

Feb. 28, 1939.

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GRAIN PUFFING MACHINE

2,148,728

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3 Sheets-Sheet 1

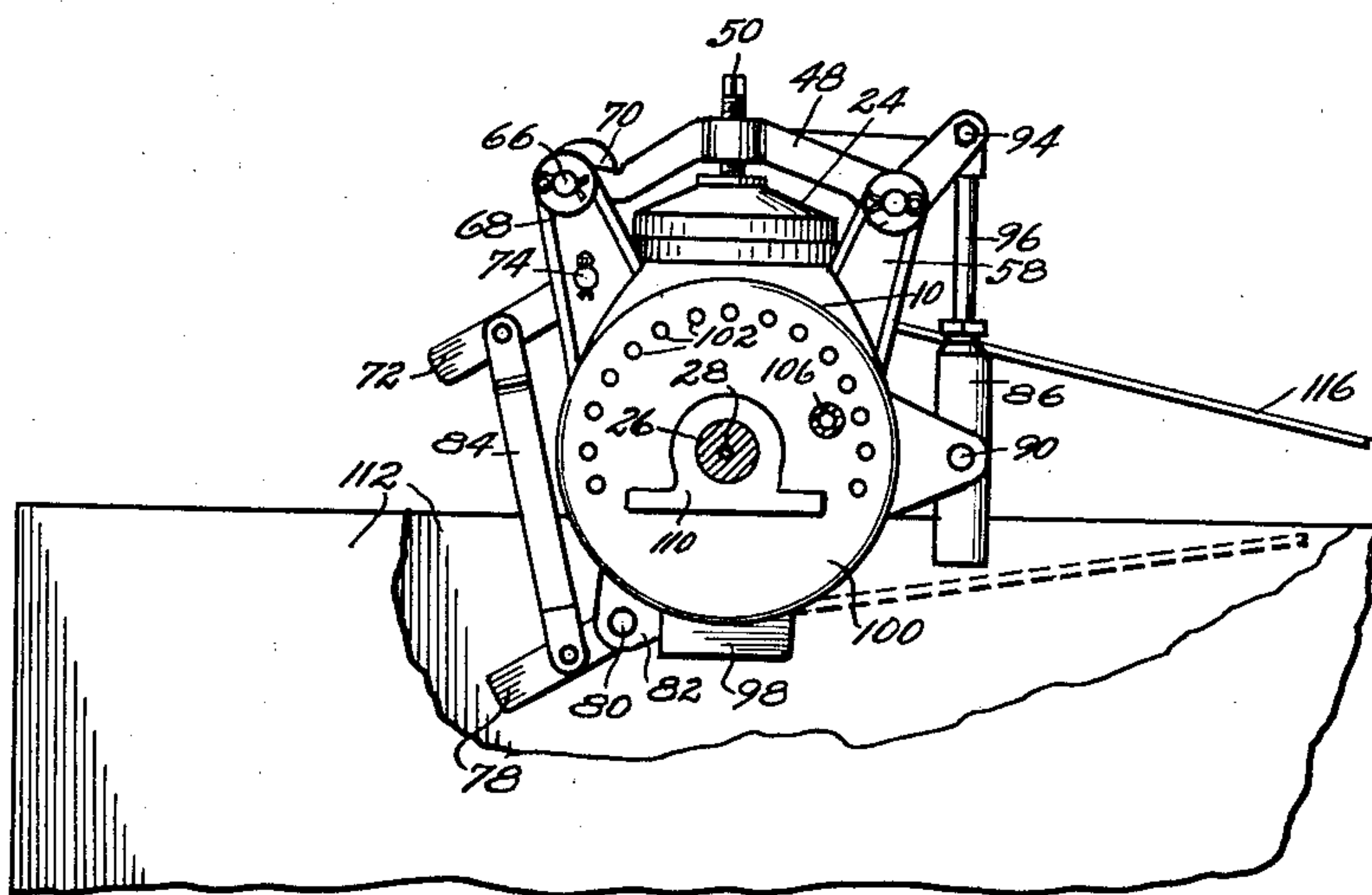


Fig. 1

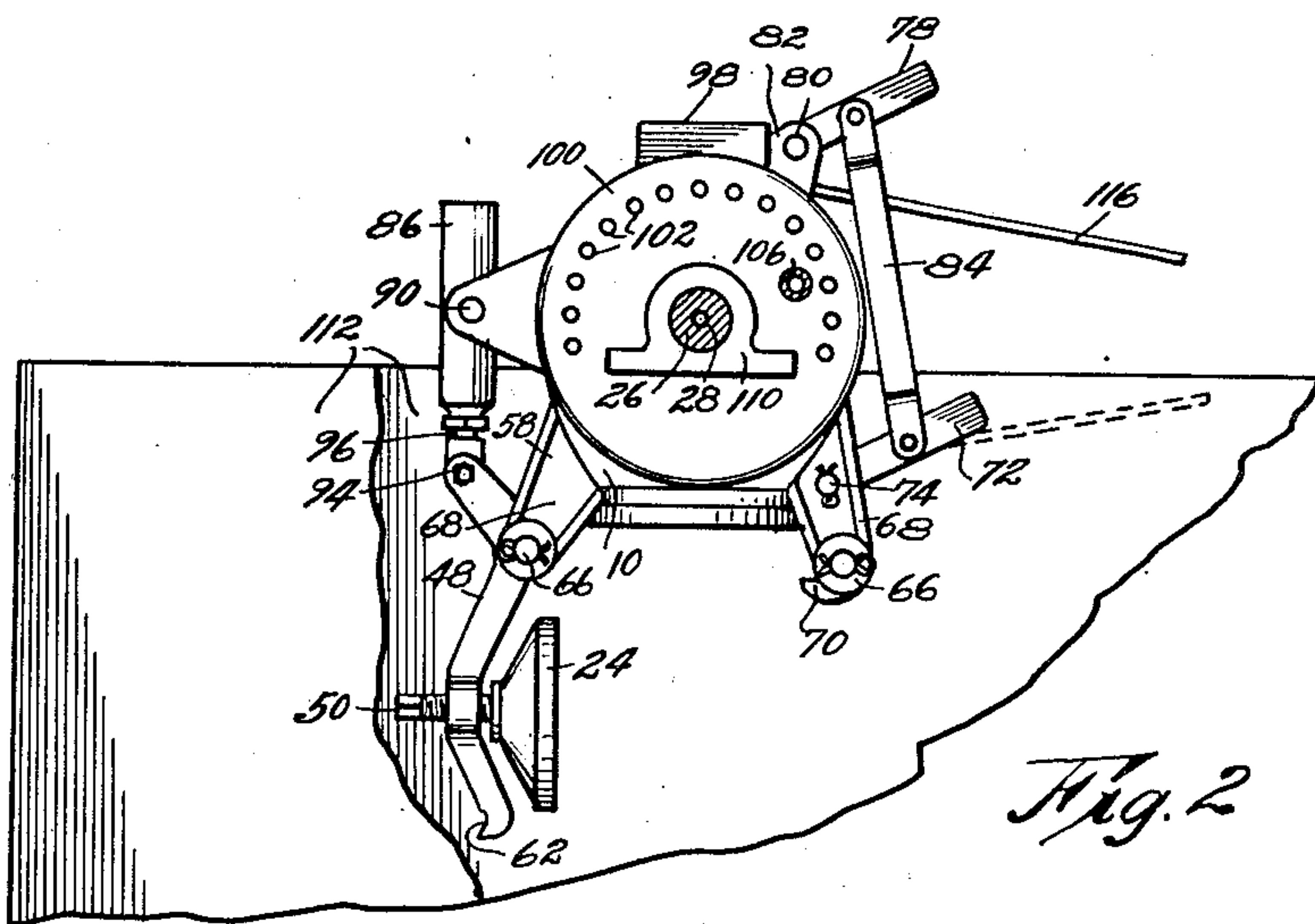


Fig. 2

