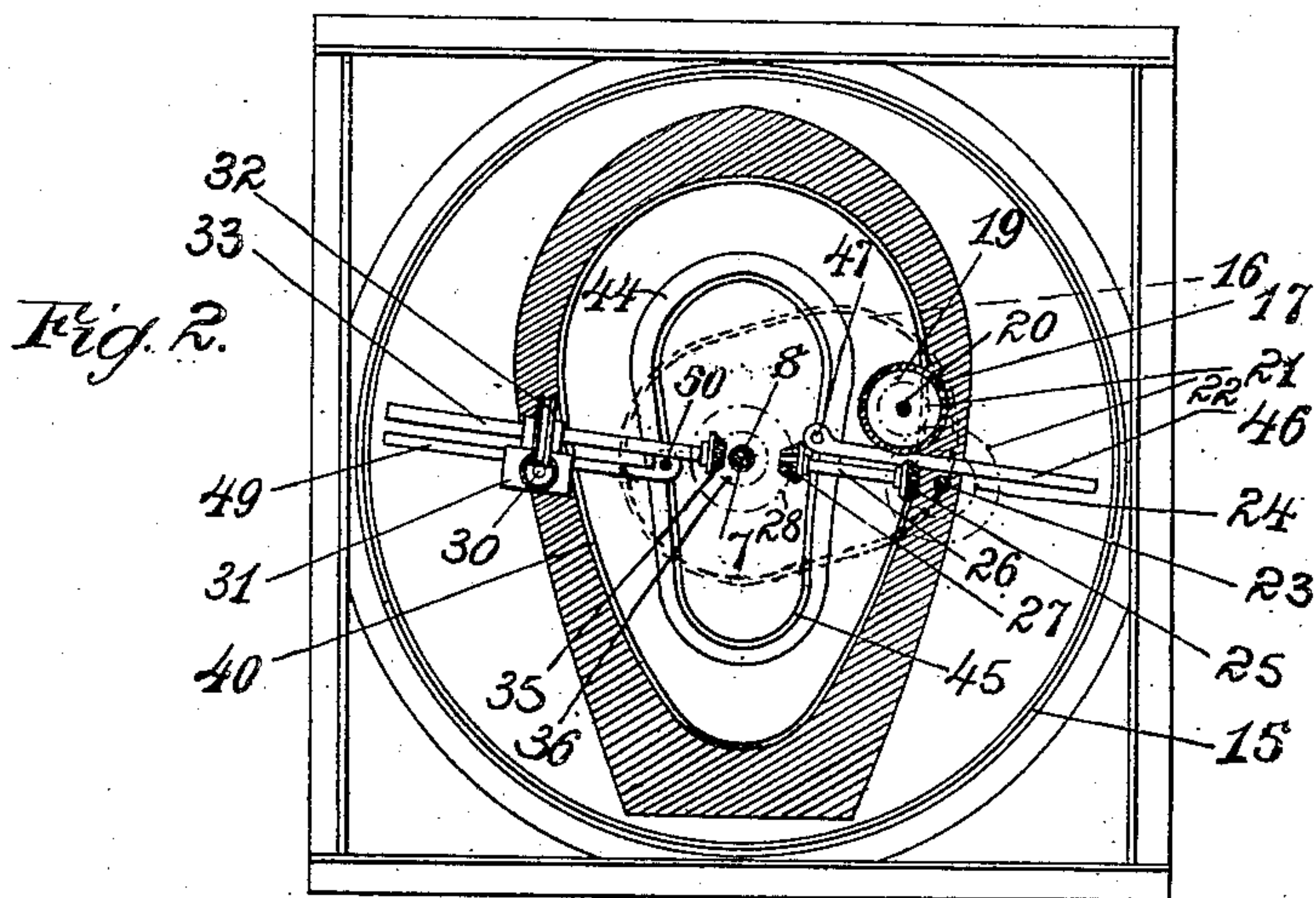
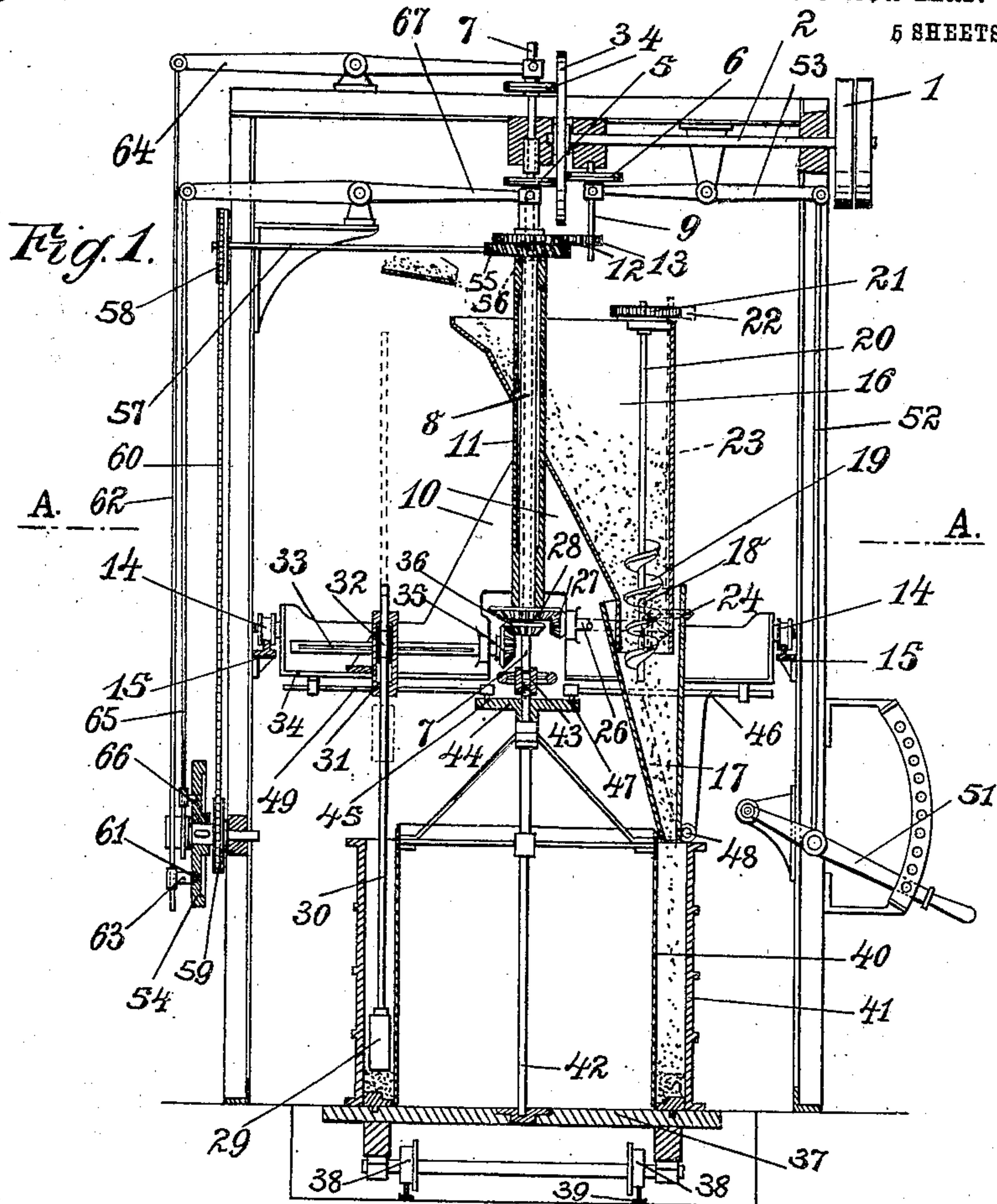


E. BONGARDT.
MACHINE FOR FORMING HOLLOW ARTICLES.
APPLICATION FILED OCT. 8, 1907.

915,331.

