M. KIRSHNER.

APPARATUS FOR EXTRACTING OILS.

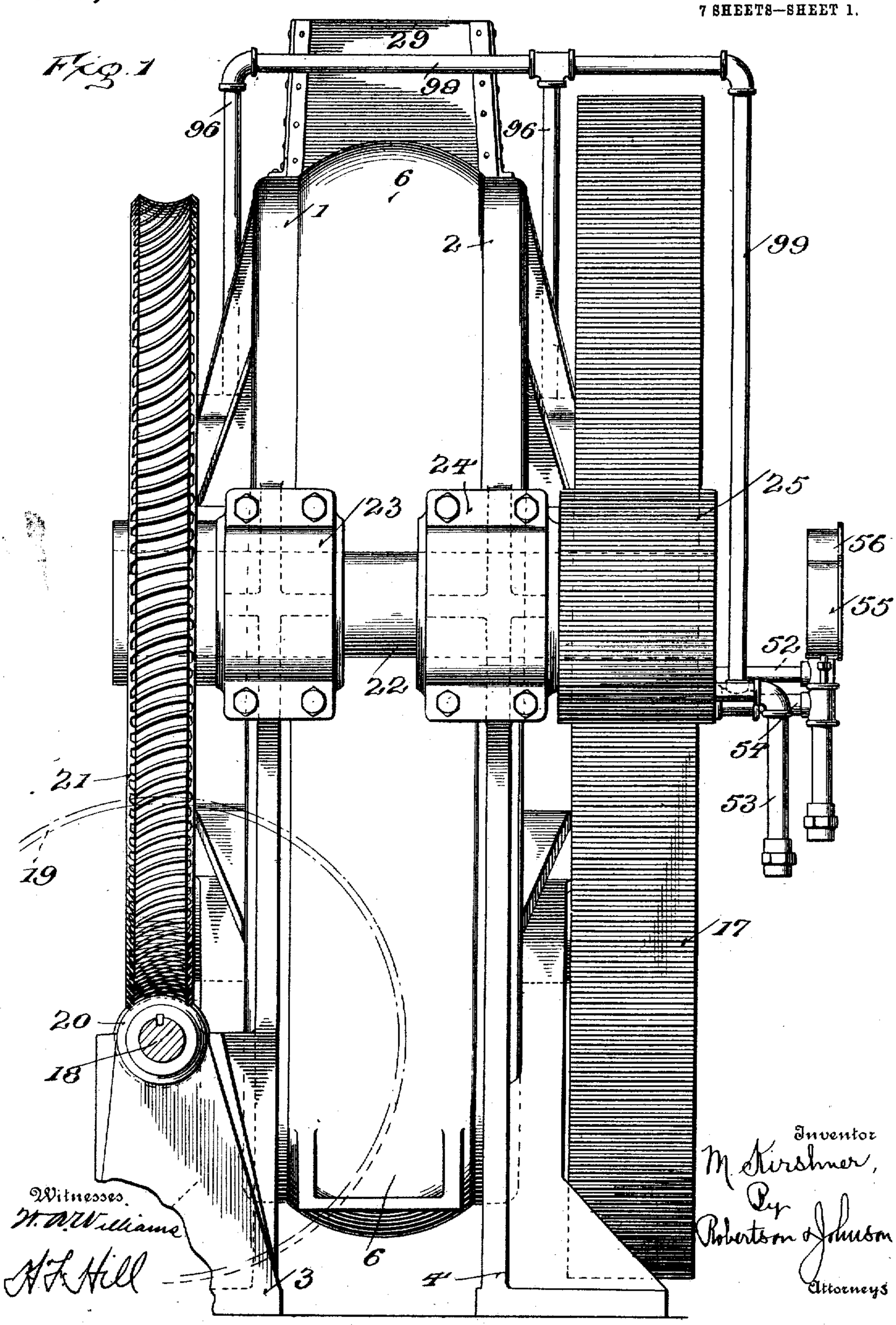
APPLICATION FILED FEB. 12, 1908.

945,549.

Patented Jan. 4, 1910.

7 SHEETS—SHEET 1.

Fig. 1



Witnesses.

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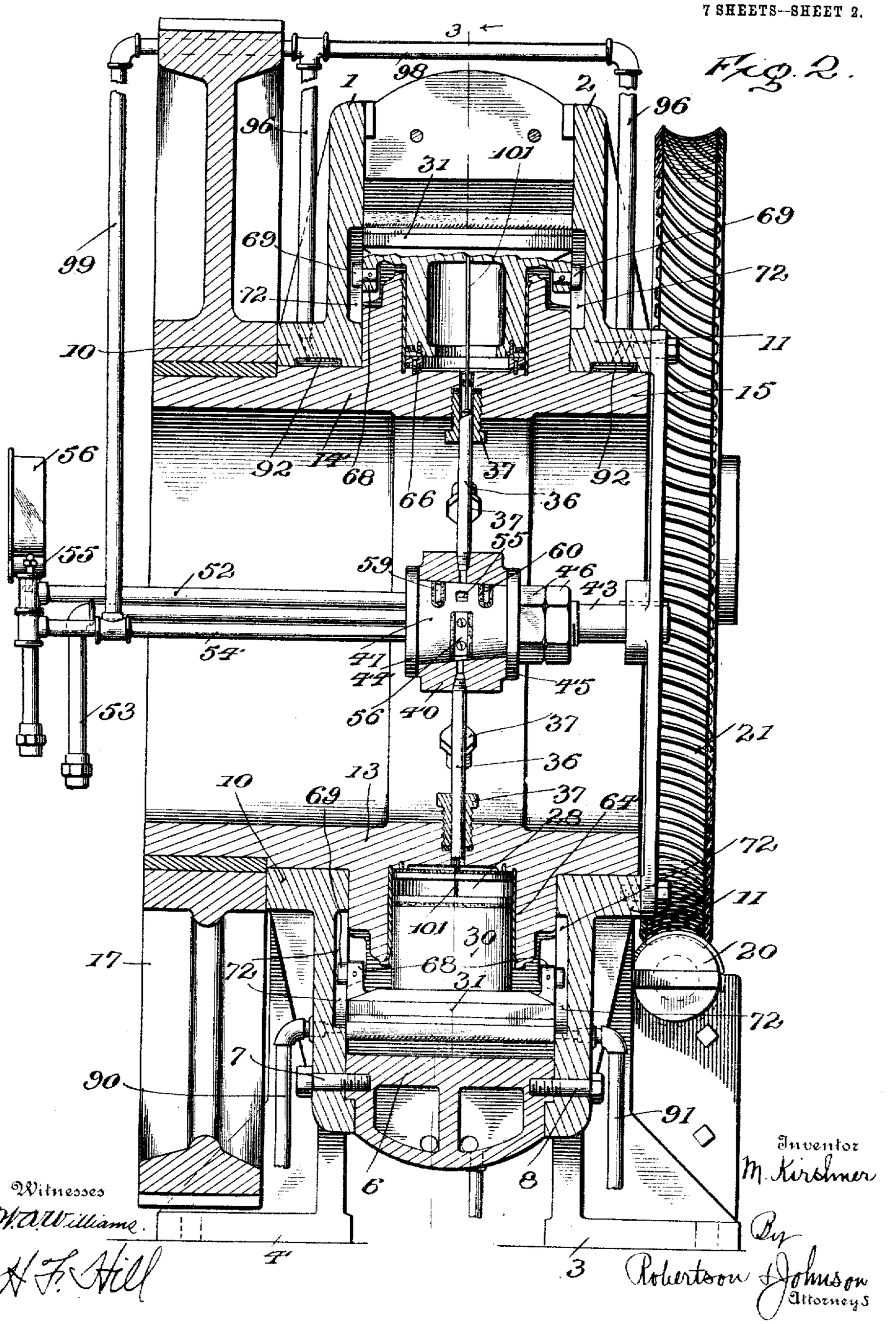
7 SHEETS—SHEET 2.

Fig. 2.



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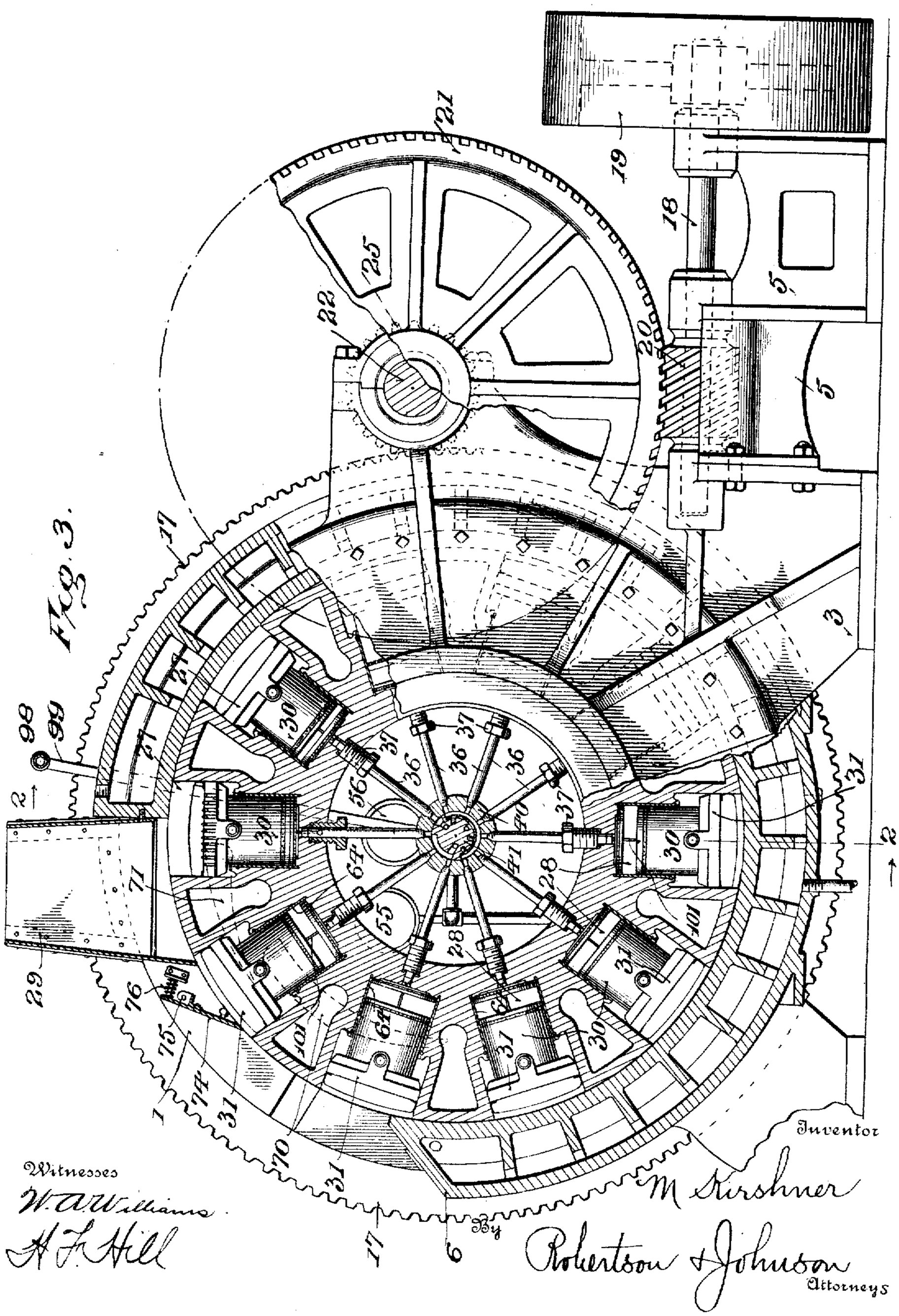

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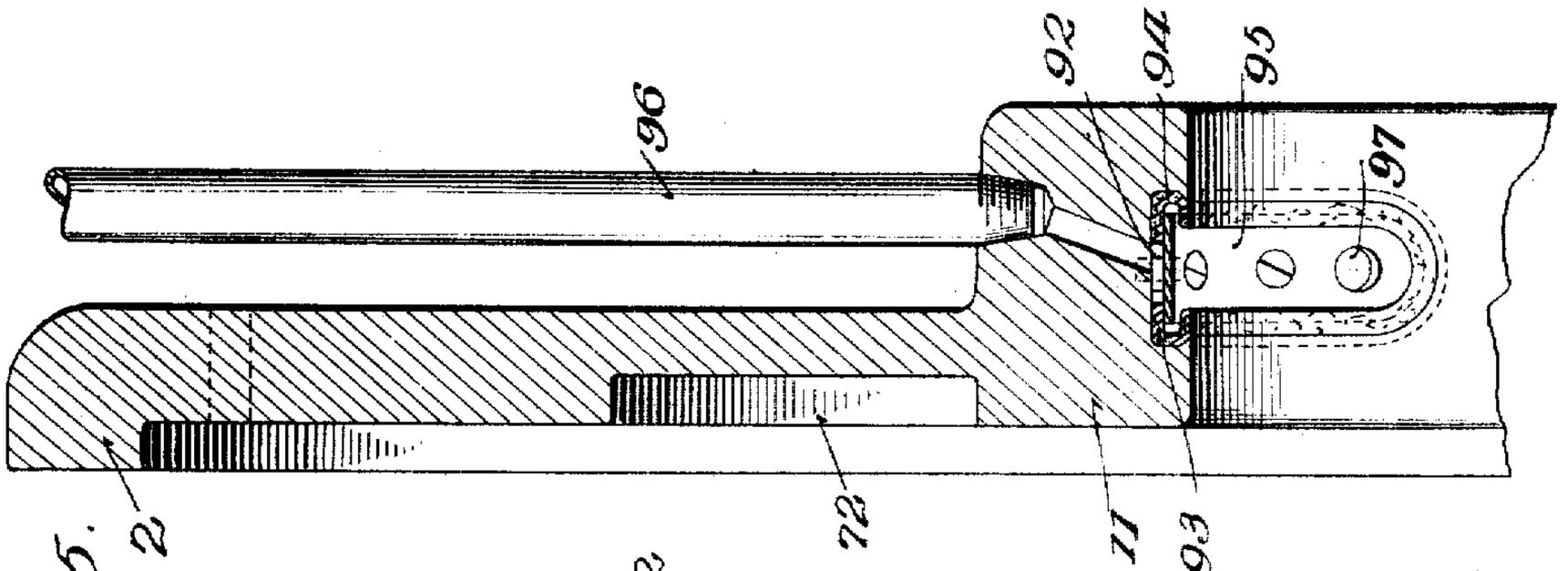

Fig. 5.