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3 Sheets-Sheet 2

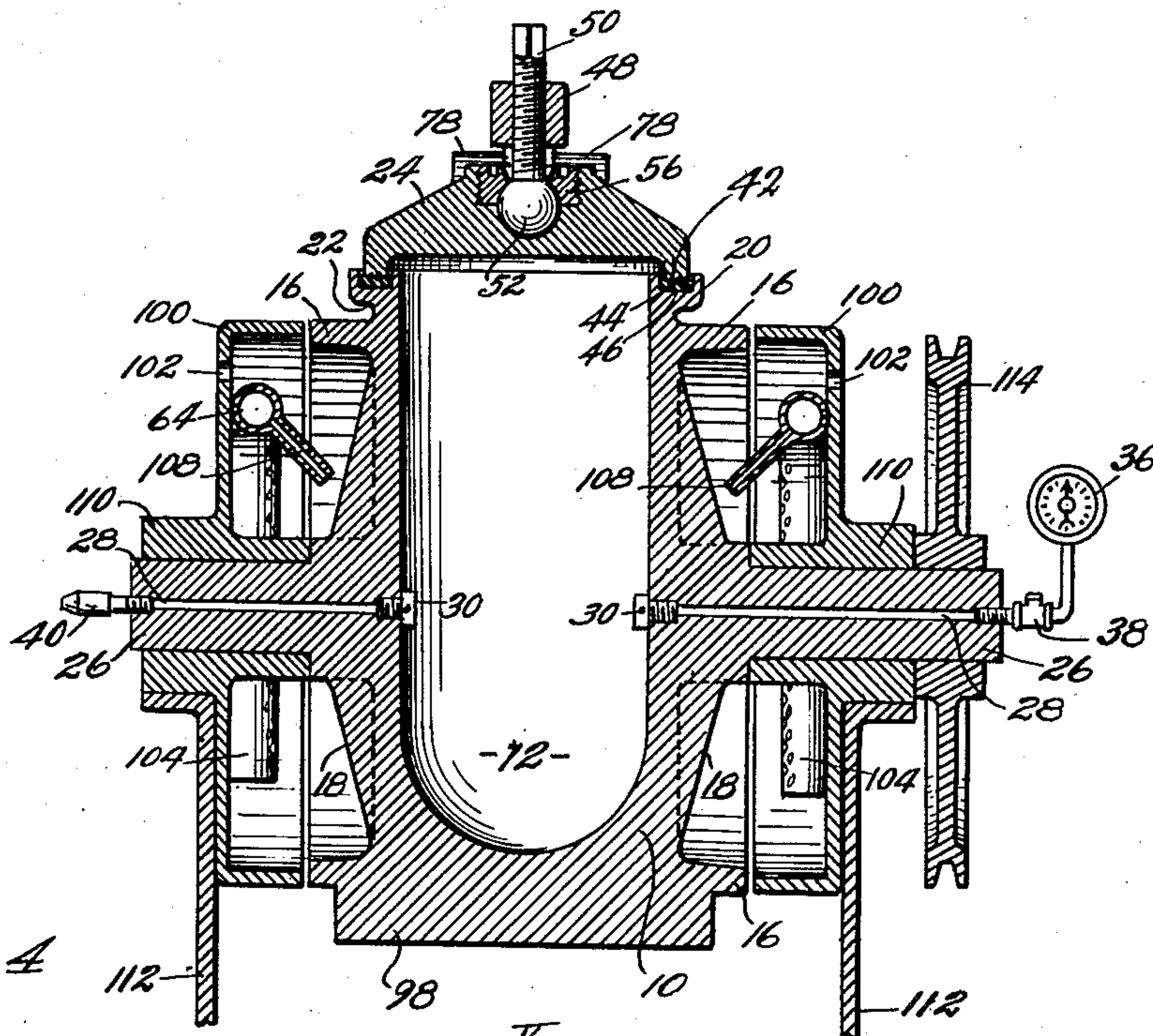


Fig. 4

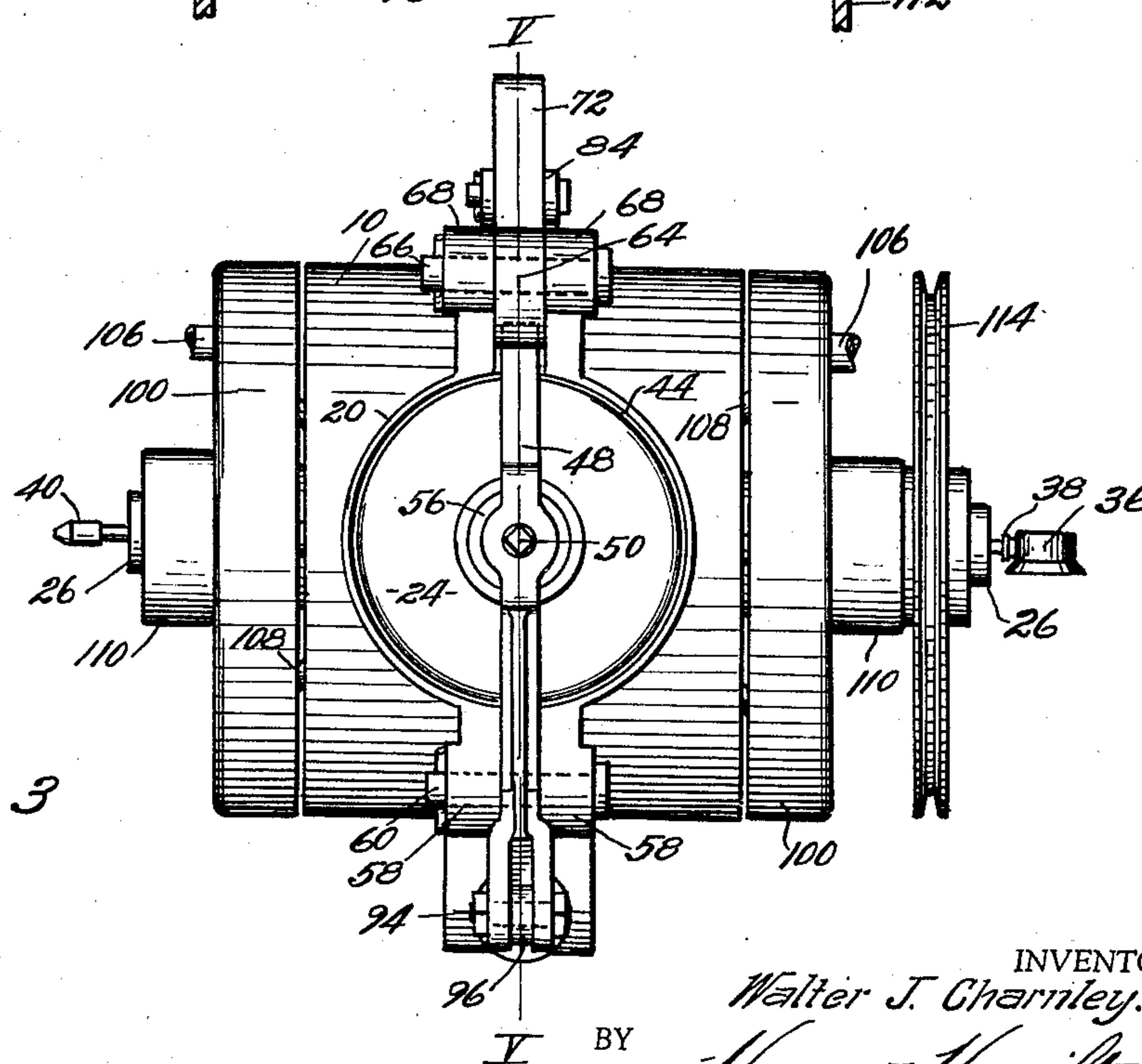


Fig. 3