Patented Mar. 16, 1909.

5 SHEETS—SHEET 1.



Witnesses:
Henry Thiele
J. George Barry

Inventor:
Eust. Bongardt
by attorney
Brown & Ward

E. BONGARDT.
MACHINE FOR FORMING HOLLOW ARTICLES.
APPLICATION FILED OCT. 8, 1907.

915,331.

Patented Mar. 16, 1909.
6 SHEETS—SHEET 2.

Fig. 3.

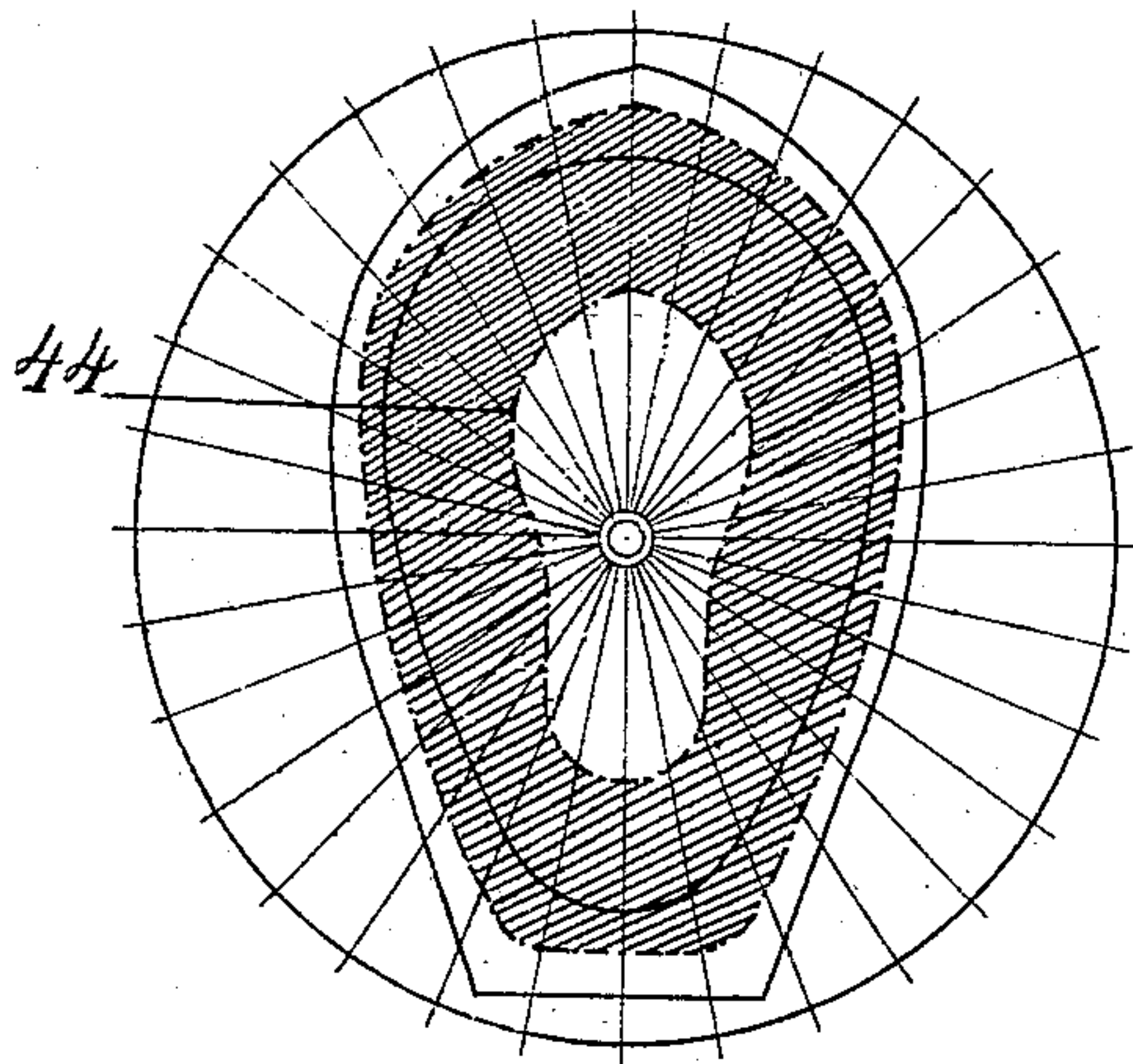


Fig. 4.