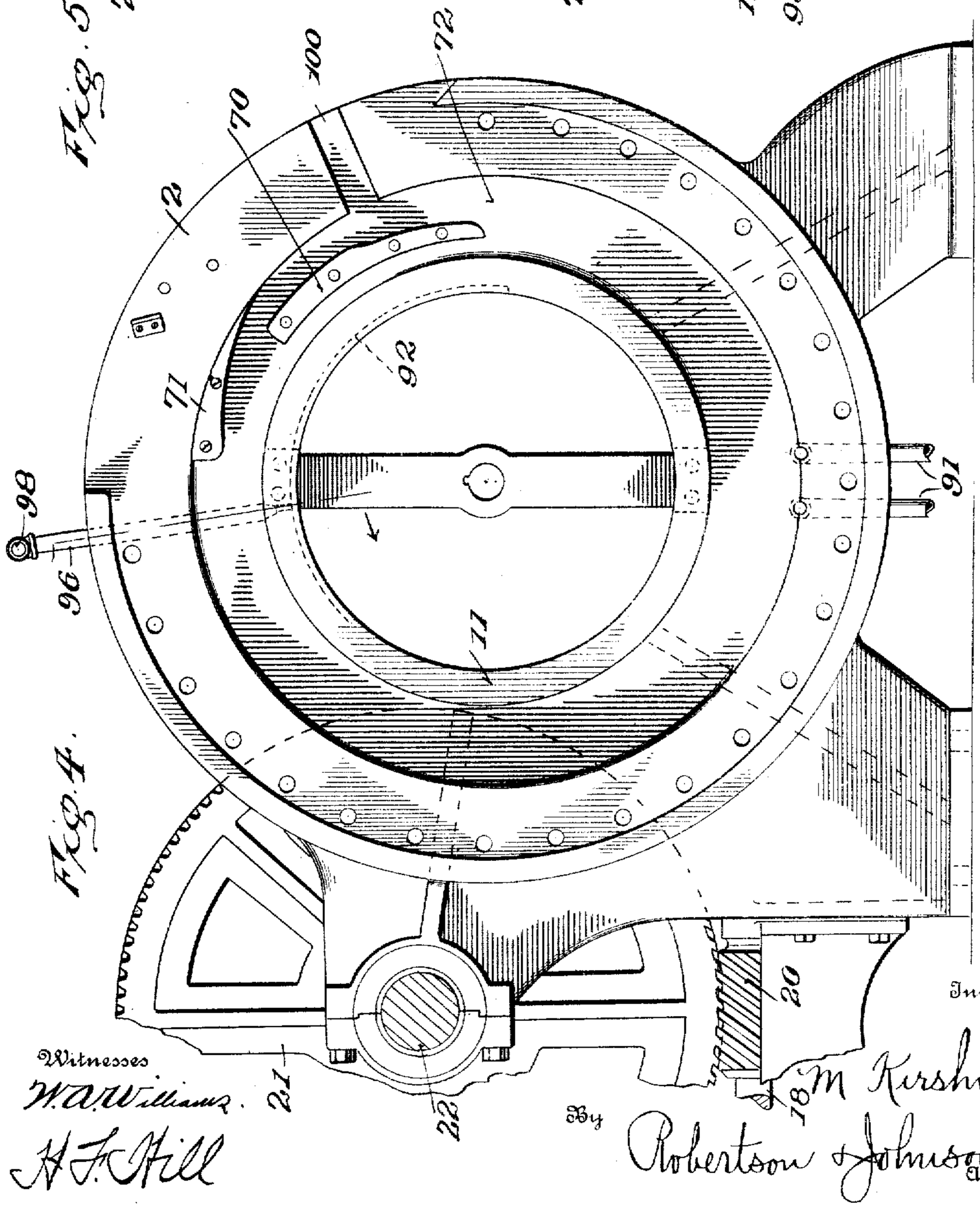

Fig. 4.

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7 SHEETS—SHEET 5.

Fig. 6.

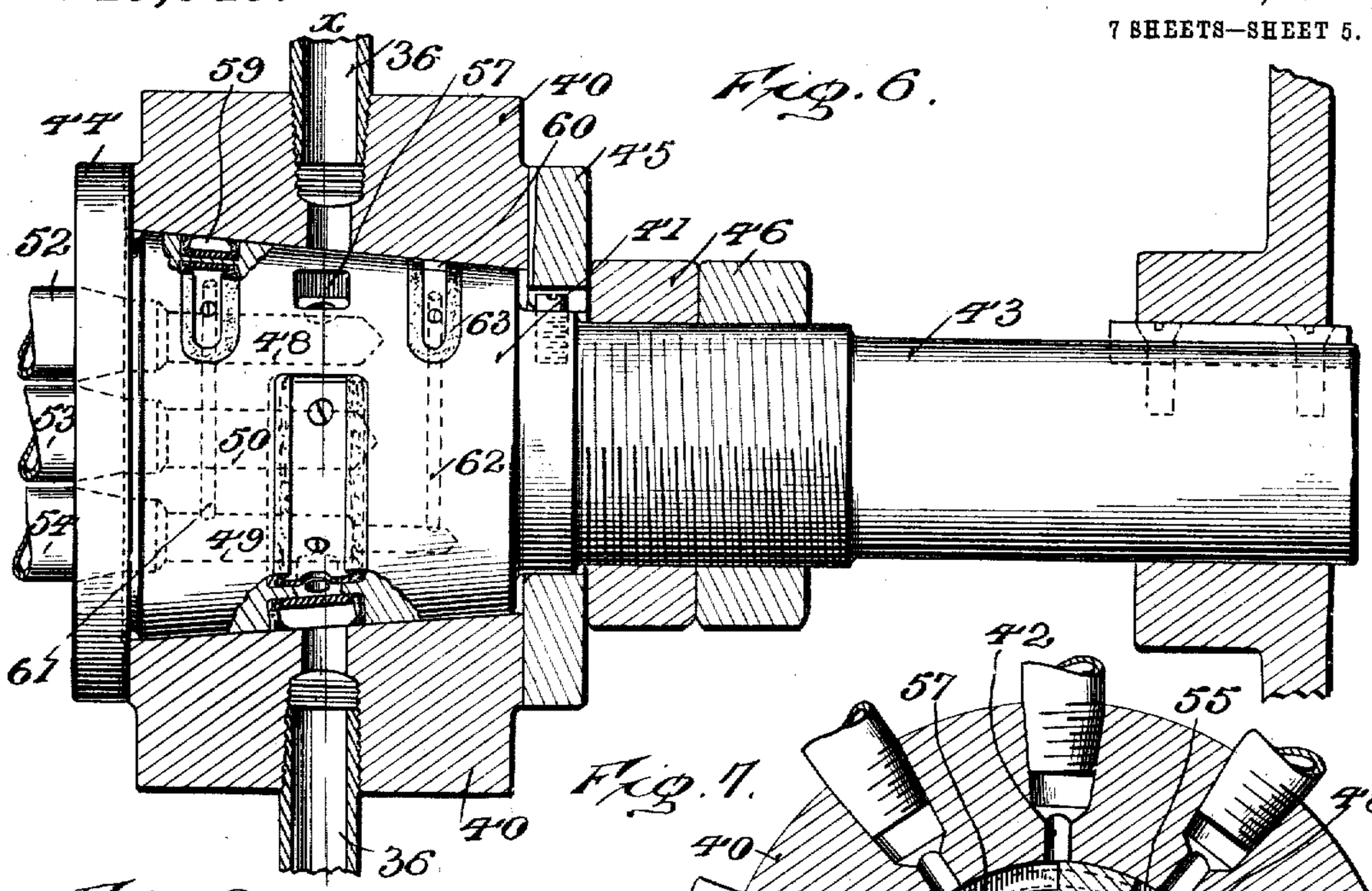


Fig. 8. x

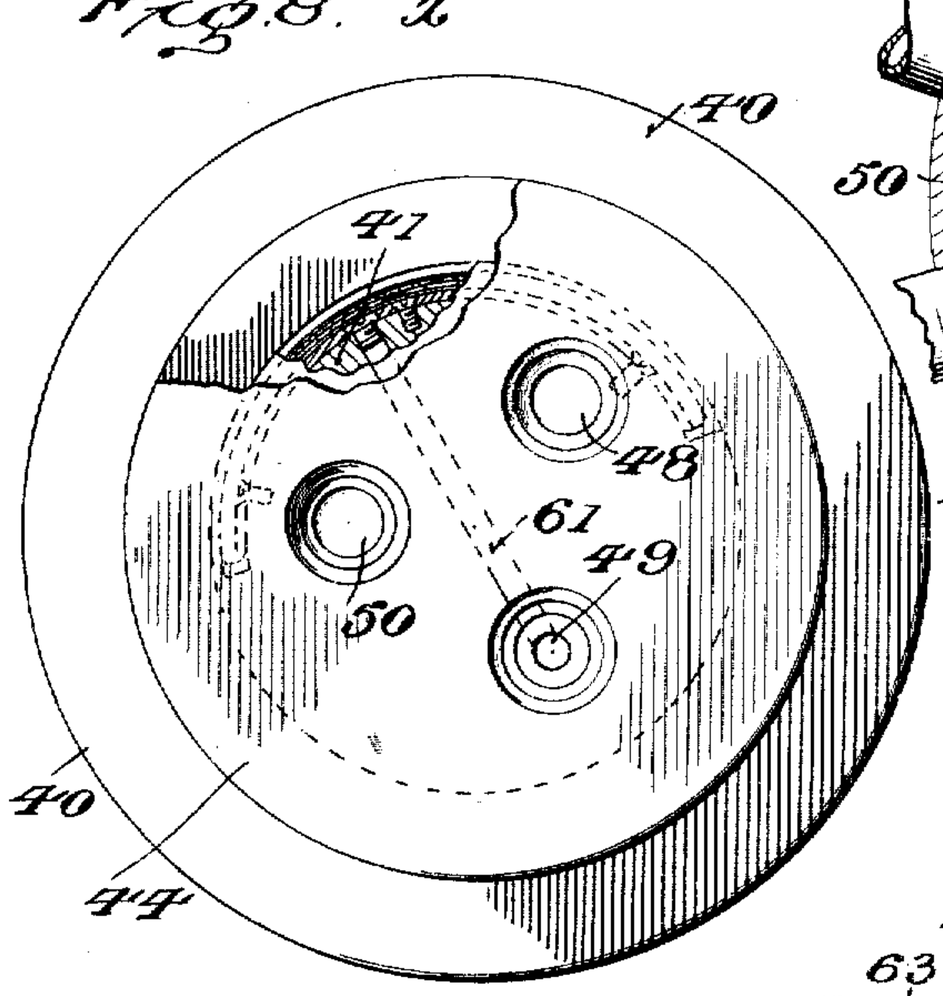


Fig. 7.