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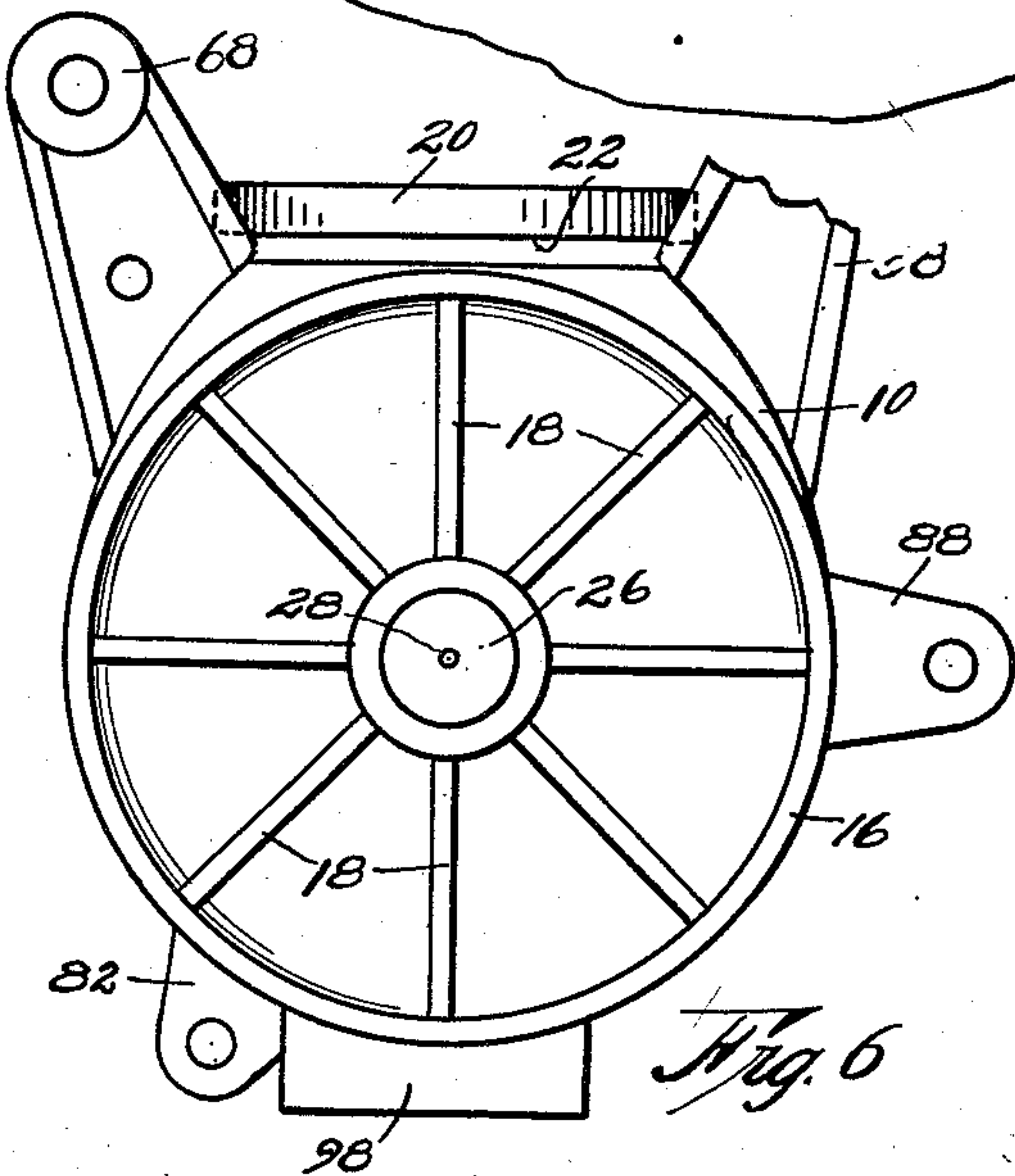
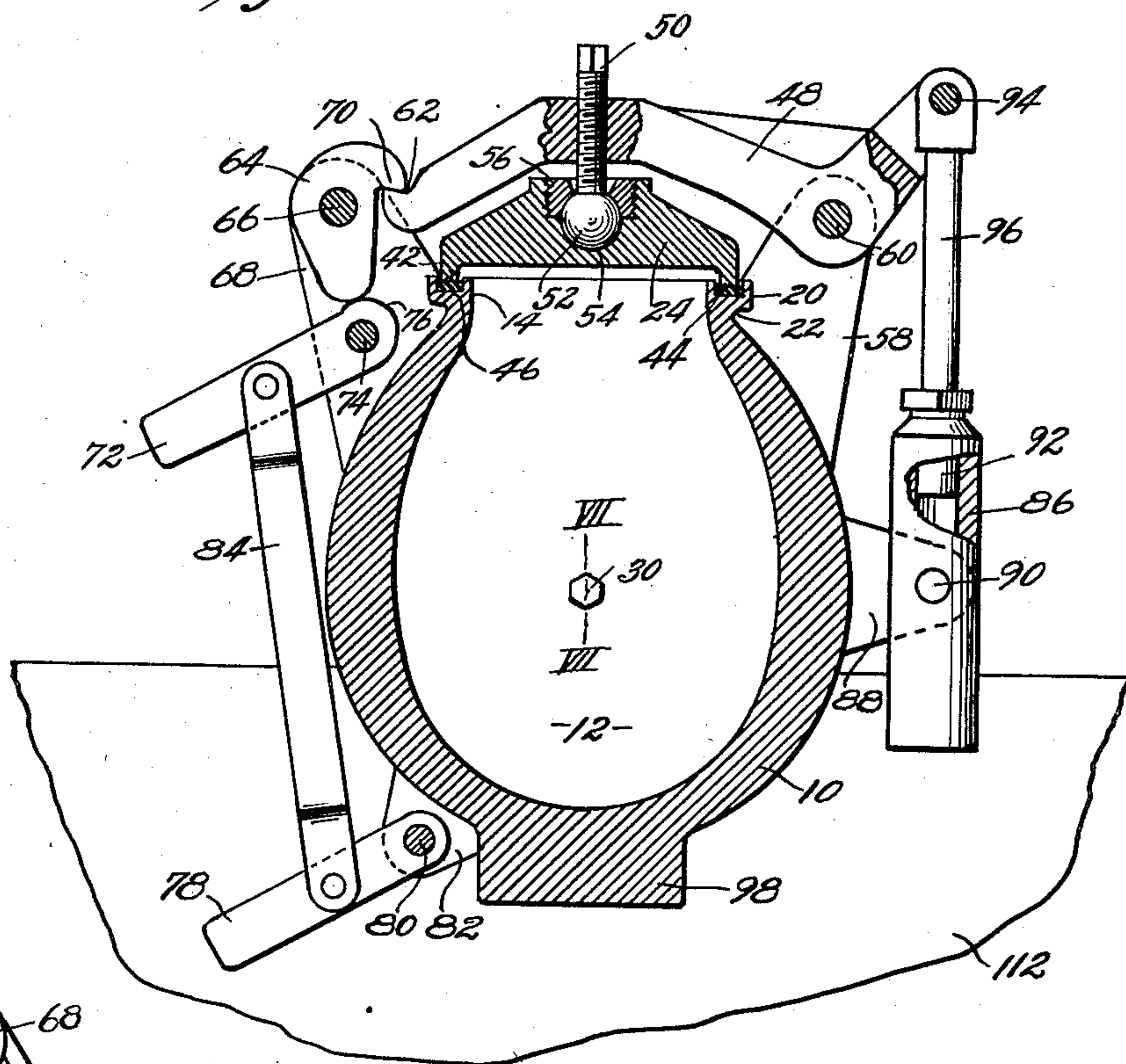
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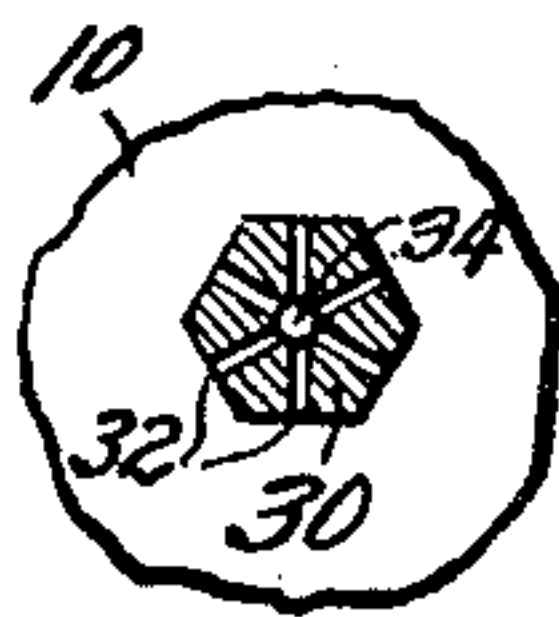
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3 Sheets-Sheet 3