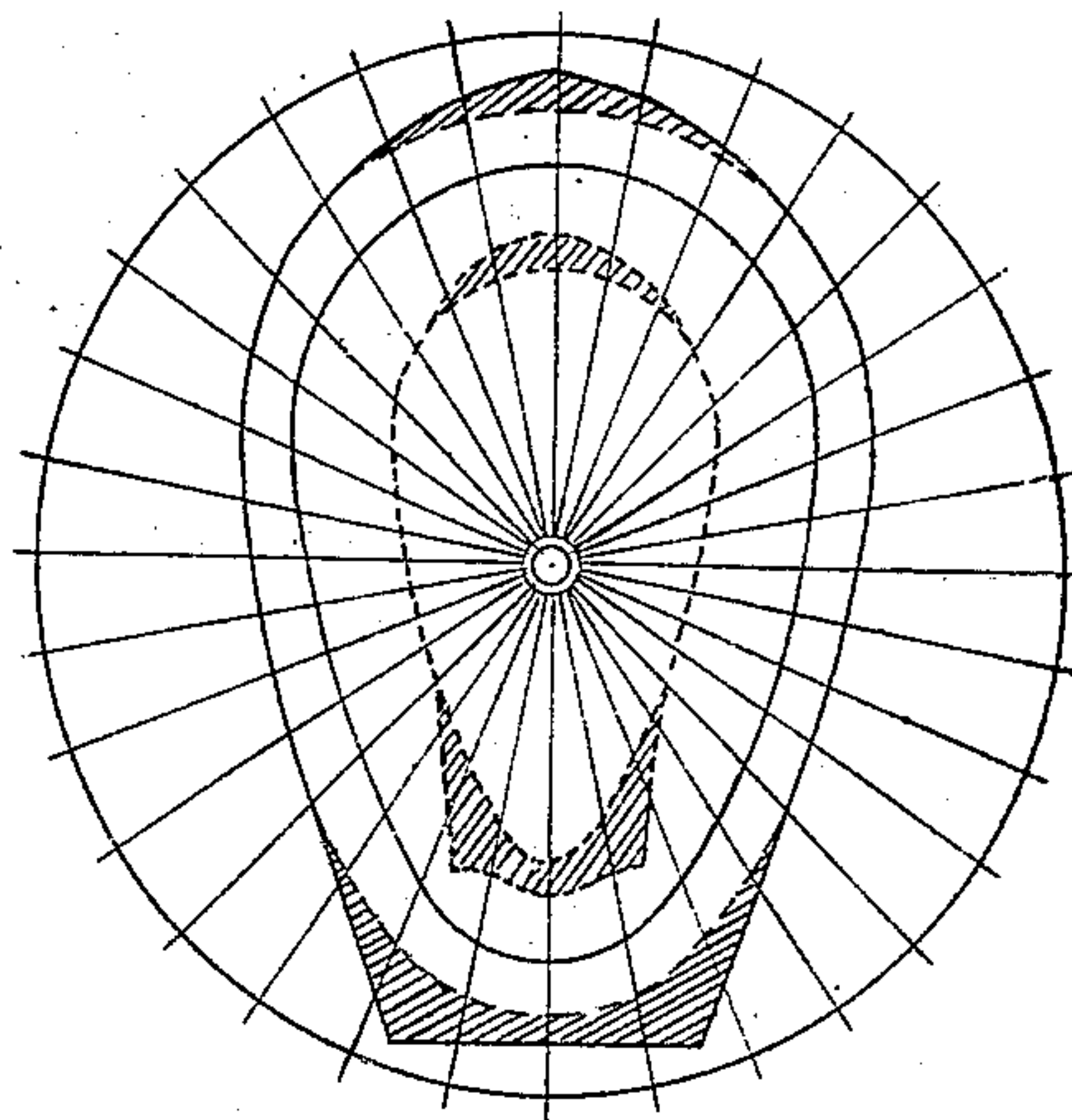
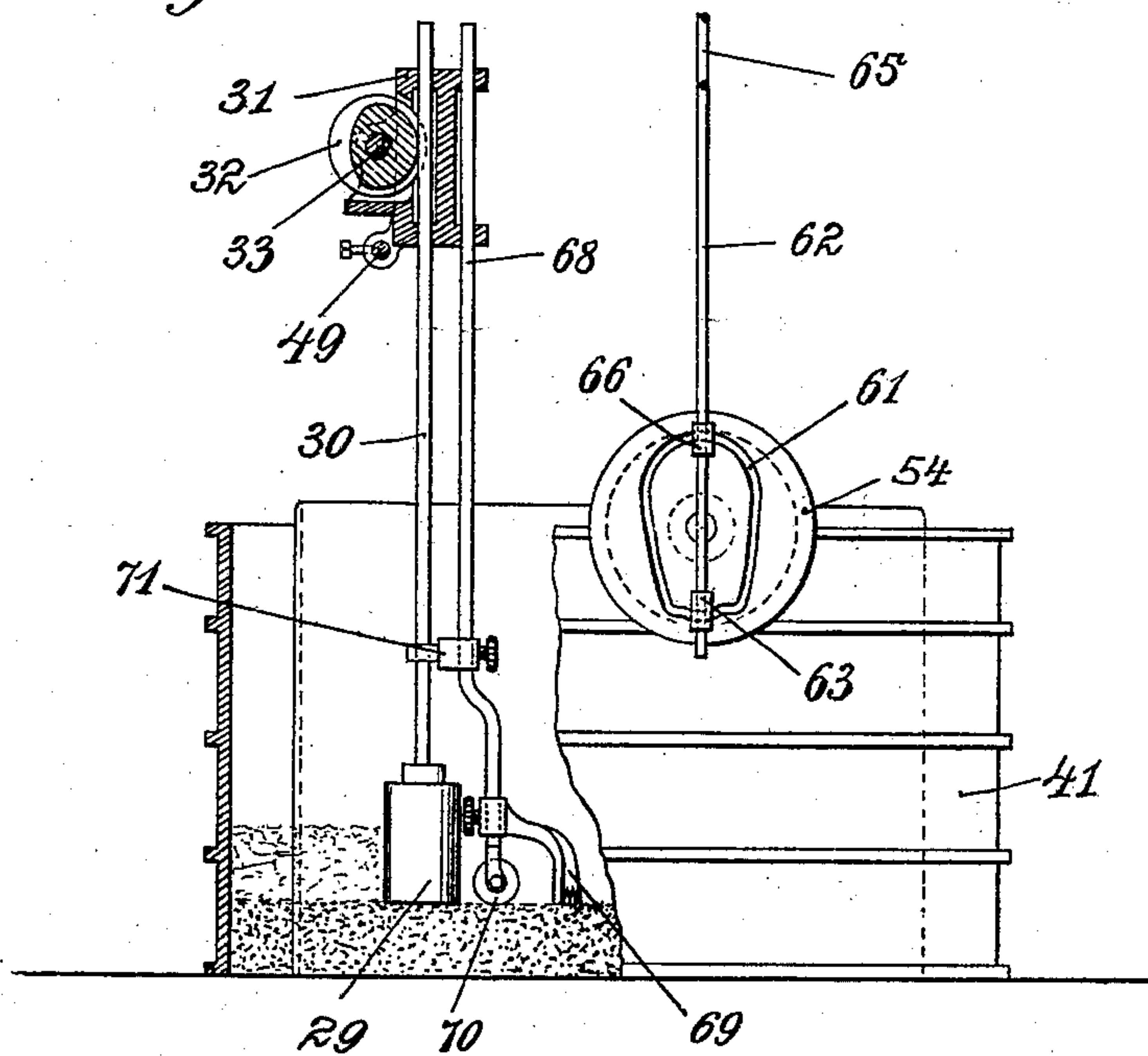


Fig. 5.



Witnesses:
Henry Thieme.
J. George Barry.

Inventor:
Ernst Bongardt
By attorney
Brown & Howard.