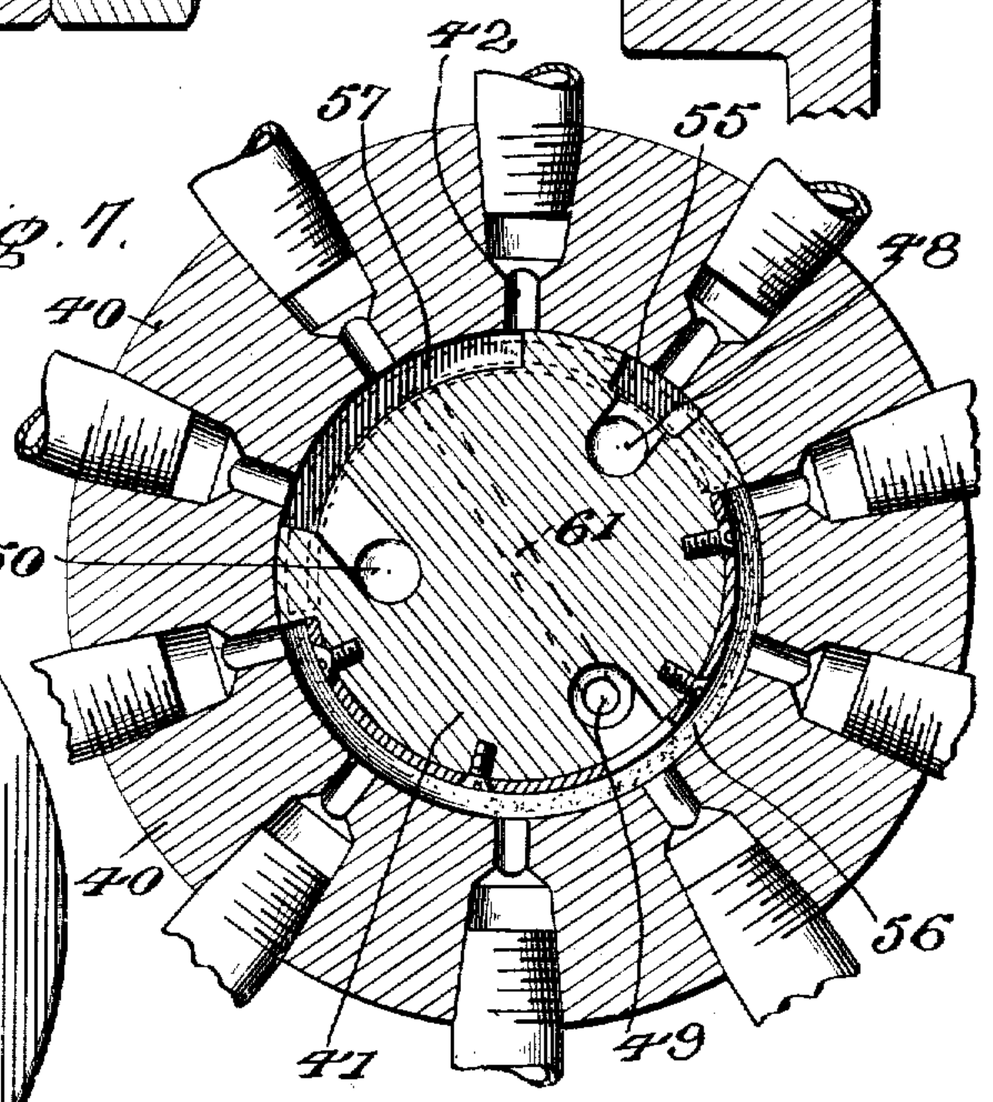
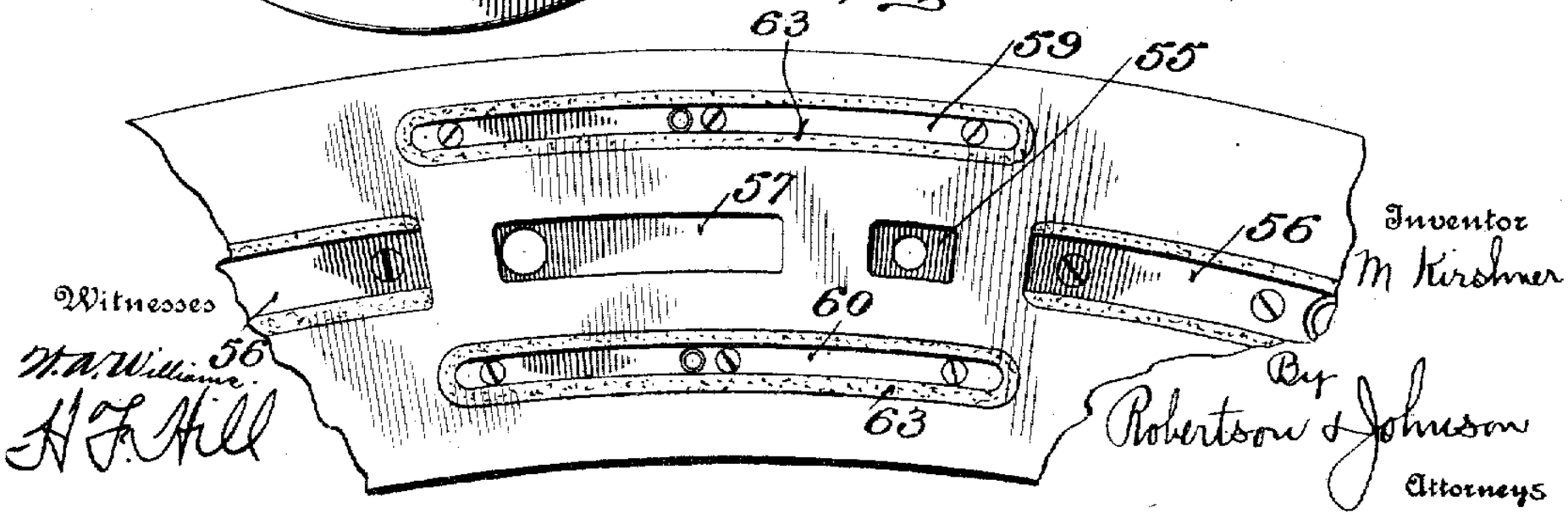


Fig. 9.



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7 SHEETS—SHEET 6.

Fig. 10.

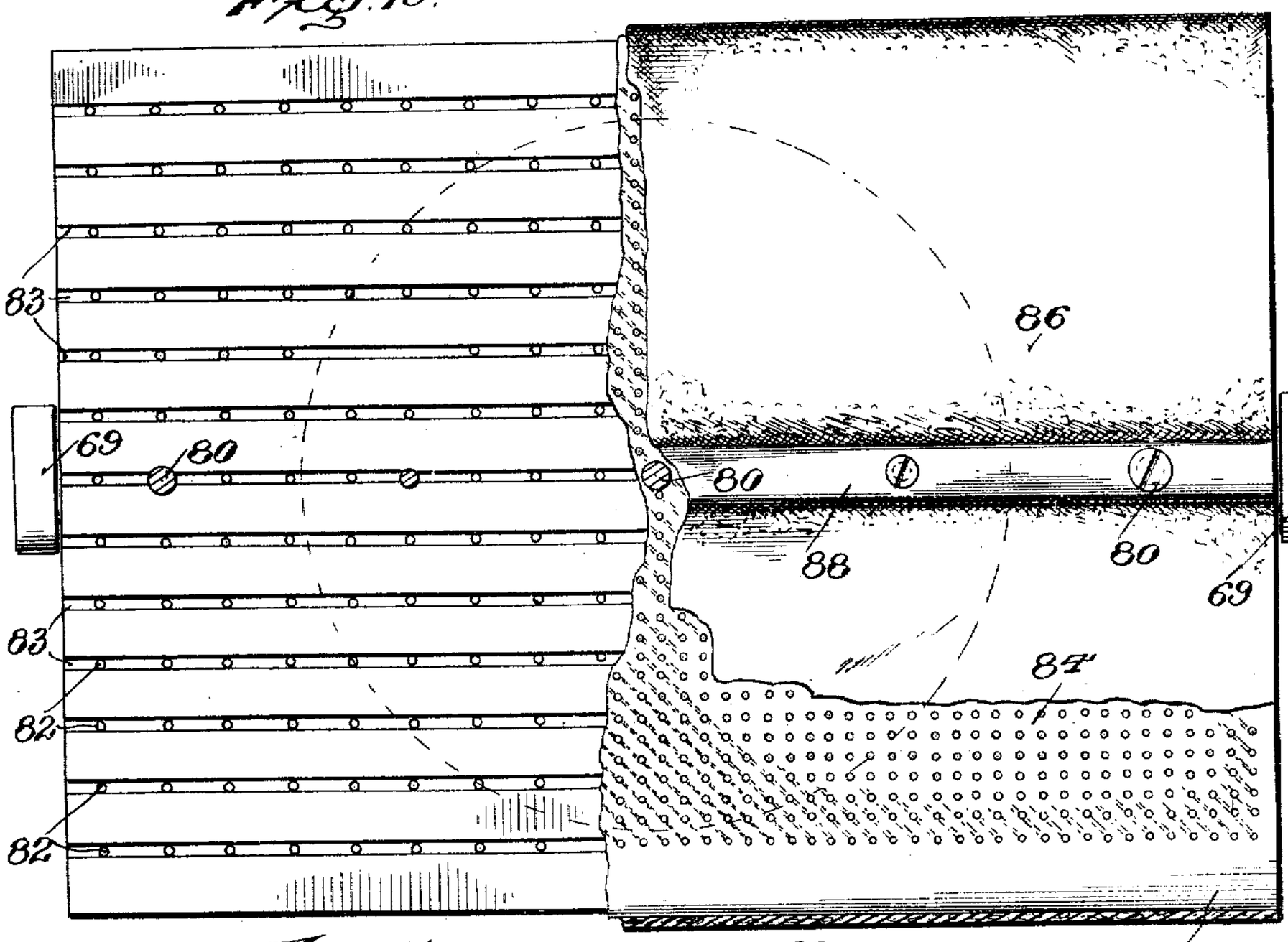
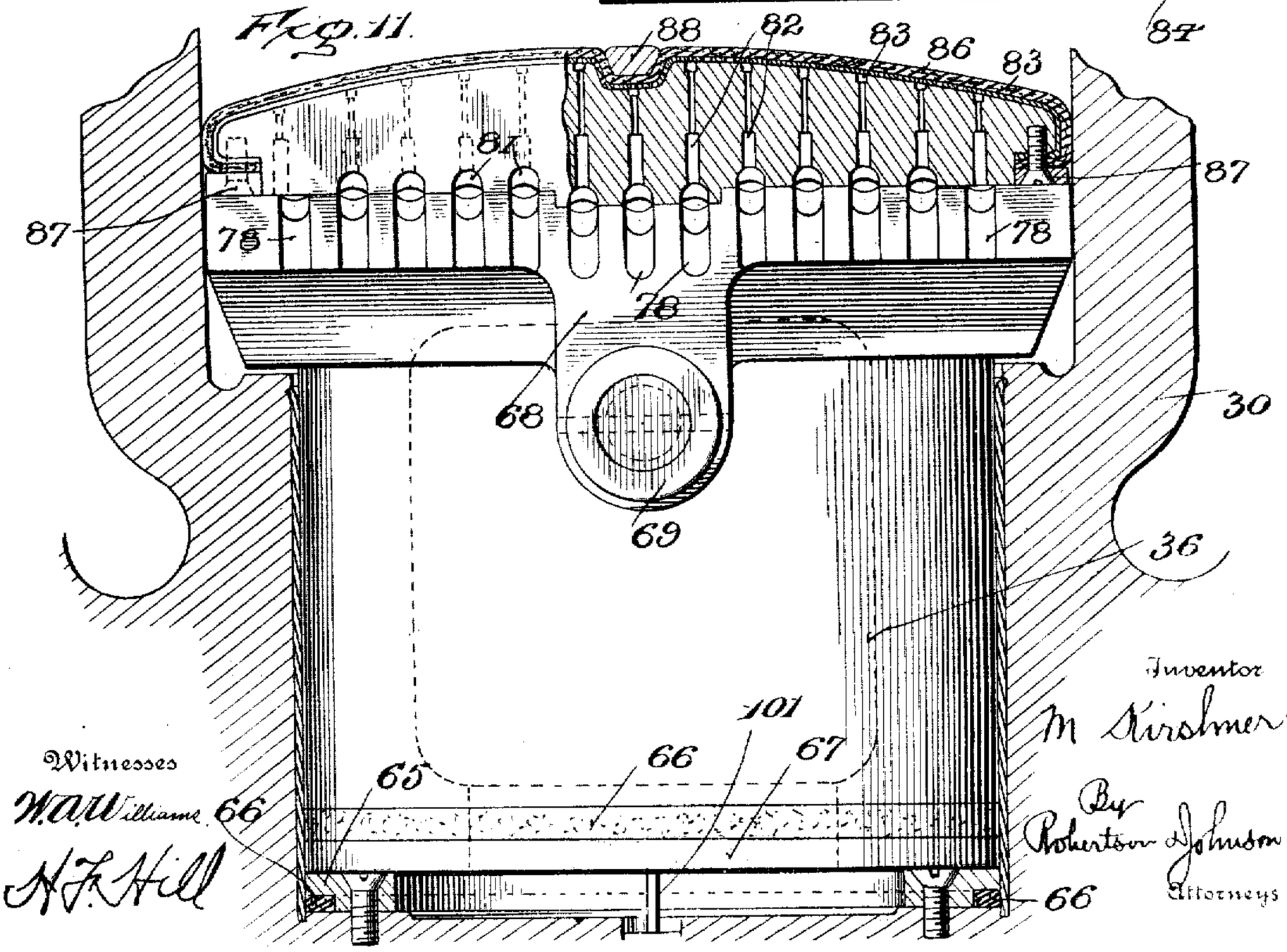


Fig. 11.