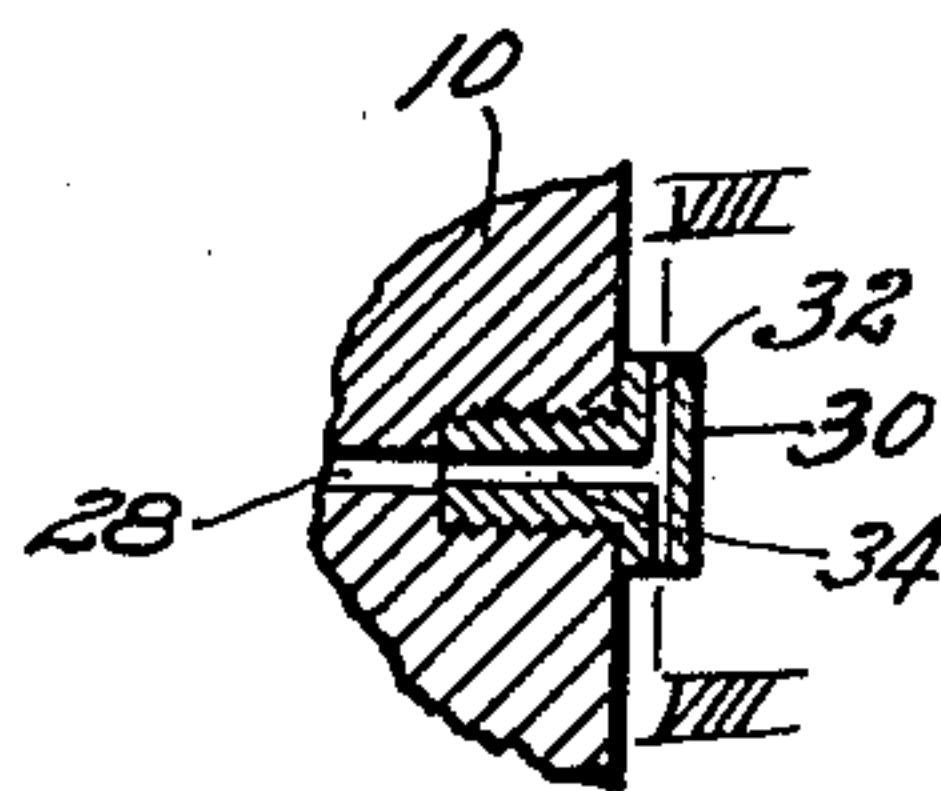
*Fig. 5*



*Fig. 8*



*Fig. 7*



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## UNITED STATES PATENT OFFICE

2,148,728

## GRAIN PUFFING MACHINE

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Application December 19, 1936, Serial No. 116,777

2 Claims. (Cl. 99—238)

This invention relates to cereal making equipment and particularly grain puffing machines employed in the manufacture of such commodities as puffed wheat, puffed rice, puffed oats and puffed corn, and the primary object of the invention is the provision of such a machine, that will withstand the high pressures and heat required, and which will embody novel features contributing to the efficiency, simplicity and ruggedness of the machine.

One of the important objects of the invention is to provide a grain puffing machine, having as a part thereof, a rotatable barrel that is mounted between a pair of heat-applying burners which direct jets of flame against the ends of the barrel as it is being rotated so that the temperature of the grain being treated might be quickly raised to the desired point.

Another important feature of this invention is to provide in a cereal puffing machine of the aforementioned character, a novelly constructed lid for the opening through the side of the barrel, which lid is releasably held in the closed position by mechanism supported by and rotatable with the barrel itself.

A still further aim of the instant invention is the provision of a grain puffing machine, having a barrel, the ends of which are specially formed and disposed in substantially parallel relation to each other and having a substantially annular side, through which is formed an opening so that the grain being treated might be discharged in a path extending outwardly and radially from the barrel.