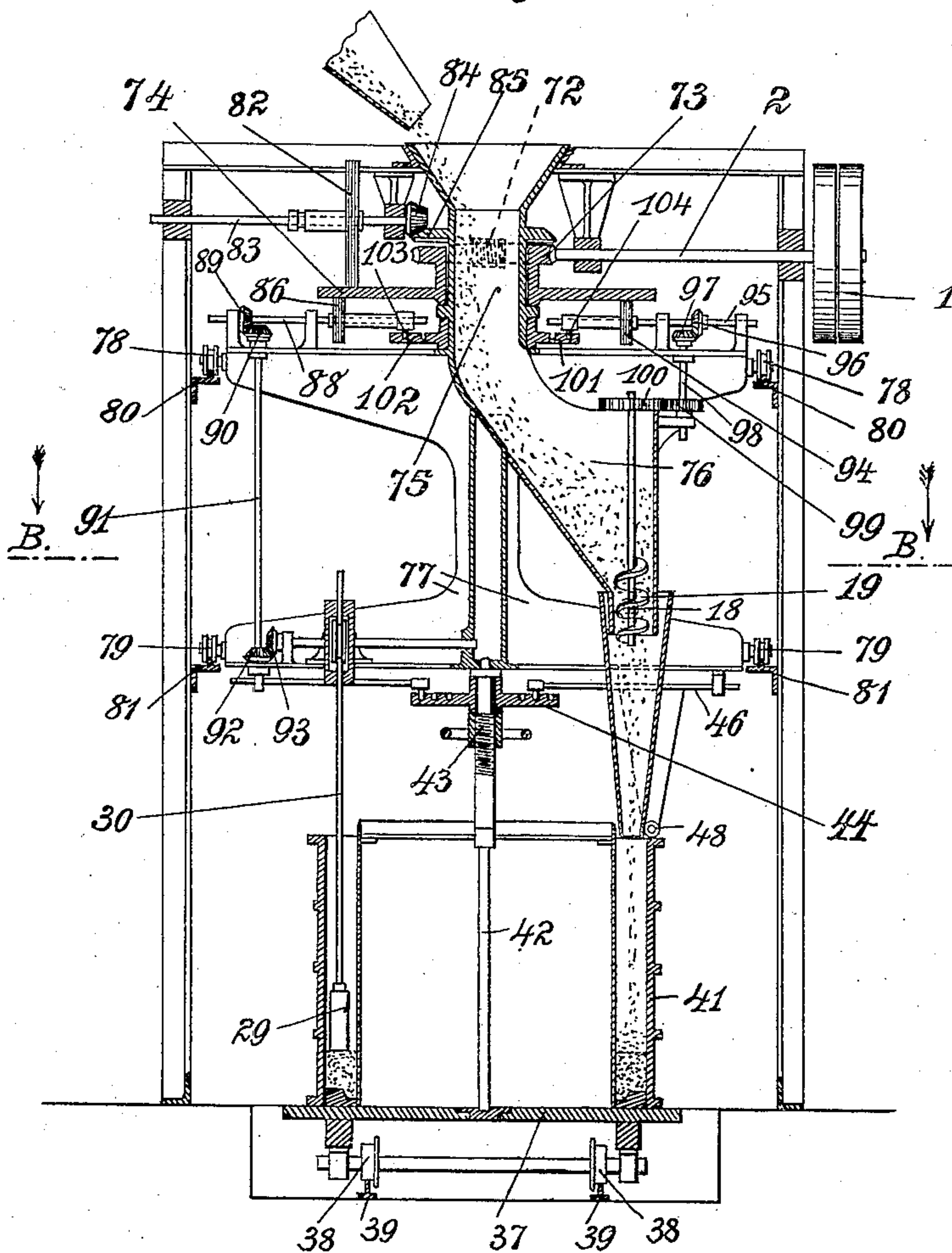
E. BONGARDT.
MACHINE FOR FORMING HOLLOW ARTICLES.
APPLICATION FILED OCT. 8, 1907.

915,331.

Patented Mar. 16, 1909.

5 SHEETS—SHEET 3.

Fig. 6.



Witnesses:
Henry Thieme.
J. George Barry.

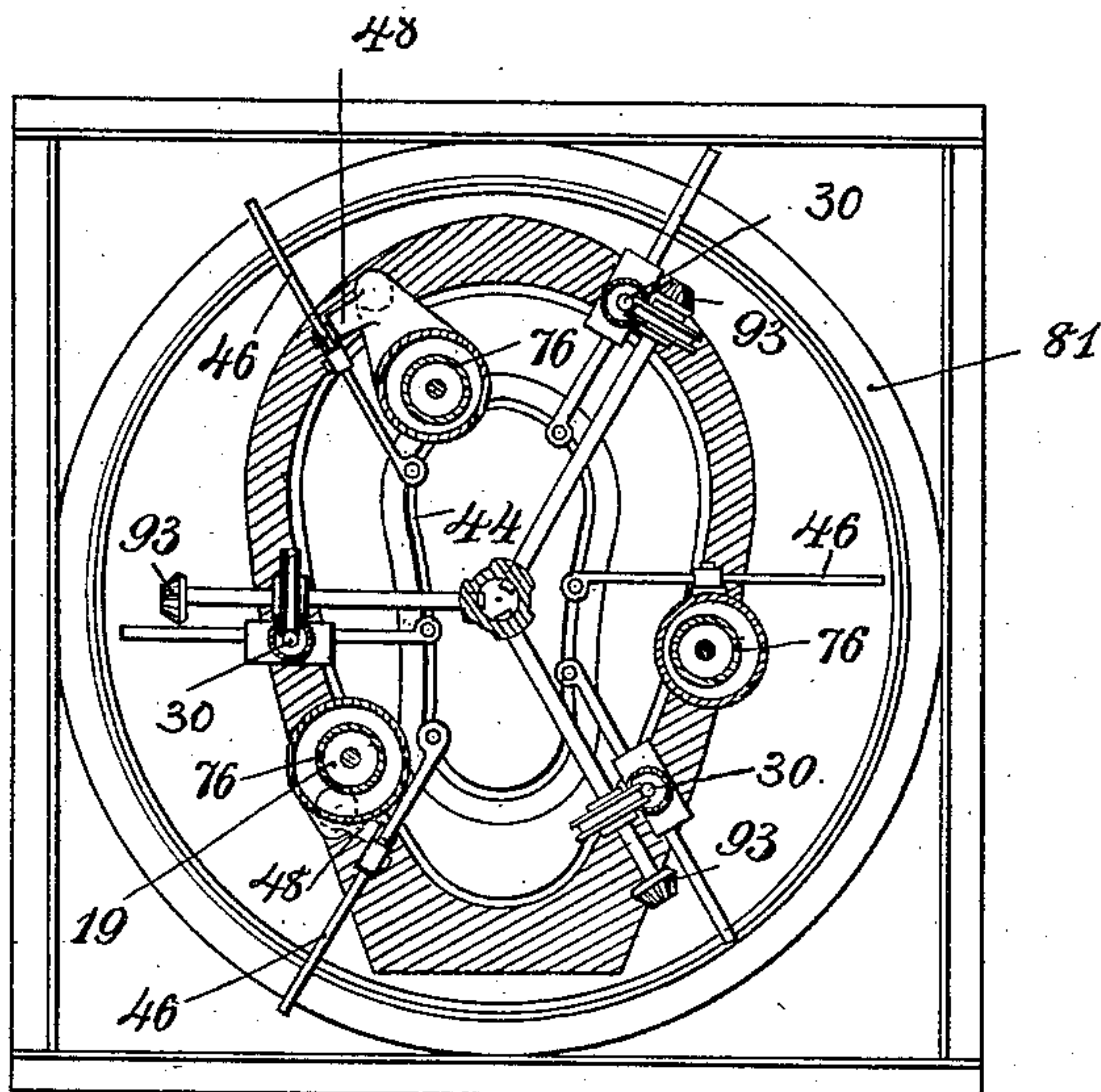
Inventor:
Ernst Bongardt
By attorneys
Thompson & Howard

E. BONGARDT.
MACHINE FOR FORMING HOLLOW ARTICLES.
APPLICATION FILED OCT. 8, 1907.

915,331.

Patented Mar. 16, 1909.
6 SHEETS—SHEET 4.

Fig. 7.



Witnesses:
Henry Thomas.
J. George Barry.