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7 SHEETS—SHEET 7.

Fig. 12.

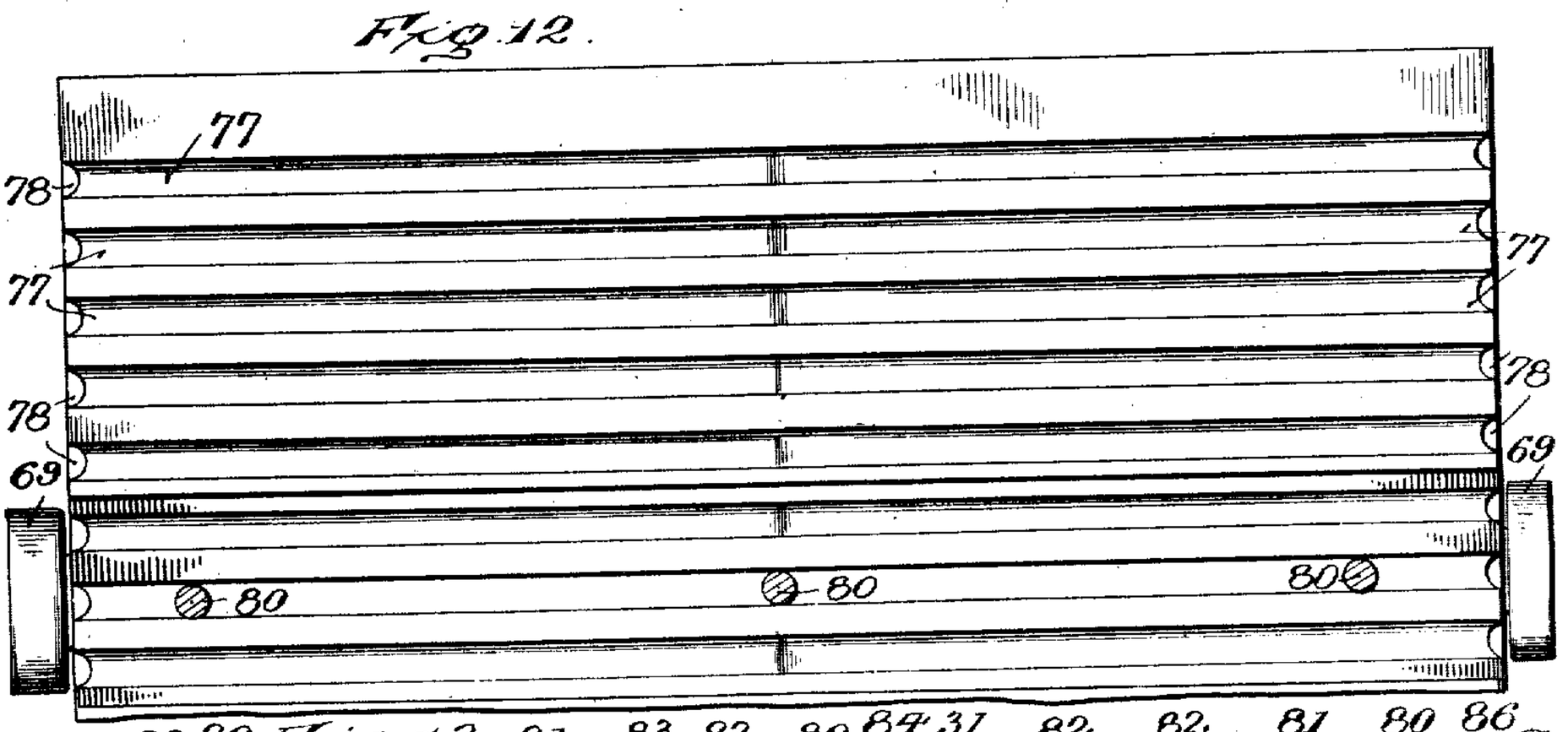
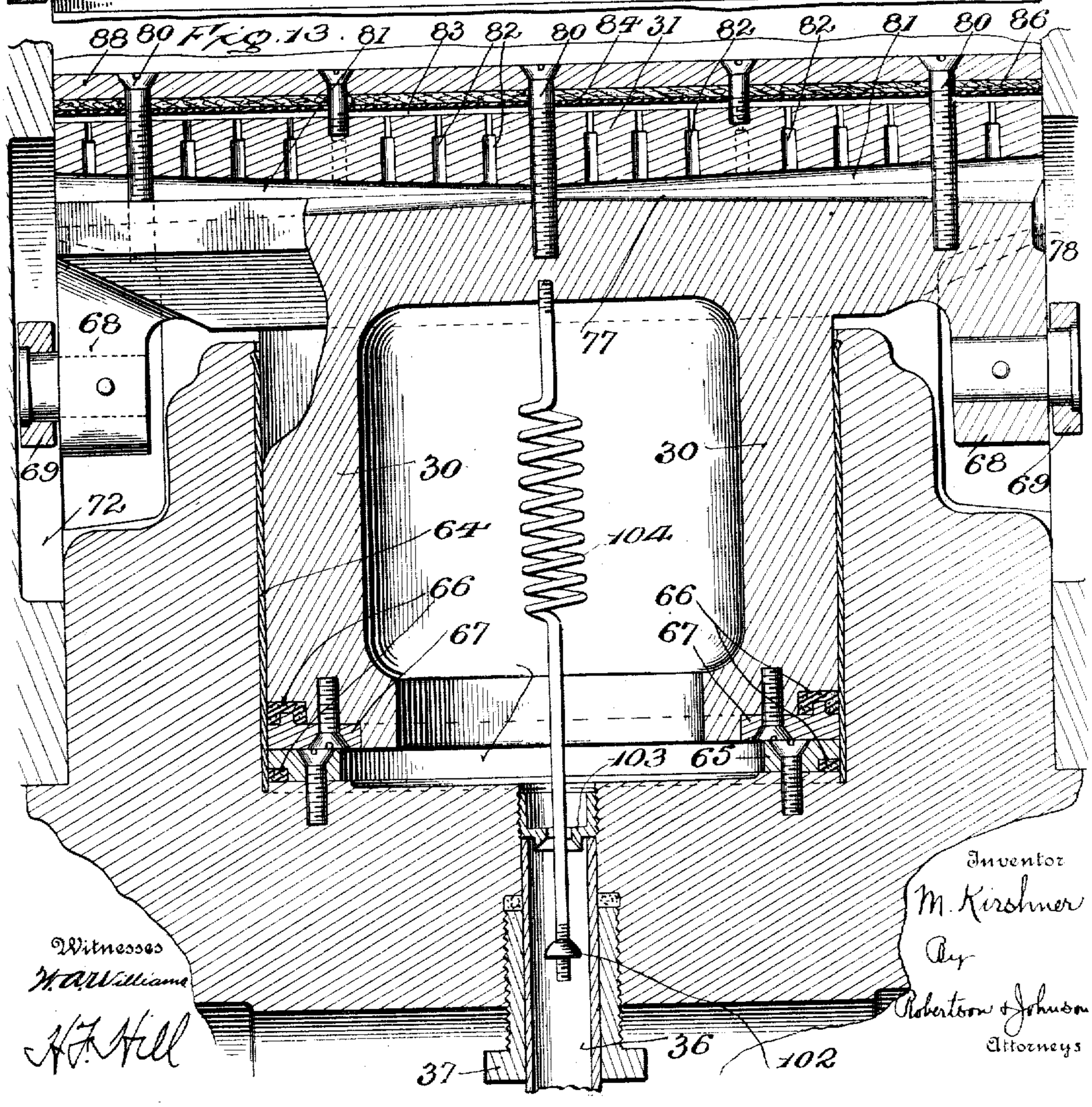


Fig. 13.



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UNITED STATES PATENT OFFICE.

MICHAEL KIRSHNER, OF LYNCHBURG, VIRGINIA, ASSIGNOR TO KIRSHNER ROTARY OIL PRESS CORPORATION, OF LYNCHBURG, VIRGINIA, A CORPORATION OF VIRGINIA.

APPARATUS FOR EXTRACTING OILS.

945,549. Specification of Letters Patent. Patented Jan. 4, 1910.

Application filed February 12, 1908. Serial No. 415,603.

To all whom it may concern:

Be it known that I, MICHAEL KIRSHNER, of Lynchburg, in the county of Campbell and State of Virginia, have invented certain new and useful Improvements in Apparatus for Extracting Oils, of which the following is a specification.

This invention relates to certain new and useful improvements in apparatus for extracting oil from cotton-seed or other matter containing oil, and one of the objects of the invention is to produce a machine of this character, operative by hydraulic means, of somewhat similar structure to the apparatus set forth in my U. S. Patent No. 761,686, granted June 7, 1904.

A further object is to provide a press which through the aid of rotating hydraulic cylinders will operate continuously, the material being automatically fed, and automatically compressed hydraulically so as to produce a continuous stream of oil, and the material automatically ejected ready to again receive a further charge as the press operates continuously.

In the preferred embodiment of my invention, as illustrated in the accompanying drawings, the machine is of rotary character and receives the material into various pockets in a revolving drum and through the aid of plungers which are automatically operated by hydraulic means, the material is compressed into a hardened cake, and the oil is squeezed therefrom, the oil being delivered into a receptacle, and the cakes discharged and carried away by any desirable means, the whole press operating continuously.

With this brief statement, my invention may be said to consist in the apparatus shown in its preferable, though not necessary, embodiment in the accompanying drawings and then hereinafter more particularly described and claimed.

In the aforesaid drawings: Figure 1 is an end elevation of a machine constructed in accordance with my invention. Fig. 2 is a vertical central section of the same on line 2—2 of Fig. 3. Fig. 3 is a side elevation with parts in section on line 3— of Fig. 2. Fig. 4 is an interior view of one of the side frames and its connected parts. Fig. 5 is a detail on a much enlarged scale of a portion of one of the side frames. Fig. 6 is a section through the central valve mechanism drawn on an enlarged scale. Fig. 7 is a cross section through the line *x*—*x* of Fig. 6. Fig. 8 is an end elevation, partly broken away, of the structure shown in Figs. 6 and 7. Fig. 9 is a diagrammatic view of a part of the periphery of the valve. Fig. 10 is a top plan view of one of the plungers and its shoe, the latter being partly broken away. Fig. 11 is a vertical section of the plunger, its shoe, and coacting parts. Fig. 12 is a plan view of one of the plungers. Fig. 13 is an enlarged view of the plunger, its shoe and coacting parts taken at right angles to that shown in Fig. 11.

Referring now to the details of the drawings by numerals: 1 and 2 represent a pair of side frames which are supported on two bases 3 and 4 formed on or connected therewith and which may be of any desired construction. Between these side frames 1 and 2 is located a casing 6 preferably of cylindrical form which is illustrated in elevation in Fig. 1 and in section in Figs. 2 and 3, this casing being bolted to the side frames as shown at 7 and 8. The said casing does not extend entirely around the space included by said frames 1 and 2, but as illustrated in Fig. 3 it has a gap or opening of, possibly, about one-fourth of its circumference for a purpose to be hereinafter described. The aforesaid side frames 1 and 2 are provided with annular rims 10 and 11 forming bearings within which is rotatably supported a hollow drum 13 as clearly seen in Fig. 2. This drum is provided with annular extensions 14 and 15 which extend on opposite sides thereof and fit within the aforesaid bearings 10 and 11 of the side frames; and the extension 14 is made somewhat larger than its companion extension 15 in order to have secured to it a large gear 17 by which the hollow drum 13 is rotated. In order to rotate the aforesaid hollow drum 13, I employ a main shaft suitably journaled in an extension 5 of base 3 and to which power may be applied by a suitable pulley 19. A worm 20 is keyed to this main shaft 18 and this worm drives a large worm wheel 21 fixed to an intermediate shaft 22 which is supported by bearings 23 and 24 bolted to the side frames 1 and 2 as clearly seen in Fig. 1. Upon the opposite end of this intermediate shaft 22 is secured a gear 25 of

smaller size relatively to the large gear 17 before referred to and this gear 25 meshes with and drives the large gear 17 hereinbefore mentioned. The result of power being applied to the belt pulley 19 is that the main shaft 18, through its worm 20, drives the worm-wheel 21, which in turn through the shaft 22 drives gear 25, and this gear 25 meshing with the larger gear 17, rotates the hollow drum 13 in its bearings supported by the side frames 1 and 2.