Further objects of the invention include the specific manner of constructing the parts of the machine so that the same will function as contemplated and the minor objects forming a part of the invention will appear during the course of the following specification, referring to the accompanying drawings, wherein:

Figure 1 is a side elevation of a grain puffing machine made in accordance with the present invention.

Fig. 2 is a similar view, but with the lid in the open position and the barrel in the discharging condition.

Fig. 3 is a top plan view of the main portion of the puffing machine.

Fig. 4 is a transverse, central cross section through the same.

Fig. 5 is a section through the barrel and associated parts of the machine, taken on line V—V of Fig. 3.

Fig. 6 is a side elevation of the barrel per se.

Fig. 7 is an enlarged, fragmentary, detailed, sectional view through a portion of the barrel, taken on line VII—VII of Fig. 5, and,

Fig. 8 is a similar section taken on line VIII—VIII of Fig. 7.

In constructing a grain puffing machine to include the broader objects of this invention, the same should have a main casting in the form of barrel 10, which is provided with a cavity 12 and an opening 14 through the side, which is in communication with cavity 12. Barrel 10 should be cast of heat-resisting material, and it has been found that gray iron, steel and nickel combines to make a heat and blow-resisting alloy very suitable for the construction of this barrel.

The ends of the barrel are substantially parallel to each other and each end presents an annular flange 16 and a plurality of ribs 18, which serve to evenly distribute the heat applied to the ends of the drum through the medium of the later describer burners. Neck 20 extends radially outwardly from the substantially annular side of barrel 10 and circumscribes the aforementioned opening 14. This neck is undercut to provide a groove 22 that serves to preclude the passage of heat units from the body of barrel 10 to a lid 24, which is specially constructed to close opening 14. Trunnions 26 are cast integrally with barrel 10 and extend outwardly in opposed relation from the ends of said barrel. These trunnions are on the axis of the barrel so that when they are journaled in suitable bearings, the barrel 10 will be very evenly balanced. In practice, these trunnions may have a steel sleeve thereover and a bore of small diameter, 28, extends longitudinally through each trunnion 26. These bores 28 are in communication with cavity 12 and a specially formed plug 30 is fitted into the bores 28 where the same connect with cavity 12. The nature of these plugs 30 is vividly illustrated in Figs. 7 and 8, and each plug comprises several radially disposed passages 32, each of which is in connection with a main passage 34, in alignment with bore 28. So constructing plug 30 insures that the material being treated will not plug or otherwise restrict bores 28.

A pressure gauge 36 of conventional nature is joined to one of bores 28 so that the operator may determine the rise and fall of the pressures within cavity 12 as the machine is functioning. A check valve 38 will protect gauge 36 against sudden rise or fall of pressure, and if the pressure within cavity 12 passes a predetermined point, relief valve 40, which is in connection with one of bores 28, will be released and thereby safeguard the entire structure.



Lid 24 has an annularly serrated, downturned lip 42 at the periphery thereof and extending from one face. This lip is brought into contact with a sealing material 44, such as lead, which is poured into groove 46, milled into the outer edge of neck 20. The serrations formed on lip 42 of lid 24 will effect a tight seal when the mechanism which holds the lid in place has been locked. Lid 24 is mounted upon yoke 48 through the medium of screw 50, one end of which has a ball 52 formed thereon and seated in a cavity 54 formed in lid 24.

A removable plug 56 serves to maintain screw 50 and lid 24 in assembled relation, yet permit the lid to adjust itself to irregularities in the sealing faces. Obviously, turning screw 50 will serve to adjust lid 24 with respect to its distance from yoke 48, and this medium of adjustment is the only one required for efficient operation of this part of the machine. Yoke 48 bridges opening 14 and extends above and across lid 24 from one side thereof to the other. Yoke 48 is a modified bell crank lever element, and has a pivotal connection with ears 58 through the use of a pin 60. In constructing the machine, ears 58, located on one side of opening 14, should be slightly spaced apart as to receive yoke 48 therebetween. Pin 60 is carried by the two spaced-apart ears 58 so that yoke 48 may be pivotally supported for free movement about the axis of pin 60.

One end of yoke 48 is specially formed, as at 62, to receive latch element 64. This latch element is pivotally carried by pin 66 that extends between two spaced-apart ears 68 that are integral with barrel 10 on the other side of opening 14 from ears 58. This latch element 64 has a lip 70 which enters notch 62, and which is forced thereinto as lever 72 is moved about the axis of a supporting pin 74. A cam face 76 is created upon the end of lever 72, which is engaged by pin 74, so that as movement is imparted to this lever, latch element 64 will be securely forced into notch 62 of yoke 48.