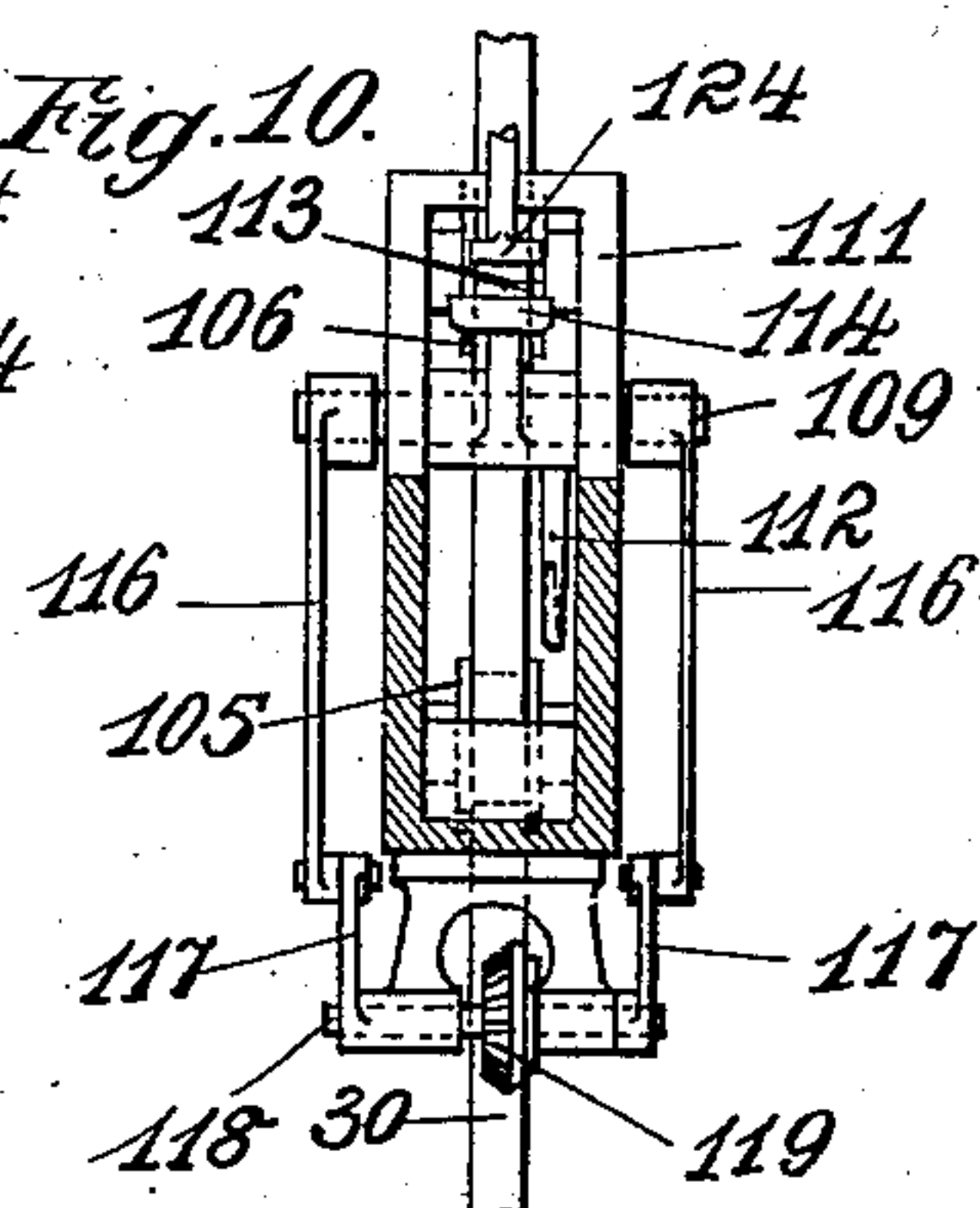
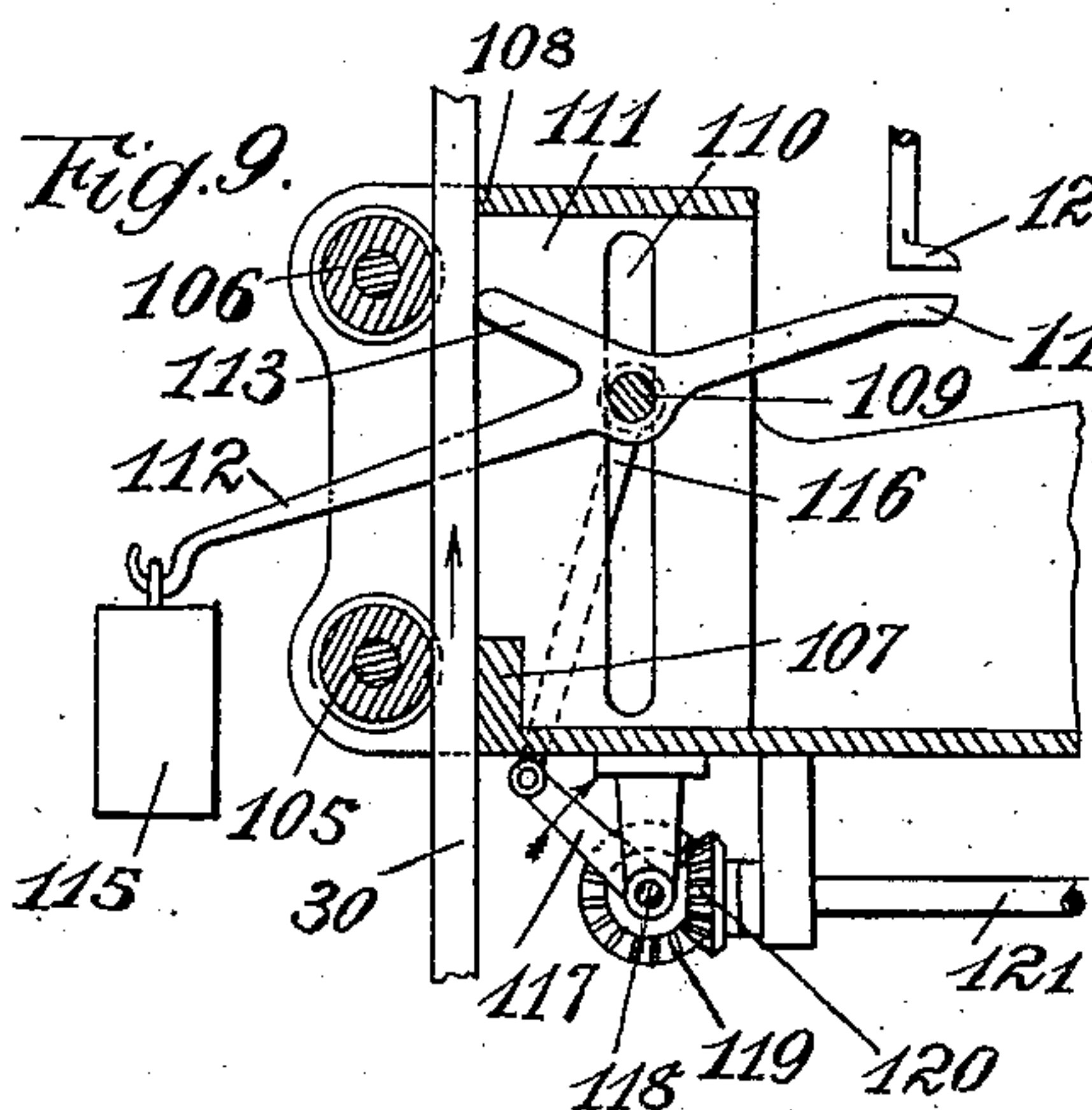
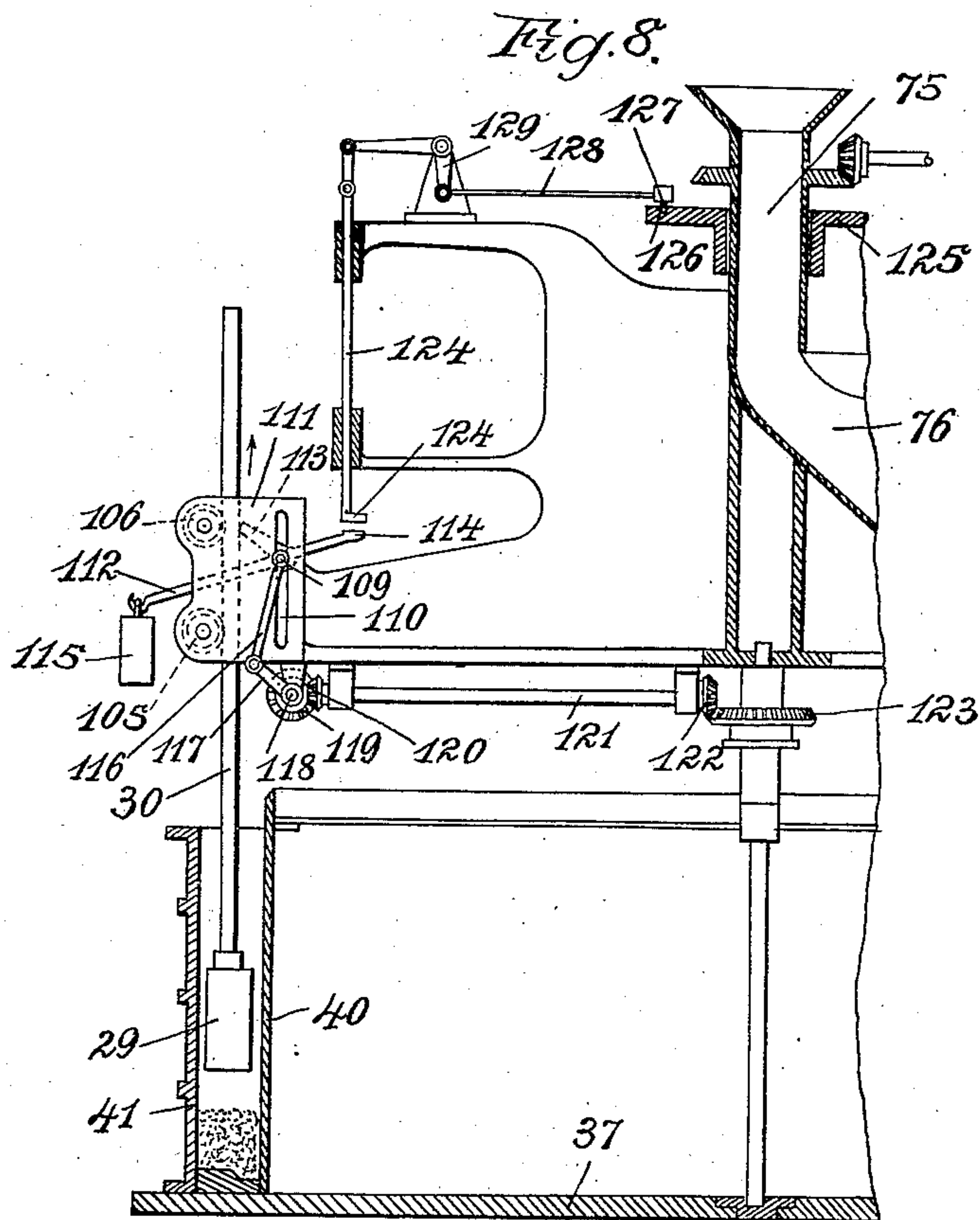
Inventor:
Eust Bongardt
by attorney
Brown & Seward