The aforesaid hollow drum 13 is formed with a plurality of radial pockets or openings 27 as clearly seen in Fig. 3; these pockets opening toward the periphery of the drum so that they may be filled by gravity as they pass under a hopper 29 as will be hereinafter described. Each pocket is preferably provided with a hydraulic cylinder 28 as clearly seen in Figs. 3 and 11, and an operating plunger 30 works in each cylinder and a shoe 31 connected with said plunger works in each pocket. The inner end of each cylinder 28 is connected by means of a pipe 36, entering through a stuffing box 37, with a valve casing 40 within which is located a stationary valve 41. It is to be understood that there are as many pipes 36 leading from the valve casing 40 to the cylinders 27 as there are cylinders and plungers and that the valve 41 is intended to connect the cylinders with a source of hydraulic supply, as oil, in order that the plungers may be operated hydraulically therein. The valve 41 is shown on a larger scale in Figs. 6 to 9 and as there shown it comprises the valve proper 41 connected to a spindle 43 and around the valve is rotatably supported the aforesaid valve casing 40, which rotates between two heads 44 and 45, the latter of which is adjustably held in position by nuts 46. Valve 41 is tapering and, as it wears, it may be removed and either the flat surface of the head 44 or the valve casing may be reground as necessary to permit the valve to make a tight fit when it is again secured in position by the nuts 46. Valve 41 has two inlets and an exhaust shown in dotted lines in Fig. 6 and in full lines in Fig. 8; the inlets being designated 48 and 49 and the exhaust 50. These inlets are connected with a source of supply by pipes 52 and 53 shown in Fig. 6, the two inlets being connected with suitable pressure gages shown at 55 and 56 in Figs. 1 and 2, and the exhaust is connected to an exhaust pipe 54. The pipe 52 is connected with a source of low pressure and pipe 53 with high pressure which may be as high as 4000 pounds, and the construction of the valve is such that when pipe 52 and its port 48 connect with any of the pipes 36 the plunger 30 is forced outward by low pressure while when the parts rotate so that pipe 54 and port 49 connect with any of the pipes 36 the plunger is forced out under high pressure; on the other hand when the rotation of the parts brings pipe 36 opposite port 50 the hydraulic means (the oil) exhausts. To this end the ports 48, 49 and 50 are connected with peripheral ports 55, 56 and 57 which are so located, (see Figs. 6 and 7) as to respectively connect the hydraulic means with the pipes 36 leading to the hydraulic cylinders 28 as the valve casing 40 rotates around the valve.

Inasmuch as the pressure through port 55 is low and the pressure in port 56 is very high, and the pressure in the port 57 is only such as is due to the passage of the oil to the exhaust, it is necessary to balance the valve from the side opposite the high pressure peripheral port 56. I accomplish this by providing two peripheral side ports 59 and 60 which are on either side of the exhaust 57 (see Figs. 6 and 9) these two ports 59 and 60 being connected by means of two small ports 61 and 62 with high pressure port 49 shown by dotted lines in Fig. 6 so that the oil from said high pressure port 49 is not only fed to the peripheral port 56 on one side of the valve but is also fed to the peripheral ports 59 and 60 on the opposite side of the valve 41, thereby balancing the pressure. Of course, suitable stuffing material 63 is provided entirely around these smaller ports 59 and 60, as clearly shown in Figs. 6 and 9, and which will be more particularly hereinafter described.

The oil, or other hydraulic means, under comparatively low pressure from port 48 or under high pressure from port 49 as the peripheral ports 55 and 56 in turn feed the oil through the pipes or tubes 36, acts upon the plungers contained in the cylinders formed in the hollow drum 13 and forces them outward and I shall, therefore, now describe the action of the said plungers. I may first state that, as illustrated in Fig. 3, I use ten plungers whose cylinders are connected by ten pipes or tubes 36 with the aforesaid valve casing 40, the construction being such that the hollow drum 13 and its cylinders and contained plungers together with the ten pipes or tubes 36 and the valve casing 40 rotate around the stationary valve 41 by means of the gearing hereinbefore described; the strain of all of said parts, however, being taken off the valve 41 because of the fact the drum 36 as before described is provided with extensions 14 and 15 which find bearings in the annular rims of the side frames 1 and 2. Two of the cylinders in the hollow drum together with the plungers, etc., are very clearly shown in section in Fig. 2 are again shown on a larger scale in Figs. 11 and 13. By referring to these figures it will be seen that the pipes or tubes 36 lead into the cylinders 28 each of which is provided with a lining 64 and with a ring 65 to hold packing 66 in place. Each plun-

ger is provided with a cylindrical body 30 fitting within the lining 64 and is also provided with a ring 67 to hold in place the packing 66. The plunger 30, above its cylindrical port is broadened out to extend to the full width of the pocket 27 and each end of the plunger is provided with downward extensions 68 to which are journaled antifriction rollers 69. These rollers are for the purpose of contacting with cams 70 and 71 formed within annular pockets 72 in the face plates 1 and 2; the construction being such that when the pockets of the drum 13 pass under the hopper 29 the material to be compressed is fed by gravity into the pockets at a time when the plunger is at the bottom of the pocket. As the hollow drum 13 rotates, the open end of the pocket 27 finally passes beyond and is closed by the inner wall of the casing 6. As the hollow drum continues to rotate that pipe 36 which connects the particular pocket which has just been filled passes over the peripheral port 55, thus affording communication with the low pressure port 48 and permitting the oil to reach the cylinder 28 and thus its plunger 30 is forced outward therein, giving a preliminary compression and taking up the loose expansion of the material. As the hollow drum continues to rotate, the following pocket is filled with the material and, the drum and its cylinders continuing to rotate, the pocket which has just been described as connecting with the low pressure port 50 reaches the point where the low pressure is cut off and where its tube or pipe 36 is brought into communication with the long peripheral port 56 and thus the oil under high pressure from port 49 flows through the port 56 into the cylinder 28 and the plunger 30 is forced outward at the high pressure which I prefer to make, as stated, at 4000 pounds. As the hollow drum continues its rotation the remaining pockets are filled and the pockets are kept under low pressure or high pressure according to which peripheral port the pipes 36 communicate with, until the one which has been the first referred to almost reaches the gap or opening in casing 6 illustrated in Fig. 3. Just before it reaches this point, its pipe 36 passes out of communication with the long peripheral port 56 and the pressure of the oil therefore is cut off. The oil, however, as soon as the pipe 23 communicates with the port 57 passes through the exhaust port 50 and out of the exhaust pipe 53. The continued rotation of the drum brings the pocket exposed through the gap or opening shown in Fig. 3 and at this point the rollers 69 which have been referred to as located on the ends of the downward extensions 68 of the plungers 30, contact with the upper or outer surface of the cams 70 shown in full lines at Fig. 4 and in dotted lines in Fig. 3. As the rollers ride upon these cams 70 the plunger is gently forced outward and the compressed cake is projected out of its pocket 27 and ejected by means of the spring supported scraper 74 shown at Fig. 3. This scraper is pivoted at 75 and its rear end is supported by a spring 76 shown in Fig. 3. After the cake is ejected the rollers 69 on the ends of the plunger ride underneath the cams 71 shown in full lines in Fig. 4 and in dotted lines in Fig. 3 and thus the plunger is returned to its lower position, as it passes under the hopper to be refilled, the pipe 36 passing out of communication with the exhaust at the time the pocket is completely filled.

The details of the plunger are clearly shown in Figs. 10 to 13 and may be described as follows: The upper surface of each plunger 30 is formed with a series of grooves 77 which run longitudinally of the shoe and are inclined downward from the center on each side. At the extreme ends of the shoe there are vertical grooves 78 running into these grooves 77. Each plunger has a shoe 31 secured to it by means of the screws 80 shown in Figs. 12 and 13 and each shoe is provided with grooves 81 similar to the grooves 77 in the top of the shoe, except that these grooves run in opposite direction so that the space afforded by the combined grooves 77 and 81 is increasingly larger from the center outward thus providing a gradual carrying capacity according to the needs of the device. Each shoe is also provided with a large number of vertical perforations or passages 82 which connect the grooves 81 with small grooves 83 formed in the top of the shoe as clearly shown in Fig. 10. Over the top of this shoe is secured a plate 84 which is not only perforated but also has a series of fine grooves connecting the perforations which grooves are diagonally shown by dotted lines at Fig. 10. Over this plate 84 which is grooved as seen in Fig. 11 is secured a hair-cloth covering 86 whose ends are underturned as shown in Fig. 11 and supported by means of screws 87; (see Fig. 11). This hair-cloth covering is also secured in position by having its center inserted in a longitudinal groove in the shoe 31 and held there by an adjusting bar 88 shown in Figs. 10 and 13. The construction just described is such that when the plungers and their shoes are forced outward in their pockets, the cotton-seed or other material is pressed into a cake between the hair-cloth covering 86 and the inner periphery of the casing 6 and the oil which is squeezed from the material in the compression passes through the hair-cloth covering, going through the perforations in the plates 84 and following the diagonal grooves shown in dotted lines in Fig. 10 and entering the longitudinal grooves at 83 in the

upper surface of the shoe. Through these grooves the oil which has been squeezed from the material passes downward from the perforations or passages 82 and enters the space formed by the grooves 77 and 81 in the top and bottom, respectively, of the plunger and its shoe. The oil gradually flows to the opposite sides of the shoes and from thence passes downward through the grooves 78 into the annular space 72 formed in the interior of the side frames 1 and 2. The oil naturally follows this passage until it reaches the bottom and is drained therefrom by the drain pipes 90 and 91, which are shown on opposite sides of Fig. 2 as connecting with the bottom. Inasmuch as the grooves 77 and 81 incline in opposite directions, the oil may flow toward the annular passage 72 in the grooves 77 when the plungers are above the center of the machine, and in the grooves 81 when the plungers are rotated so that they are below the center of the machine.

I have hereinbefore referred to the fact that the pressure on one side of the valve 41 is balanced because pressure is produced in the peripheral port 57, and I also balance the pressure on the main bearing of the hollow drum 13. To this end I form grooves 92 in the interior of the annular rims 10 and 11 as shown in Figs. 2 and 5 and within these grooves I place packing strips 93 and 94 which are held in place by means of a plate 95 which is screwed to the inner wall of the groove and clamps the packing in position. The fluid pressure is fed to the groove by means of pipes 96 which enter on one side of the plates 94, the plates being perforated as shown at 97 to admit the fluid through the plate against the extensions 14 and 15 of the hollow drum 13. This same arrangement for securing the packing in position is used on the valve 41 as shown in Figs. 6 to 9. The aforesaid pipes are connected with the high pressure pipe 54 by means of the pipes 98 and 99 as clearly shown in Fig. 2.

In connection with the valve it should be stated that as illustrated in Fig. 9, the balancing peripheral ports 57 are on either side of the low pressure peripheral port 55 and the exhaust 57 and that, as illustrated in Fig. 7, the peripheral port 56 occupies almost all of the periphery from the peripheral port 55 around to the exhaust port 57. The high pressure peripheral port 56 and the high pressure balancing port 57 are provided with a packing as illustrated in said Fig. 9.

By referring to Fig. 4, it will be seen that the side frames are each provided with a radial slot 100 which slots are for the purpose of permitting of the easy removal of the plungers and their shoes, the rollers of the shoes passing into the slots 100 as the plungers and shoes are withdrawn.

In order to prevent the plungers 30 from being forced out against the outer casing when the press is first started and when no charge is contained in the compression chambers, I prefer to employ mechanism as follows: To each plunger I connect a stem 101, which projects downward and has formed on or connected to it a check valve 102 of hemi-spherical shape which, when the plunger 30 is at the extreme limit of its stroke, closes against its seat 103 so as to prevent the plunger being forced farther outward. Or instead of using a spindle of the character shown in Fig. 2, the spindle may comprise a spring 104 as indicated in Fig. 13 this being arranged to close the valve 102 when the plunger is within one-eighth of an inch of the outer casing, the spring permitting the cams 70 to act upon the rollers and move the plungers outward the remaining fraction of an inch to permit the cake to be ejected.

In the detailed description of the various parts I have given such a full description of the operation of my apparatus that it is believed further description of the operation is unnecessary.

What I claim as my invention is:—

1. In a device of the character described, a rotatable member having a series of compression chambers opening toward the periphery and a series of hydraulic cylinders communicating with said compression chambers, means for feeding material to said chambers, means for connecting hydraulic pressure with said cylinders as they rotate, plungers operating in said cylinders and arranged as they are operated by said hydraulic pressure to compress the material in said chambers, and means for collecting the oil compressed from the material in said chambers.

2. In a device of the character described, a rotatable member having a series of compression chambers opening toward the periphery and a series of hydraulic cylinders communicating with said compression chambers, plungers in said cylinders, shoes supported by said plungers and operating in said compression chambers, means for feeding material to said chambers, means for connecting hydraulic pressure with said cylinders as they rotate, and means for collecting the oil expressed from the material fed to said compression chambers whereby as the rotatable member and its compression chambers and hydraulic cylinders rotate, the material is received, compressed by hydraulic means, discharged, and the oil is conveyed therefrom in a continuous stream.

3. In a device of the character described, a rotatable member having a series of compression chambers opening toward the periphery and a series of hydraulic cylinders arranged radially, means for feeding material to said chambers, and means for con-

necting said cylinders with hydraulic pressure, said means comprising low pressure, high pressure and exhaust respectively as the member and its cylinders rotate.