To release latch element 64 so that the yoke 48 and lid 24 may be swung to the open position, it is merely necessary to strike lever 72 so as to break down the relation between cam face 76 and the engaged end of latch element 64. Lever 72 is supplemented by another lever 78, pivotally mounted upon barrel 10 through the medium of pin 80 and spaced-apart ears 82. A link 84 interconnects levers 72 and 78 and when lever 72 cannot be struck by the operator to open lid 24, lever 78 is available, as shown in Fig. 2.

When yoke and lid 48 and 24 are violently moved about the axis of pin 60, the force is absorbed by the parts illustrated in Figs. 1 and 5. A cylinder 86 is pivotally mounted upon barrel 10 by ears 88 and trunnions 90. A piston 92, joined to yoke 48 at the end thereof, reciprocates in cylinder 86 and the filling of fluid in said cylinder absorbs the shock so that the parts which move about the axis of pin 60 will not be damaged in the opening operation. Cross pin 94 pivotally interconnects piston rod 96 and yoke 48. The rocking motion which is permitted by trunnions 90 further contributes to the successful dampening of the force exerted by the internal pressure when lid 24 is allowed to open.

All of the lid operating parts and the latch therefor are mounted upon barrel 10 and the same may be counterweighted as at 98 to insure even distribution of the weight about the aligned axes of trunnions 26. Thus very little power is

needed to drive this relatively heavy part of the machine and the momentum will assist in maintaining the rotary action.

It is desirable to apply heat to the grain being treated within cavity 12, and undesirable to provide a movable burner or other heating element. The manner of accomplishing this desirable feature is through the provision of perforated end caps 100, one of which is at each end of the rotatable barrel 10. Perforations 102, formed in caps 100, provide the necessary vents and a combustion chamber is formed between 100 and the specially formed ends of barrel 10. In each of these combustion chambers is disposed a burner 104, which partially circumscribes trunnions 26 and which directs jets of flame against the respective ends of barrel 10. These burners 104 are carried on the inner side of caps 100 and pipes 106 conduct gas thereto. It is notable that these burners 104 are stationary, and since there is a large amount of metal to the axis of rotation where trunnions 26 join barrel 10, the burners are provided with branch pipes 108 that serve to concentrate gas flames at points close to the zone of connection between trunnions 26 and the body proper of barrel 10. Thus all parts of the metal ends are heated and the conductivity of the metal evenly distributes the heat throughout the mass.

Caps 100 may serve to form bearings 110 which journal trunnions 26, and these bearings 110 are mounted upon the upper edges of opposed walls 112 of a polygonal enclosure. In actual practice, walls 112 of the said enclosure extend around an opening formed through the floor, and when the machine is in the position shown in Fig. 2, its discharge will be directed downwardly through the enclosure, the opening through the floor, and into suitable bins.

Means for rotating barrel 10 is here shown to be a pulley wheel 114, that is mounted directly upon one of trunnions 26. This wheel 114 may be belted to any suitable motor, not here shown, and the belt 116 passed over pulleys of any suitable size to obtain the desired speed of rotation.

It has been found in practice that puffing machines of the character described and shown are capable of producing large quantities of puffed grain, and due to the ruggedness and simplicity of structure, shut-downs are practically eliminated.

It is conceivable that machines having physical characteristics other than those illustrated might be produced without departing from the spirit of the invention or scope of the appended claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. In a cereal puffing machine having a barrel provided with an opening through the annular side thereof to discharge the cereal from the barrel in a path extending radially from the annular side, a lid for the opening mounted on the side of the barrel for movement toward and from the closed position, mechanism for so mounting the lid comprising a radially extending ear on each side of the opening, a yoke having one end swingably carried by the ear on one side of the opening, an independent latch element on the other ear formed to engage the free end of the yoke, and an operating lever pivotally mounted on the said other ear for frictionally engaging the latch element, said yoke supporting the lid intermediate its ends and bridging the opening formed in the barrel, said operating lever being provided



with a cam face formed for exerting force against the latch element as the lever is moved about its pivotal mounting in one direction.

5 2. In a cereal puffing machine having a barrel provided with an opening through the annular side thereof to discharge the cereal from the barrel in a path extending radially from the annular side, a lid for the opening mounted on the side of the barrel for movement toward and from the closed position, mechanism for so mounting the lid comprising a radially extending ear on each side of the opening, a yoke having one end swingably carried by the ear on one side of the opening, an independent latch element on the other

ear formed to engage the free end of the yoke, and an operating lever for the latch element, said yoke supporting the lid intermediate its ends and bridging the opening formed in the barrel, said operating lever being pivotally mounted on the said other ear adjacent to the latch element and provided with a cam face formed to exert increasingly greater frictional force as the element is moved about its pivotal mounting in one direction and to release said frictional force as the lever is moved about its pivotal mounting in the opposite direction. 10

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