E. BONGARDT.
MACHINE FOR FORMING HOLLOW ARTICLES.
APPLICATION FILED OCT. 8, 1907.

915,331.

Patented Mar. 16, 1909.

5 SHEETS—SHEET 6.



Witnesses:
Henry Thieme
J. George Barry.

Inventor:
Ernst Bongardt
by attorneys
Brown & Sward

UNITED STATES PATENT OFFICE.

ERNST BONGARDT, OF BIEBRICH, GERMANY.

MACHINE FOR FORMING HOLLOW ARTICLES.

No. 915,331.

Specification of Letters Patent.

Patented March 16, 1909.

Application filed October 8, 1907. Serial No. 396,420.

To all whom it may concern:

Be it known that I, ERNST BONGARDT, engineer, a subject of the German Emperor, and resident of Kasteler street 17, Biebrich-on-the-Rhine, Germany, have invented new and useful Improvements in Machines for Forming Hollow Articles, of which the following is a specification.

The object of this invention is to provide improvements in the construction, form and arrangement of the several parts of a machine for forming hollow articles, such, for instance, as cement pipes, whereby articles of various shapes in cross section and varying thickness of walls may be readily formed.

This invention contemplates the formation of walls of different shapes and varying thicknesses by controlling the amount of material which is fed into the mold and by varying the effect of the stamper, either by speed or by the height of drop. Means are also provided for moving the feeding funnel and stamper laterally. Means are also provided for roughening the surface of the material back of the stamper so as to insure a proper adhesion of the next layer of material to the preceding layer.

Practical embodiments of this invention are represented in the accompanying drawings in which—

Figure 1 is a view in side elevation partially in section of one form of my improved machine; Fig. 2 is a horizontal section taken in the plane of the line A—A of Fig. 1, looking in the direction of the arrows, with certain of the parts removed to more clearly show the parts beneath the same; Fig. 3 shows diagrammatically the construction of the guiding groove for the feeding-funnel; Fig. 4 is a diagrammatic view showing the cross sectional shape of the pipe for which the present machine is adapted, illustrating the varying thickness of wall, Fig. 5 is a detail side view taken in a plane at right angles to Fig. 1, certain of the parts being broken away to more clearly show the parts back of the same, Fig. 6 is a view in side elevation partially in section showing a modified construction of machine. Fig. 7 is a horizontal cross section taken in the plane of the line B—B of Fig. 6, looking in the direction of the arrows, with certain of the parts removed to show more clearly the parts beneath the same, Fig. 8 is a detail section showing a modified form in which the effect of the stamper is obtained by varying the length of drop instead of by

varying the speed thereof. Fig. 9 is a section on a larger scale showing the means for lifting and dropping the stamper and Fig. 10 is a front view of the same partly in section.