4. In a device of the character described, a rotatable member having a series of compression chambers opening toward the periphery and a series of hydraulic cylinders arranged radially, means for feeding material to said chambers, and a single valve connecting low pressure, high pressure and exhaust respectively with said cylinders as they rotate.

5. In a device of the character described, a rotatable member having a series of compression chambers opening toward the periphery and a series of hydraulic cylinders arranged radially, means for feeding material to said chambers, and valve mechanism located within said rotatable member and having ports connecting low pressure, high pressure and exhaust respectively with said cylinders as the rotatable member and its cylinders rotate around said valve mechanism.

6. In a device of the character described, a supporting member having a series of compression chambers and a series of hydraulic cylinders, means for feeding material to said chambers, and valve mechanism located within said rotatable member and having ports connecting low pressure, high pressure and exhaust respectively with said cylinders.

7. In a device of the character described, a rotatable member having a series of compression chambers, a series of hydraulic cylinders also arranged in said rotatable member and arranged radially, means for feeding material to said chambers, and a valve located within said rotatable member and having ports connecting low pressure, high pressure and exhaust respectively with said cylinders as said rotatable member and cylinders rotate.

8. In a device of the character described, a rotatable member having a series of compression chambers opening toward the periphery and a series of hydraulic cylinders, a hopper located above said rotatable member for feeding material to its compression chambers as they rotate by the hopper, and means for connecting low pressure, high pressure and exhaust respectively with said cylinders as the rotatable member and its cylinders rotate.

9. In a device of the character described, a supporting member rotatable on a horizontal axis and having a series of compression chambers opening toward the periphery, a series of hydraulic cylinders located in said member, means for feeding material to said chambers as they rotate under said feeding means, and a valve for connecting low pressure, high pressure and exhaust ports respectively with said cylinders as they rotate with their supporting member under said feeding means.

10. In a device of the character described, a rotatable member having a series of compression chambers and a series of hydraulic cylinders, said cylinders being arranged radially, a valve having low pressure, high pressure and exhaust ports, and a valve casing for said valve rotatable with said member and having communication with each of said cylinders and arranged to respectively feed low and high pressure to said cylinders as the rotatable member, its cylinders and the valve casing rotate with respect to said valve.

11. In a device of the character described, a hollow or open rotatable member having a series of compression chambers and a series of hydraulic cylinders, and a valve located within said hollow rotatable member and having communication with each of said cylinders, said valve having low pressure, high pressure and exhaust ports whereby as the hollow rotatable member and its cylinders rotate around said valve, the latter supplies low and high pressure respectively to said cylinders.

12. In a device of the character described, a hollow or open rotatable member having a series of compression chambers opening toward the periphery and a series of radially arranged cylinders, means for feeding material to said compression chambers and a valve located within said hollow member, communicating with said cylinders and having low pressure, high pressure and exhaust ports whereby as the hollow rotatable member and its cylinders rotate around said valve low and high pressure respectively are connected with said cylinders.

13. In a device of the character described, a pair of side frames supporting a casing provided with an opening at one point of its periphery, a rotatable member supported by said side frames and having a series of compression chambers opening toward the periphery, means for feeding material through the opening in the casing to said compression chambers, said rotatable member also having hydraulic cylinders and valve mechanism arranged to respectively connect the low, high pressure and exhaust with said cylinders as the rotatable member and its cylinders rotate.

14. In a device of the character described, a pair of side frames supporting a casing provided with an opening at one point of its periphery, a rotatable member supported by said side frames and having a series of compression chambers opening toward the periphery, means for feeding material through the opening in the casing to said compression chambers, said rotatable member also having hydraulic cylinders and a valve hav-

ing communication with each of said cylinders and having low pressure, high pressure and exhaust ports whereby as the rotatable member and its cylinders move around said valve, low pressure and high pressure are respectively connected with said cylinders and they are then exhausted.

15. In a device of the character described, a rotatable member having a series of compression chambers opening toward the periphery and a series of hydraulic cylinders arranged radially, means for feeding material to said chambers, and a valve connecting low pressure, high pressure and exhaust respectively with said cylinders as they rotate, said valve maintaining the high pressure in connection with each cylinder for a longer period than the low pressure.

16. In a device of the character described, a rotatable member having a series of compression chambers opening toward the periphery and a series of hydraulic cylinders arranged radially, means for feeding material to said chambers, and valve mechanism located within said rotatable member and having ports connecting low pressure, high pressure and exhaust respectively with said cylinders as the rotatable member and its cylinders rotate around said valve mechanism, said valve mechanism maintaining the high pressure in connection with each cylinder for a longer period than the low pressure.

17. In a device of the character described, a rotatable member having a series of compression chambers opening toward the periphery and a series of hydraulic cylinders arranged radially, means for feeding material to said chambers, and a single valve located within said rotatable member and having ports connecting low pressure, high pressure and exhaust respectively with said cylinders as said rotatable member and its cylinders rotate around said valve, and said valve maintaining the high pressure in connection with each cylinder for a longer period than the low pressure.

18. In a device of the character described, a supporting member having a series of compression chambers and a series of hydraulic cylinders, means for feeding material to said chambers, and valve mechanism located within said rotatable member and having ports connecting low pressure, high pressure and exhaust respectively with said cylinders, said valve mechanism maintaining the high pressure in connection with each cylinder for a longer period than the low pressure.

19. In a device of the character described, a supporting member having a series of compression chambers and a series of hydraulic cylinders, means for feeding material to said chambers, and a single valve having ports connecting low pressure, high pressure and exhaust with said cylinders, said valve maintaining the high pressure in connection with each cylinder for a longer period than the low pressure.

20. In a device of the character described, a rotatable member having a series of compression chambers, a series of hydraulic cylinders also arranged in said rotatable member and arranged radially, means for feeding material to said chambers, and a valve located within said rotatable member and having ports connecting low pressure, high pressure and exhaust respectively with said cylinders as said rotatable member and cylinders rotate, said valve maintaining the high pressure in connection with each cylinder for a longer period than the low pressure.

21. In a device of the character described, a rotatable member having a series of compression chambers opening toward the periphery and a series of hydraulic cylinders, a hopper located above said rotatable member and feeding material to its compression chambers as they rotate by the hopper, and means for connecting low pressure, high pressure and exhaust respectively with said cylinders as the rotatable member and its cylinders rotate, said means maintaining the high pressure in connection with each cylinder for a longer period than the low pressure.

22. In a device of the character described, a rotatable member having a series of compression chambers opening toward the periphery and a series of hydraulic cylinders, a hopper located above said rotatable member and feeding material to its compression chambers as they rotate by the hopper, and a valve having ports connecting low pressure and high pressure supply and exhaust with said cylinders as the rotatable member and its cylinders rotate, said valve maintaining the high pressure in connection with each cylinder for a longer period than the low pressure.

23. In a device of the character described, a supporting member rotatable on a horizontal axis and having a series of compression chambers opening toward the periphery, a series of hydraulic cylinders located in said member, means for feeding material to said chambers as they rotate under said feeding means, and a valve for connecting low pressure, high pressure and exhaust ports respectively with said cylinders as they rotate with their supporting member under said feeding means, said valve maintaining the high pressure in connection with each cylinder for a longer period than the low pressure.

24. In a device of the character described, a rotatable member having a series of compression chambers and a series of hydraulic cylinders, said cylinders being arranged radially, a valve having low pressure and high

pressure ports, and a valve casing for said valve rotatable with said member and having communication with each of said cylinders and arranged to respectively feed low, high pressure and exhaust to said cylinders as the rotatable member, its cylinders and the valve casing rotate with respect to said valve, said valve maintaining the high pressure in connection with each cylinder for a longer period than the low pressure.

25. In a device of the character described, a hollow or open rotatable member having a series of compression chambers and a series of hydraulic cylinders, and a valve located within said hollow rotatable member and having communication with each of said cylinders, said valve having low pressure, high pressure and exhaust ports whereby as the hollow rotatable member and its cylinders rotate around said valve, the latter supplies low and high pressure respectively to said cylinders, said valve maintaining the high pressure in connection with each cylinder for a longer period than the low pressure.

26. In a device of the character described, a hollow or open rotatable member having a series of compression chambers opening toward the periphery and a series of radially arranged cylinders, means for feeding material to said compression chambers and a valve located within said hollow member, communicating with said cylinders and having low pressure, high pressure and exhaust ports whereby as the hollow rotatable member and its cylinders rotate around said valve low and high pressure respectively are connected with said cylinders, said valve maintaining the high pressure in connection with each cylinder for a longer period than the low pressure.

27. In a device of the character described, a pair of side frames supporting a casing provided with an opening at one point of its periphery, a rotatable member supported by said side frames and having a series of compression chambers opening toward the periphery, means for feeding material through the opening in the casing to said compression chambers, said rotatable member also having hydraulic cylinders and valve mechanism arranged to respectively connect the low and high pressure and exhaust with said cylinders as the rotatable member and its cylinders rotate, said valve mechanism maintaining the high pressure in connection with each cylinder for a longer period than the low pressure.

28. In a device of the character described, a pair of side frames supporting a casing provided with an opening at one point of its periphery, a rotatable member supported by said side frames and having a series of compression chambers opening toward the periphery, means for feeding material through the opening in the casing to said compression chambers, said rotatable member also having hydraulic cylinders and a valve having communication with each of said cylinders and arranged to connect low pressure, high pressure and exhaust thereto as said cylinders and the rotatable member rotate, said valve maintaining the high pressure in connection with each cylinder for a longer period than the low pressure.

29. In a device of the character described, a rotatable member having a series of compression chambers opening toward the periphery and a series of hydraulic cylinders arranged radially, means for feeding material to said chambers, and a valve having communication with said cylinders and having low, high pressure and exhaust ports connecting with said cylinders as they rotate, said low pressure port being shorter than the high pressure port whereby the high pressure is maintained for a longer period of time than the low pressure.

30. In a device of the character described, a rotatable member having a series of compression chambers, a series of hydraulic cylinders also arranged in said rotatable member and arranged radially, means for feeding material to said chambers, and a valve having communication with said cylinders and having low, high pressure and exhaust ports connecting with said cylinders as they rotate, said low pressure port being shorter than the high pressure port whereby the high pressure is maintained for a longer period of time than the low pressure.

31. In a device of the character described a rotatable member having a series of compression chambers, a series of hydraulic cylinders also arranged in said rotatable member and arranged radially, means for feeding material to said chambers, a valve having low pressure, high pressure and exhaust ports, and a valve casing rotating with said rotatable member and its cylinders and having communication with each of said cylinders, whereby as the rotatable member, its cylinders and valve casing rotate around said valve, low pressure and high pressure are respectively connected with said cylinders.

32. In a device of the character described, a rotatable member having a series of compression chambers opening toward the periphery and a series of hydraulic cylinders, a hopper located above said rotatable member for feeding material to its compression chambers as they rotate by the hopper, a valve having low pressure, high pressure and exhaust ports, the former being shorter than the latter whereby the high pressure is maintained for a longer period of time than the low pressure, and a valve casing rotating with said rotatable member and its cylinders and having communication with each of said cylinders whereby as the rotatable member, its cylinders and valve casing rotate around

said valve, low pressure and high pressure are respectively connected with said cylinders.

33. In a device of the character described, a supporting member rotatable on a horizontal axis and having a series of compression chambers opening toward the periphery, a series of hydraulic cylinders located in said chamber, means for feeding material to said chambers as they rotate under said feeding means, and a valve having communication with said cylinders and having low, high pressure and exhaust ports connecting with said cylinders as they rotate, said low pressure port being shorter than the high pressure port whereby the high pressure is maintained for a longer period of time than the low pressure.

34. In a device of the character described, a pair of side frames supporting a casing provided with an opening at one point of its periphery, a rotatable member supported by said side frames and having a series of compression chambers opening toward the periphery, means for feeding material through the opening in the casing to said compression chambers, said rotatable member also having hydraulic cylinders and a valve having communication with said cylinders and having low pressure, high pressure and exhaust ports respectively connecting with said cylinders as the latter rotate, and said low pressure port being shorter than the high pressure port whereby the high pressure is maintained for a longer period of time than the low pressure.

35. In a device of the character described, a pair of side frames supporting a casing provided with an opening at one point of its periphery, a rotatable member supported by said side frames and having a series of compression chambers opening toward the periphery, means for feeding material through the opening in the casing to said compression chambers, said rotatable member also having hydraulic cylinders a valve having low pressure, high pressure and exhaust ports, and a valve casing rotating with said rotatable member and its cylinders and having communication with each of said cylinders, whereby as the rotatable member, its cylinders and valve casing rotate around said valve, low pressure and high pressure and the exhaust are respectively connected with said cylinders.