Proceeding to describe the machine set forth in Figs. 1 to 5 inclusive: 1 designates the main driving belt pulley which may be driven from any suitable source of power, not shown herein. The horizontal belt pulley shaft 2 is provided with a friction driving wheel 3. Concentric, centrally arranged, vertical shafts 7 and 8 are rotated respectively by friction wheels 4 and 5 keyed to said shafts but having a longitudinal sliding movement thereon, which friction wheels 4 and 5 engage one face of the friction driving wheel 3 upon opposite sides of its center. A friction wheel 6 engages the opposite face of the friction driving wheel 3, which wheel 6 is arranged to drive a short vertical shaft 9 but has a longitudinal sliding movement thereon. By reason of the longitudinal sliding movement of the wheels 4, 5 and 6, their respective shafts may be driven at varying speeds according to the position of the said wheels on the faces of the driving wheel 3. A rotary frame 10 is provided with a tubular shaft 11 which is concentric with the shafts 7 and 8. This tubular shaft 11 is provided with a gear 12 which meshes with a pinion 13 fixed to the short vertical shaft 9, whereby rotary motion is imparted to the frame 10 from the driving wheel 3. This frame 10 is provided with traction wheels 14 which are arranged to travel on a circular track 15 carried by the framing of the machine. A feed hopper 16 is fixed on the frame 10 and is arranged to feed the material in varying quantities to a laterally movable funnel 17 which is pivoted at 18. A rotary screw conveyer 19 is carried by a shaft 20, which conveyer is arranged to be rotated at the desired speed to feed the material from within the hopper 16 into the funnel 17. The means herein shown for rotating the conveyer 19 comprises a spur gear 21 fixed to the shaft 20 which meshes with a spur gear 22 fixed to a shaft 23, which shaft has a bevel gear 24 which meshes with a bevel gear 25 on a short horizontal shaft 26. This shaft 26 is provided with a bevel gear 27 which meshes with a bevel gear 28 fixed to rotate with the vertical shaft 8. A stamper 29 is located in position to stamp the material within the mold, which stamper is provided with a vertical rod 30 which passes up through the

stamper casing 31. A cam roller 32 is mounted on a horizontal shaft 33 in position to alternately raise and release the stamper rod 30, which cam roller is fixed to rotate with a shaft 33 but is longitudinally movable thereon. The stamper casing 31 is also longitudinally movable on the guide 34 of the frame 10. Rotary motion is imparted to the shaft 33 through a bevel gear 35 which meshes with a bevel gear 36 fixed to rotate with the shaft 7.

The truck for bringing the mold into position to be filled, is denoted by 37 and is provided with traction wheels 38 arranged to travel on tracks 39.

The inner wall of the mold is denoted by 40 and the outer wall by 41. A centrally arranged vertical rod 42 is fitted to be centered with respect to the shafts 7, 8 and 11 by providing the upper end of the rod 42 with a nut 43 which has a screw-threaded engagement with the rod 42 and which is adapted to cause the lower end of the shaft 7 to enter the nut as the nut is partially unscrewed from the rod 42. This insures the proper placement of the mold with respect to the filling and stamping mechanisms.

A pattern plate 44 is fixed against movement on the rod 42, which pattern plate is provided with a cam groove 45 corresponding in shape to the median line of the walls of the article to be formed. A radially sliding bar 46 is carried by the frame 10, which bar is provided with a stud 47 located in the cam groove 45 of the pattern plate 44 and is also pivoted at 48 to the feeding funnel 17. The distance between the pivotal point of connection between the funnel and the radially sliding bar 46 and the pivotal connection 18 of the funnel with the frame 10, is such that as the frame 10 rotates, the discharge mouth of the funnel will be swung the required distance to properly distribute the material into the mold.

A radially sliding bar 49 is secured to the stamper casing 31, which bar is mounted on the frame 10 and is provided with a stud 50 which is arranged to travel in the cam groove 45 of the pattern plate 44 so that the stamper may be adjusted radially as the frame 10 rotates to insure the proper stamping of the material within the mold. The speed of rotation of the frame 10 is controlled by a hand lever 51 through a rod 52 which is connected to one arm of a lever 53, the other arm of which lever is connected to the friction wheel 6 whereby the wheel 6 may be shifted along the face of the friction driving wheel 3.

A pattern disk 54 is rotated at the same speed as the frame 10, by the following means. A worm gear 55 fixed to the shaft 11 of the frame 10, meshes with a worm 56 carried by a shaft 57, which shaft in turn has a sprocket and chain connection 58, 59, 60, with the rotary pattern disk 54. This

pattern disk is provided with a cam groove 61 which is so shaped as to impart the proper speed of rotation to the conveyer 19 and also the proper number of reciprocations to the stamper 29. The connection between the shaft 7 and the pattern disk 54 is as follows. A rod 62 is provided with an adjustable stud 63 located within the cam groove 61, which rod is also connected to one arm of a rocking lever 64, the other arm of which is connected to the friction wheel 4. As the wheel 4 is shifted across the face of the driving wheel 3, it will be seen that the speed of the stamper 29 is increased or diminished according to the requirements.

The shaft 8 is connected to the pattern disk 54 as follows. A rod 65 is provided with an adjustable stud 66 located within the cam groove 61, which rod is also connected to one arm of a rocking lever 67, the other arm of which is connected to the friction wheel 5. As the friction wheel 5 is shifted across the face of the driving wheel 3, it will be seen that the speed of movement of the screw conveyer 19 is varied for feeding the material faster or slower according to the thickness of the walls of the article being formed. The stamper 29 carries a roughener for roughening the surface of the material back of the stamper so as to insure the proper adhesion of the next succeeding layer of material, which roughener comprises a rod 68 guided in the stamper casing 31, the said rod 68 having at its lower end a roughening iron 69 and a roller 70 for preventing the iron from entering the material too deeply. To cause the roughener to rise on to the next succeeding layer with the rise of the stamper, I provide on the rod 68 of the roughener a stop 71 at such a distance that the stamper will engage the same at the limit of its upward movement, thus causing the stamper as it rises to the next succeeding layer to also lift the roughener with it. This rod is axially movable so as to permit the roughener to travel along within the mold as the profile of the same requires.

In the modified form shown in Figs. 6 and 7, the parts are shown as arranged in the proper position for use in connection with a plurality of material feeding devices and stampers. In this form the shaft 2 is provided with a worm and gear connection 72, 73 with the friction driving wheel 74, which wheel is arranged horizontally and is free to rotate on a central extension 75 of the feed hopper 76 which forms a permanent part of the rotary frame 77. This frame 77 is provided with upper and lower sets of traction wheels 78, 79 arranged to travel on circular tracks 80, 81. In this form the frame 77 is driven at the required speed through a longitudinally adjustable friction wheel 82 fixed to rotate with a horizontal shaft 83

which has a bevel gear connection 84, 85 with the extension 75 of the hopper 76. The friction wheel 86 for controlling the speed of the stamper is herein shown as longitudinally adjustable on and fixed to a horizontal shaft 88 having a bevel gear connection 89, 90, with a vertical shaft 91, which vertical shaft has a bevel gear connection 92, 93, with the horizontal shaft 33 which carries the cam lifting disk 32. The friction wheel 94 which controls the speed of the conveyer is longitudinally adjustable on and fixed to a horizontal shaft 95 which has a bevel gear connection 96, 97, with a short vertical shaft 98 which has in turn a spur gear connection 99, 100, with the shaft 20 of the conveyer. An upper horizontally arranged pattern plate 101 is fixed to rotate with the frame 77 and is provided with a cam groove 102, in which groove travel the studs 103, 104 of the longitudinally adjustable friction wheels 86 and 94 respectively. The pattern plate 44 controls the movements of the funnel 17 and stamper 29 in the same manner as in the first form of machine herein described. It will be seen that this latter form of machine is particularly well adapted for use in connection with a plurality of filling funnels and stampers for the reason that the shafts 88, 95, 33 and 46 are all arranged radially, thus permitting the pattern plates 101 and 44 to have series of cam grooves corresponding to the number of filling devices and stampers which it is desired to employ.