36. In a device of the character described, a pair of side frames supporting a casing provided with an opening at one point of its periphery, a rotatable member supported by said side frames and having a series of compression chambers opening toward the periphery, means for feeding material through the opening in the casing to said compression chambers, said rotatable member also having hydraulic cylinders a valve having low pressure, high pressure and exhaust ports, the former being shorter than the latter whereby the high pressure is maintained for a longer period of time than the low pressure, and a valve casing rotating with said rotatable member and its cylinders and having communication with each of said cylinders whereby as the rotatable member, its cylinders and valve casing rotate around said valve, low pressure and high pressure and the exhaust are respectively connected with said cylinders.

37. In a device of the character described, a series of compression chambers; a series of hydraulic cylinders having plungers therein, said chambers and said cylinders communicating with each other and rotating together, means for feeding material to be compressed by said plungers, means for discharging material while in motion, and means for continuously collecting and delivering the oil, whereby as the chambers and hydraulic cylinders rotate, material is received, compressed by hydraulic means, and discharged and oil is compressed therefrom into a continuous stream.

38. In a device of the character described, a supporting member having a series of compression chambers, hydraulic cylinders and plungers, said chambers and cylinders communicating with each other and the plungers being located in said cylinders, said supporting member, and its chambers, cylinders and plungers rotating, means for feeding material to said chambers, means for discharging material while in motion, and means for continuously collecting and delivering the oil, whereby as the said member and its cylinders rotate, material is received by said chambers, compressed hydraulically in said cylinders, and discharged, and the oil compressed therefrom is discharged in a stream as the parts continuously rotate.

39. In a device of the character described, a supporting member having a series of compression chambers and a series of hydraulic cylinders, said cylinders opening into said chambers, means for feeding material to said chambers, valve mechanism located within said supporting member and connecting a source of supply with said cylinders, plungers in said cylinders acting to compress the material in said compression chambers, and means comprising cams acting upon said plungers to eject the material after compression.

40. In a device of the character described, a supporting member having a series of compression chambers and a series of hydraulic cylinders, said cylinders opening into said chambers, means for feeding material to said chambers, valve mechanism located within said supporting member and connecting a source of supply with said cylinders, plun-

gers in said cylinders acting to compress the material in said compression chambers, rollers carried by said plungers, and cams acting upon said rollers for ejecting the material after compression.

41. In a device of the character described, a supporting member having a series of compression chambers and a series of hydraulic cylinders, said cylinders opening into said chambers, means for feeding material to said chambers, valve mechanism located within said supporting member and connecting a source of supply with said cylinders, plungers in said cylinders acting to compress the material in said compression chambers, means for ejecting the material after compression, and means for returning the plungers to receive further material for compression.

42. In a device of the character described, a supporting member having a series of compression chambers and a series of hydraulic cylinders, said cylinders opening into said chambers, means for feeding material to said chambers, valve mechanism located within said supporting member and connecting a source of supply with said cylinders, plungers in said cylinders acting to compress the material in said compression chambers, cams for ejecting the material after compression, and cams for returning the plungers to receive further material for compression.

43. In a device of the character described, a supporting member having a series of compression chambers and a series of hydraulic cylinders, said cylinders opening into said chambers, means for feeding material to said chambers, a valve having ports connecting low pressure, high pressure and exhaust with said cylinders, and plungers in said cylinders arranged to compress the material in said compression chambers.

44. In a device of the character described, a supporting member having a series of compression chambers and a series of hydraulic cylinders, said cylinders opening into said chambers, means for feeding material to said chambers, a valve having ports connecting low pressure, high pressure and exhaust with said cylinders, plungers in said cylinders acting to compress the material in said compression chambers, and means for ejecting the material after compression.

45. In a device of the character described, a supporting member having a series of compression chambers and a series of hydraulic cylinders, said cylinders opening into said chambers, means for feeding material to said chambers, a valve having ports connecting low pressure, high pressure and exhaust with said cylinders, plungers in said cylinders acting to compress the material in said compression chambers, and means comprising cams acting upon said plungers to eject the material after compression.

46. In a device of the character described, a rotatable member having a series of compression chambers and a series of hydraulic cylinders, said cylinders being arranged radially and opening into said chambers, a valve located within said rotatable member, a valve casing for said valve rotatable with said rotatable member, said valve casing having communication between said valve and each of said cylinders, and plungers in said cylinders arranged to compress the material in said compression chambers.

47. In a device of the character described, a rotatable member having a series of compression chambers and a series of hydraulic cylinders, said cylinders being arranged radially and opening into said chambers, a valve located within said rotatable member, a valve casing for said valve rotatable with said rotatable member, said valve casing having communication between said valve and each of said cylinders, plungers in said cylinders acting to compress the material in said compression chambers, and means for ejecting the material after compression.

48. In a device of the character described, a rotatable member having a series of compression chambers and a series of hydraulic cylinders, said cylinders being arranged radially and opening into said chambers, a valve located within said rotatable member, a valve casing for said valve rotatable with said rotatable member, said valve casing having communication between said valve and each of said cylinders, plungers in said cylinders acting to compress the material in said compression chambers, and means comprising cams acting upon said plungers to eject the material after compression.

49. In a device of the character described, a rotatable member having a series of compression chambers and a series of hydraulic cylinders, said cylinders being arranged radially and opening into said chambers, a valve located within said rotatable member, a valve casing for said valve rotatable with said rotatable member, said valve casing having communication between said valve and each of said cylinders, plungers in said cylinders acting to compress the material in said compression chambers, means for ejecting the material after compression, and means for returning the plungers to receive further material for compression.

50. In a device of the character described, a rotatable member having a series of compression chambers and a series of hydraulic cylinders, said cylinders being arranged radially and opening into said chambers, a valve located within said rotatable member, a valve casing for said valve rotatable with said rotatable member, said valve casing

having communication between said valve and each of said cylinders, plungers in said cylinder acting to compress the material in said compression chambers, cams for ejecting the material after compression, and cams for returning the plungers to receive further material for compression.

51. In a device of the character described, a rotatable member having a series of compression chambers and a series of hydraulic cylinders, said cylinders being arranged radially and opening into said chambers, a valve having low pressure, high pressure and exhaust ports, a valve casing for said valve rotatable with said member and having communication with each of said cylinders and arranged to respectively feed low and high pressure to said cylinders as the rotatable member, its cylinders and the valve casing rotate with respect to said valve, and plungers in said cylinders arranged to compress the material in said compression chambers.

52. In a device of the character described, a rotatable member having a series of compression chambers and a series of hydraulic cylinders, said cylinders being arranged radially and opening into said chambers, a valve having low pressure, high pressure and exhaust ports, a valve casing for said valve rotatable with said member and having communication with each of said cylinders and arranged to respectively connect low and high pressure and the exhaust to said cylinders as the rotatable member, its cylinders and the valve casing rotate with respect to said valve, plungers in said cylinders acting to compress the material in said compression chambers, and means for ejecting the material after compression.

53. In a device of the character described, a rotatable member having a series of compression chambers and a series of hydraulic cylinders, said cylinders being arranged radially and opening into said chambers, a valve having low pressure, high pressure and exhaust ports, a valve casing for said valve rotatable with said member and having communication with each of said cylinders and arranged to respectively connect low and high pressure and the exhaust to said cylinders as the rotatable member, its cylinders and the valve casing rotate with respect to said valve, plungers in said cylinders acting to compress the material in said compression chambers, and means comprising cams acting upon said plungers to eject the material after compression.

54. In a device of the character described, a rotatable member having a series of compression chambers and a series of hydraulic cylinders, said cylinders being arranged radially and opening into said chambers, a valve having low pressure, high pressure and exhaust ports, a valve casing for said valve rotatable with said member and having communication with each of said cylinders and arranged to respectively connect low and high pressure and the exhaust to said cylinders as the rotatable member, its cylinders and the valve casing rotate with respect to said valve, plungers in said cylinders acting to compress the material in said compression chambers, rollers carried by said plungers, and cams acting upon said rollers for ejecting the material after compression.

55. In a device of the character described, a rotatable member having a series of compression chambers and a series of hydraulic cylinders, said cylinders being arranged radially and opening into said chambers, a valve having low pressure, high pressure and exhaust ports, a valve casing for said valve rotatable with said member and having communication with each of said cylinders and arranged to respectively connect low and high pressure and the exhaust to said cylinders as the rotatable member, its cylinders and the valve casing rotate with respect to said valve, plungers in said cylinders acting to compress the material in said compression chambers, means for ejecting the material after compression, and means for returning the plungers to receive further material for compression.

56. In a device of the character described a rotatable member having a series of compression chambers and a series of hydraulic cylinders, said cylinders being arranged radially and opening into said chambers, a valve having low pressure, high pressure and exhaust ports, a valve casing for said valve rotatable with said member and having communication with each of said cylinders and arranged to respectively connect low and high pressure and the exhaust to said cylinders as the rotatable member, its cylinders and the valve casing rotate with respect to said valve, plungers in said cylinders acting to compress the material in said compression chambers, cams for ejecting the material after compression, and cams for returning the plungers to receive further material for compression.

57. In a device of the character described, a supporting member having a series of compression chambers and a series of hydraulic cylinders opening into said chambers, means for feeding material to said chambers, valve mechanism located within said supporting member and connecting a source of supply with said cylinders, plungers in said cylinders having shoes arranged to compress the material in said compression chambers and means for conducting away the oil expressed by said plungers from the material in said chambers.

58. In a device of the character described, a rotatable member having a series of com-

pression chambers and a series of hydraulic cylinders, said cylinders being arranged radially opening into said chambers, a valve having low pressure, high pressure and exhaust ports, a valve casing for said valve rotatable with said member and having communication with each of said cylinders and arranged to respectively connect low and high pressure and the exhaust to said cylinders as the rotatable member, its cylinders and the valve casing rotate with respect to said valve, and plungers in said cylinders having shoes arranged to compress the material in said compression chambers and means for conducting away the oil expressed by said shoes from the material in said chambers.

59. In a device of the character described, a rotatable drum, a casing containing said drum and having an opening or gap therein, compression chambers in said drum arranged as the drum rotates in said casing to be exposed through said opening or gap, hydraulic cylinders contained in said drum and opening into said chambers, means for filling said compression chambers, and means for connecting hydraulic pressure with said cylinders as the drum and cylinders rotate, said means entering the cylinders after the compression chambers are filled and exhausting as the compresssion chambers are exposed through said opening or gap.

60. In a device of the character described, a rotatable drum, a casing containing said drum and having an opening or gap therein, compression chambers in said drum arranged as the drum rotates in said casing to be exposed through said opening or gap, hydraulic cylinders contained in said drum and opening into said chambers, means for filling said compression chambers, means for connecting hydraulic pressure with said cylinders as the drum and cylinders rotate, said means entering the cylinders after the compression chambers are filled and exhausting as the compression chambers are exposed through said opening or gap, and means for ejecting the material as the compression chambers are exposed through said opening or gap.

61. In a device of the character described, a rotatable drum, a casing containing said drum and having an opening or gap therein, compression chambers in said drum arranged as the drum rotates in said casing to be exposed through said opening or gap, hydraulic cylinders contained in said drum and opening into said chambers, means for filling said compression chambers, and means for connecting hydraulic pressure with said cylinders as the drum and cylinders rotate, said means connecting low pressure with said cylinders after the latter pass said opening or gap and later in the revolution of the drum connecting high pressure with said cylinders and exhausting as the compression chambers are exposed through said opening or gap.

62. In a device of the character described, a rotatable drum, a casing containing said drum and having an opening or gap therein, compression chambers in said drum arranged as the drum rotates in said casing to be exposed through said opening or gap, hydraulic cylinders contained in said drum and opening into said chambers, means for filling said compression chambers, means for connecting hydraulic pressure with said cylinders as the drum and cylinders rotate, said means connecting low pressure with said cylinders after the latter pass said opening or gap and later in the revolution of the drum connecting high pressure with said cylinders and exhausting as the compression chambers are exposed through said opening or gap, and means for ejecting the material as the compression chambers are exposed through said opening or gap.

63. In a device of the character described, a rotatable drum, a casing containing said drum and having an opening or gap therein, compression chambers in said drum arranged as the drum rotates in said casing to be exposed through said opening or gap, means for filling said compression chambers, hydraulic cylinders contained in said drum and opening into said chambers, plungers operating in said cylinders and compressing the material in said compression chambers, and means for connecting hydraulic pressure with said cylinders as the drum and its cylinders and plungers rotate, said pressure entering the cylinders after the compression chambers are filled and exhausting as the compression chambers are exposed through said opening or gap.

64. In a device of the character described, a rotatable drum, a casing containing said drum and having an opening or gap therein, compression chambers in said drum arranged as the drum rotates in said casing to be exposed through said opening or gap, means for filling said compression chambers, hydraulic cylinders contained in said drum and opening into said chambers, plungers operating in said cylinders and compressing the material in said compression chambers, means for connecting hydraulic pressure with said cylinders as the drum and its cylinders and plungers rotate, said pressure entering the cylinders after the compression chambers are filled and exhausting as the compression chambers are exposed through said opening or gap, and means for ejecting the material as the compression chambers are exposed through said opening or gap.

65. In a device of the character described, a rotatable drum, a casing containing said drum and having an opening or gap therein,

compression chambers in said drum arranged as the drum rotates in said casing to be exposed through said opening or gap, means for filling said compression chambers, hydraulic cylinders contained in said drum and opening into said chambers, plungers operating in said cylinders and compressing the material in said compression chambers, means for connecting hydraulic pressure with said cylinders as the drum and its cylinders and plungers rotate, said pressure entering the cylinders after the compression chambers are filled and exhausting as the compression chambers are exposed through said opening or gap, and means for returning the plungers to receive further material for compression.

66. In a device of the character described, a drum rotatable on a horizontal axis and having compression chambers therein, a casing containing said drum and having an opening or gap therein, a hopper for feeding material through said opening or gap to the compression chambers in said drum as the latter rotates under said hopper, hydraulic cylinders also carried by said drum and means for connecting hydraulic pressure with said cylinders as the drum and cylinders rotate, said pressure entering the cylinders after the compression chambers are filled and exhausting as the compression chambers are exposed through said opening or gap.

67. In a device of the character described, a drum rotatable on a horizontal axis and having compression chambers therein, a casing containing said drum and having an opening or gap therein, a hopper for feeding material through said opening or gap to the compression chambers in said drum as the latter rotates under said hopper, hydraulic cylinders also carried by said drum and a valve for connecting hydraulic pressure with said cylinders as the drum and cylinders rotate, said valve connecting low pressure with said cylinders after the latter pass said opening or gap and later in the revolution of the drum and cylinders connecting high pressure with said cylinders, and exhausting as the compressing chambers are exposed through said opening or gap.

68. In a device of the character described, a drum rotatable on a horizontal axis and having compression chambers therein, a casing containing said drum and having an opening or gap therein, a hopper for feeding material through said opening or gap to the compression chambers in said drum as the latter rotates under said hopper, hydraulic cylinders also carried by said drum as the drum and cylinders rotate, and a valve having ports connecting low pressure with said cylinders after the latter pass said opening or gap and later in the revolution connecting high pressure with said cylinders and then exhausting as the compression chambers are again exposed through said opening or gap, said low pressure port being shorter than said high pressure port whereby the high pressure is maintained for a longer period of time than the low pressure.

69. In a device of the character described, a hollow rotatable drum, side frames upon opposite sides of said drum and arranged to support the same, a casing also between said side frames and located around said drum, said casing having a gap or opening therein, compression chambers in said hollow drum arranged to be exposed as said drum brings the compression chambers opposite the opening or gap in said casing, and a valve located within said hollow drum and having means for communicating with each of said compression chambers, said valve having ports connecting with low and high pressure and exhaust, and the low pressure port being of less capacity than the high pressure port whereby the high pressure is maintained for a longer period of time than the low pressure.

70. In a device of the character described, a hollow rotatable drum, side frames, a casing supporting said frame, a series of compression chambers in said hollow drum, means for feeding material to said chambers, a valve located or contained within the opening within said drum having the drum and its chambers and cylinders rotating around it, a connection between said valve and each of said cylinders, said valve being arranged to admit and exhaust fluid pressure to said cylinders as the drum, its cylinders and compression chambers rotate around the valve.

71. In a device of the character described, a hollow rotatable drum, compression chambers therein, a valve located within the opening of the drum, a valve casing for said valve, and connections between said valve casing and each of said compression chambers, said drum and its compression chambers together with the valve casing and connections rotating around said valve.

72. In a device of the character described, a hollow rotatable drum, compression chambers therein, a valve located within the opening of the drum, a valve casing for said valve, and connections between said valve casing and each of said compression chambers, said drum and its compression chambers together with the valve casing and connections rotating around said valve and said valve having ports for admitting low and high fluid pressure and connecting the exhaust.

73. In a device of the character described, a hollow rotatable drum, compression chambers therein, a valve located within the opening of the drum, a valve casing for said valve, and connections between said valve casing and each of said compression cham-

bers, said drum and its compression chambers together with the valve casing and connections rotating around said valve and said valve having an exhaust port and ports for admitting low and high fluid pressure, one of said ports being of larger capacity than the other whereby the high pressure is maintained for a longer period of time than the low pressure.

74. In a device of the character described, a rotatable drum having a series of compression chambers, a supporting drum in which said drum rotates, fluid means for compressing material in said chambers, and fluid means for balancing the pressure on the bearings of said rotatable drum.

75. In a device of the character described, a rotatable drum having a series of compression chambers, bearings for said drum, a valve for controlling fluid pressure to said drum, and means for conducting the fluid pressure to one of said bearings to balance the pressure.

76. In a device of the character described, a rotatable drum, a casing therefor, fluid controlled means for compressing material, bearings for said drum, a groove or port in said bearings and means for conducting fluid pressure thereto to balance the pressure.

77. In a device of the character described, a rotatable drum, a casing therefor, fluid pressure means for compressing material, bearings for said drum, and a valve for controlling the fluid pressure to said drum, and means for conducting the fluid pressure to said bearings to balance the same.

78. In a device of the character described, a rotatable drum, bearings therefor, a groove or passage around said bearings, means for admitting fluid pressure thereto to balance the pressure against the bearing, and packing around said groove or passage.

79. In a device of the character described, a rotatable drum, bearings therefor, a groove or passage around said bearings, means for admitting fluid pressure thereto to balance the pressure against the bearing, a packing around said groove or passage, said packing being formed of strips and having perforated plates to hold the same in position.

80. In a device of the character described, a series of compression chambers, a valve for admitting fluid pressure to said chambers, said valve having high pressure and low pressure ports, and means for balancing said valve on the side opposite the high pressure port.

81. In a device of the character described, a series of compression chambers, a valve for admitting fluid pressure to said chambers, said valve having high pressure and low pressure ports, said valve also having a groove or passage opposite the high pressure port connected with the high pressure supply whereby the pressure on the valve is balanced.

82. In a device of the character described, a series of compression chambers, a valve for controlling the admission of fluid thereto, said valve having a port on one side thereof, and a groove or passage on the opposite side of said valve to balance the pressure.

83. In a device of the character described, a valve for controlling the admission of fluid thereto, said valve having a port on one side thereof, and a groove or passage on the opposite side of said valve to balance the pressure, said groove or passage having packing.

84. In a device of the character described, a series of compression chambers, a valve casing, and a valve located within said casing, a high pressure port at one side thereof and a balancing port at the opposite side thereof.

85. In a device of the character described, a drum having an opening through it, a series of compression chambers in said drum, a series of chambers and cylinders also in said drum communicating with said chambers, a valve and valve casing independent of the drum but located within its opening, said valve controlling fluid for compressing material in said chambers, and said valve having axial passages and radial passages connecting said axial passages, and connections located within the opening of said drum and connecting the axial ports with said cylinders.

86. In a device of the character described, a drum having an opening through it and containing a series of chambers and cylinders communicating with said chambers, a valve and valve casing independent of the drum but located within this opening, connections also located within the opening in said drum and connecting said valve casing with the aforesaid cylinders, peripheral ports between said valve and valve casing, and axial ports connecting with said peripheral ports.

87. In a device of the character described, a series of compression chambers and cylinders, a valve casing having connections with said cylinders, a valve in said casing, low pressure, high pressure and exhaust peripheral ports between said valve and valve casing, and axial high pressure, low pressure and exhaust ports connecting with said peripheral ports.

88. In a device of the character described, a supporting member having a series of compression chambers and cylinders, a valve casing having connections with said cylinders, a valve in said casing, low pressure, high pressure and exhaust peripheral ports between said valve and valve casing, and

axial high pressure, low pressure and exhaust ports connecting with said peripheral ports.

89. In a device of the character described, a series of compression chambers and cylinders, a valve casing having connections with said cylinders, a valve in said casing, low pressure, high pressure and exhaust peripheral ports between said valve and valve casing, axial high pressure and low pressure and exhaust ports connecting with said peripheral ports, said high pressure port having packing therefor.

90. In a device of the character described, a series of compression chambers and cylinders, a valve casing having connections with said cylinders, a valve in said casing, low pressure, high pressure and exhaust peripheral ports between said valve and valve casing, axial high pressure and low pressure and exhaust ports connecting with said peripheral ports, said valve also having means for balancing the pressure of said high pressure peripheral port.

91. In a device of the character described, a series of compression chambers and cylinders, a valve casing having connections with said cylinders, a valve in said casing, low pressure, high pressure and exhaust peripheral ports between said valve casing, and axial high pressure and low pressure ports connecting with said peripheral ports, said valve also having a peripheral port connecting with the high pressure for balancing the high pressure peripheral port.

92. In a device of the character described, a drum having an opening through it and containing a series of compression chambers and a series of cylinders, a valve independent of said drum but located within its opening, connections located within the opening of said drum affording a communication between said valve and said cylinders, said valve having axial passages and radial passages, the radial passages connecting with said connections to the cylinders, an inlet connecting with one axial passage and an exhaust connecting with the other axial passage.

93. In a device of the character described, a series of compression chambers, a valve for controlling fluid pressure for compressing material in said chambers, said valve being of conical shape and having a shoulder at one end, means for tightening from the other end, and axial passages leading material into said valve.

94. In a device of the character described, a valve and a casing, the casing having a port leading therefrom, the valve being conical in shape and having a shoulder contacting with the casing, said valve also having a port leading axially thereinto and communicating radially with the port from the casing.

95. In a device of the character described, a drum having an opening through it and containing a series of cylinders, a valve casing located within the opening of said drum and having a series of pipes also located within the opening of said drum and leading radially to said cylinders, a plug valve within said casing having a plurality of ports leading axially thereinto, each of said ports communicating with a peripheral port in the plug, and said peripheral ports as the valve or its casing rotates communicating with the pipes leading from the casing closing and opening the ports of the pipes.

96. In a device of the character described, a compression chamber, a plunger for compressing material and a shoe for said plunger, the said plunger and shoe having coinciding grooves inclined in opposite directions and deeper at the outer edges than at the centers, and perforations in the shoe leading to said grooves.

97. In a device of the character described, a compression chamber, a plunger for compressing material and a shoe for said plunger, the said plunger and shoe having coinciding grooves inclined in opposite directions and deeper at the outer edges than at the centers, perforations in the shoe leading to said grooves, a cover for said shoe and a perforated plate between said shoe and its cover.

98. In a device of the character described, a pair of side frames, a casing having an opening or gap therein, a drum revolving between said side frames and in said casing, plungers within said drum, and slots in said frames permitting the removal of said plungers through the gap in said casing.

99. In a device of the character described, a pair of side frames, a casing, a drum between said side frames, within said casing, plungers within said drum, said plungers having rollers thereon, and said side frames having slots for the passage of the rollers on said plungers.

100. In a device of the character described, a rotatable drum, a casing containing said drum, compression chambers in said drum, and a substantially stationary scraper yieldingly held in position for removing the material compressed in said compression chambers.

101. In a device of the character described, a rotatable drum, a casing containing said drum, compression chambers in said drum, plungers operating to compress material in said compression chambers, means for ejecting the cake, and a substantially stationary scraper yieldingly held in position.

102. In a device of the character described, a rotatable drum, a casing containing said drum and having an opening or gap therein, compression chambers in said

drum arranged as the drum rotates in said casing to be exposed through said opening or gap, hydraulic cylinders contained in said drum, means for filling said compression chambers, means for connecting hydraulic pressure with said cylinders as the drum and cylinders rotate, said means connecting low pressure with said cylinders after the latter pass said opening or gap and later in the revolution of the drum connecting high pressure with said cylinders and exhausting as the compression chambers are exposed through said opening or gap, and a spring actuated scraper coacting with said drum.

103. In a device of the character described, a cylinder having a plunger therein, means for delivering fluid pressure to said cylinder to operate said plunger, and means for cutting off the fluid supply when the plunger reaches a predetermined position in said cylinder.

104. In a device of the character described, a cylinder having a plunger therein, means for delivering fluid pressure to said cylinder to operate said plunger, and a valve for cutting off the fluid supply when the plunger reaches a predetermined position in said cylinder.

105. In a device of the character described, a cylinder having a plunger therein, means for delivering fluid pressure to said cylinder to operate said plunger, a valve for cutting off the supply of pressure, and a connection between said valve and said plunger, whereby when the plunger reaches a predetermined position in said cylinder the valve is closed.

106. In a device of the character described, a cylinder having a plunger therein, means for delivering fluid pressure to said cylinder to operate said plunger, a valve for cutting off the supply of fluid pressure, and a spring connection between said valve and said plunger, whereby as the plunger reaches a predetermined position, said spring connection will close said valve.

107. In a device of the character described, a cylinder having a plunger therein, means for delivering fluid pressure to said cylinder to operate said plunger, a valve for cutting off the supply of fluid pressure, a spring connection between said valve and said plunger, whereby as the plunger reaches a predetermined position, said spring connection will close said valve, and means for moving said plunger against the tension of said spring to complete the stroke of said plunger.

Signed by me this 8th day of Feby, 1908.

MICHAEL KIRSHNER.

Witnesses:
R. H. T. Adams, Jr.,
Reid H. Colhoun.