If it be desired to control the amount of work of the stampers by changing the height of the drop instead of by changing the number of strokes of the stampers, the modification shown in Figs. 8, 9 and 10 might be employed. The stamper 29 has its vertical rod 30 held between rollers 105, 106 and guides 107, 108. A shaft 109 is movable in a vertical elongated slot 110 of the casing 111, on which shaft is loosely mounted a three-armed rocking lever 112, 113, 114, the arm 112 of which is provided with a weight 115 for holding the arm 113 of the lever pressed against the rod 30 of the stamper 29. This shaft 109 is raised and lowered by connecting rods 116 the lower ends of which are attached to rotary arms 117 of a shaft 118 which is rotated by a bevel gear connection 119, 120, with a shaft 121 driven from the vertical central shaft of the machine through bevel gears 122, 123. The arm 113 of the lever 112, 113, 114, is kept in engagement with the stamper rod 30 during a predetermined amount of the upward movement of the shaft 109 according to the amount of drop which the stamper is to be permitted. The means for accomplishing this result comprises a vertically sliding rod 124 arranged to be brought down into position to act as a stop for engaging the arm 114 of the three armed lever when the

shaft 109 reaches a certain point in its upward movement, the position of the said rod 124 being determined by a face cam 125, the groove 126 of which engages a stud 127 on a rod 128 connected to the rod 124 through a rocking lever 129. This cam 125 is fixed to rotate with the central extension 75 of the feed hopper 76. The cam groove 126 is of such shape that the height of drop of the stamper 29 may be regulated according to the amount of material supplied to the mold.

Now what I claim and desire to secure by Letters Patent is the following:

1. A machine for forming hollow structures having varying wall thickness, comprising a mold and means for supplying material thereto in varying quantities according to the wall thickness of the structure being formed.

2. A machine for forming hollow structures having varying wall thickness, comprising a mold and a variable speed mechanism for supplying material thereto in varying quantities according to the wall thickness of the structure being formed.

3. A machine for forming hollow structures having varying wall thickness, comprising a mold, a pattern disk having a groove corresponding to the cross section of the mold and means controlled by the pattern disk for supplying material to the mold in varying quantities.

4. A machine for forming hollow structures having varying wall thickness, comprising a mold, a pattern disk having a groove corresponding to the cross section of the mold and a variable speed mechanism controlled by the pattern disk for supplying material to the mold in varying quantities.

5. A machine for forming hollow structures having varying wall thickness, comprising a mold, means for supplying material thereto in varying quantities, a stamper and means for varying the work done by the stamper.

6. A machine for forming hollow structures having varying wall thickness, comprising a mold, a pattern disk having a groove corresponding to the cross section of the mold, and separate variable speed mechanism controlled by the pattern disk for supplying material to the mold in varying quantities and for varying the work done by the stamper according to the amount of material fed to the mold.

7. A machine for forming hollow structures having varying wall thickness, comprising a mold, means for supplying material thereto in varying quantities according to the wall thickness of the structure being formed, a stamper and means for varying the work done by the stamper according to the amount of material fed to the mold.

8. A machine for forming hollow structures having varying wall thickness, comprising a

mold, a rotary frame, means for controlling the speed of the frame and means carried by the frame for supplying material to the mold in varying quantities.

5 9. A machine for forming hollow structures having varying wall thickness, comprising a mold, a rotary frame, means for controlling the speed of the frame, a pattern disk having a groove corresponding to the
10 cross section of the mold and means carried by the frame and controlled by the pattern disk for supplying material to the mold in varying quantities.

10. A machine for forming hollow structures having varying wall thickness, comprising a mold, a rotary frame, means for controlling the speed of the frame, means carried by the frame for supplying material to the mold in varying quantities and a
15 stamper carried by the frame for engaging the material within the mold.
20

11. A machine for forming hollow structures having varying wall thickness, comprising a mold, a rotary frame, means for
25 controlling the speed of the frame, a pattern disk having a groove corresponding to the cross section of the mold, a material feeding device carried by the frame, a stamper carried by the frame and variable speed mechanisms controlled by the pattern disk for
30 controlling the amount of material supplied to the mold and for controlling the speed of the stamper.

12. A machine for forming hollow structures having varying wall thickness, comprising a mold, a funnel, a pattern disk and a pattern plate having grooves corresponding to the cross section of the mold, means controlled by the pattern disk for supplying material to the funnel in varying quantities and
35 means controlled by the pattern plate for moving the funnel radially.
40

13. A machine for forming hollow structures having varying wall thickness comprising a mold, means for supplying material thereto, a stamper, a pattern disk and a pattern plate having grooves corresponding to the cross section of the mold, means controlled by the pattern disk for driving the
45 stamper at varying speeds and means controlled by the pattern plate for moving the stamper radially.
50

14. A machine for forming hollow structures having varying wall thickness, comprising a mold, a funnel, a stamper, a pattern disk and a pattern plate having grooves corresponding to the cross section of the mold, separate means controlled by the pattern disk for supplying the material in varying
55 quantities to the funnel and for driving the stamper at varying speeds and separate
60

means controlled by the pattern plate for moving the funnel and the stamper radially.

15. A machine for forming hollow structures having varying wall thickness, comprising a mold, a rotary frame, means for controlling the speed of the frame, means for centering the mold with respect to the frame and means carried by the frame for supplying material to the mold. 65 70

16. A machine for forming hollow structures having varying wall thickness, comprising a mold, a rotary frame, means for controlling the speed of the frame, means for centering the mold with respect to the frame, means carried by the frame for supplying material to the mold and a stamper carried by the frame for engaging the material within the mold. 75

17. A machine for forming hollow structures having varying wall thickness, comprising a mold, means for supplying material thereto, a stamper for engaging the material within the mold and a roughener carried by the stamper in position to engage the surface of the stamped material within the mold. 80 85

18. A machine for forming hollow structures having varying wall thickness, comprising a mold, means for supplying material thereto, a stamper for engaging the material within the mold, a roughener carried by the stamper in position to engage the surface of the stamped material within the mold and a roller carried by the roughener for limiting its roughening effect. 90 95

19. A machine for forming hollow structures having varying wall thickness, comprising a mold, means for supplying material thereto, a stamper for engaging the material within the mold, a roughener carried by the stamper in position to engage the surface of the stamped material within the mold and a stop carried by the roughener in position to be engaged by the stamper for automatically raising the roughener to the next succeeding layer within the mold. 100 105

20. A machine for forming hollow structures having varying wall thickness, comprising a mold, means for supplying material thereto, a stamper for the material and means for varying the effect of the stamper according to the amount of material supplied to the mold. 110

In testimony, that I claim the foregoing as my invention, I have signed my name in presence of two witnesses, this twenty-third day of September 1907. 115

ERNST BONGARDT.

Witnesses:

REINHARDT ISENBERG,
OTTO KELLNER.