No. 714,174.

Patented Nov. 25, 1902.

F. S. GUY.

FILTER PRESS.

(Application filed Aug. 30, 1901.)

(No Model.)

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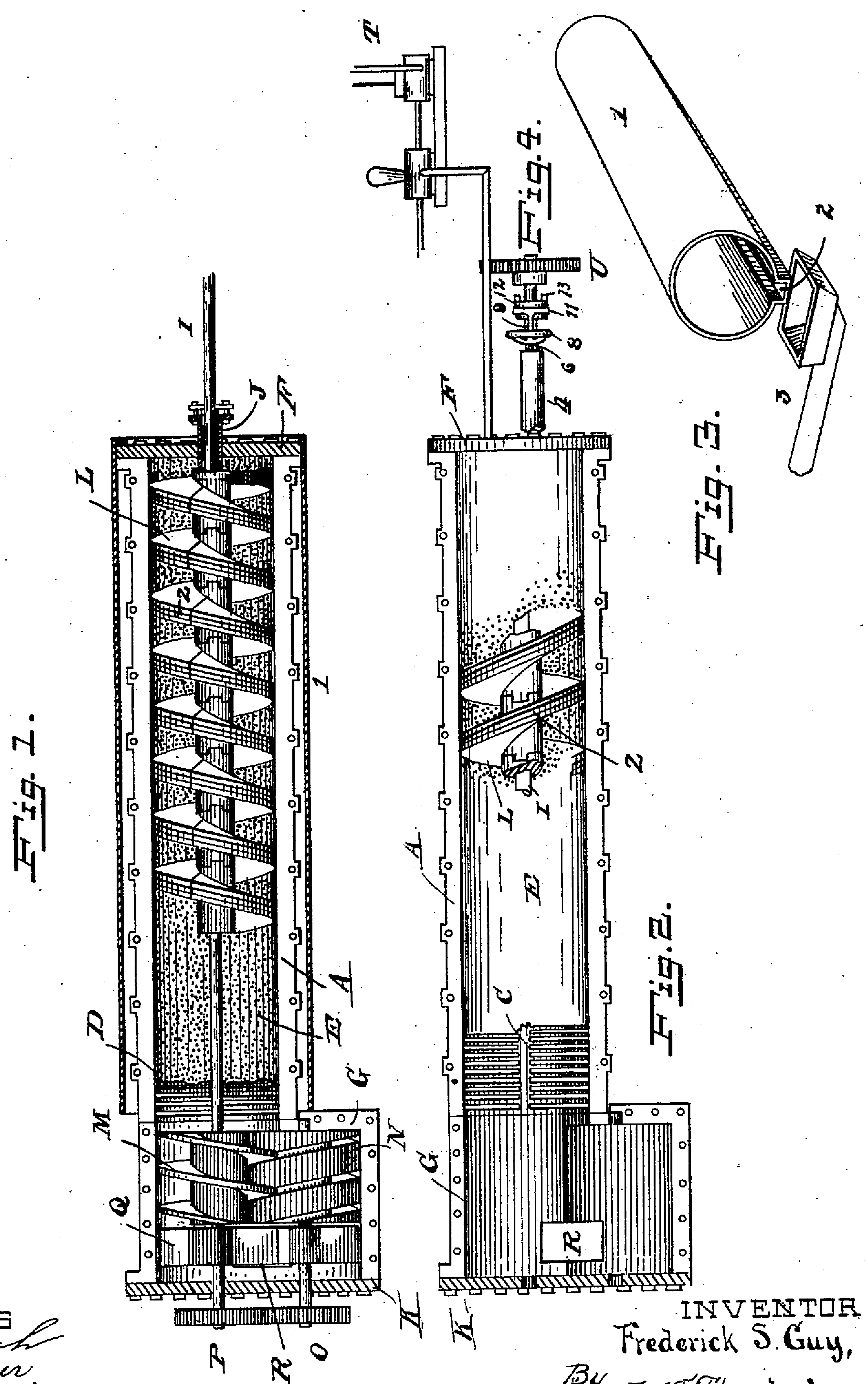

WITNESSES
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INVENTOR
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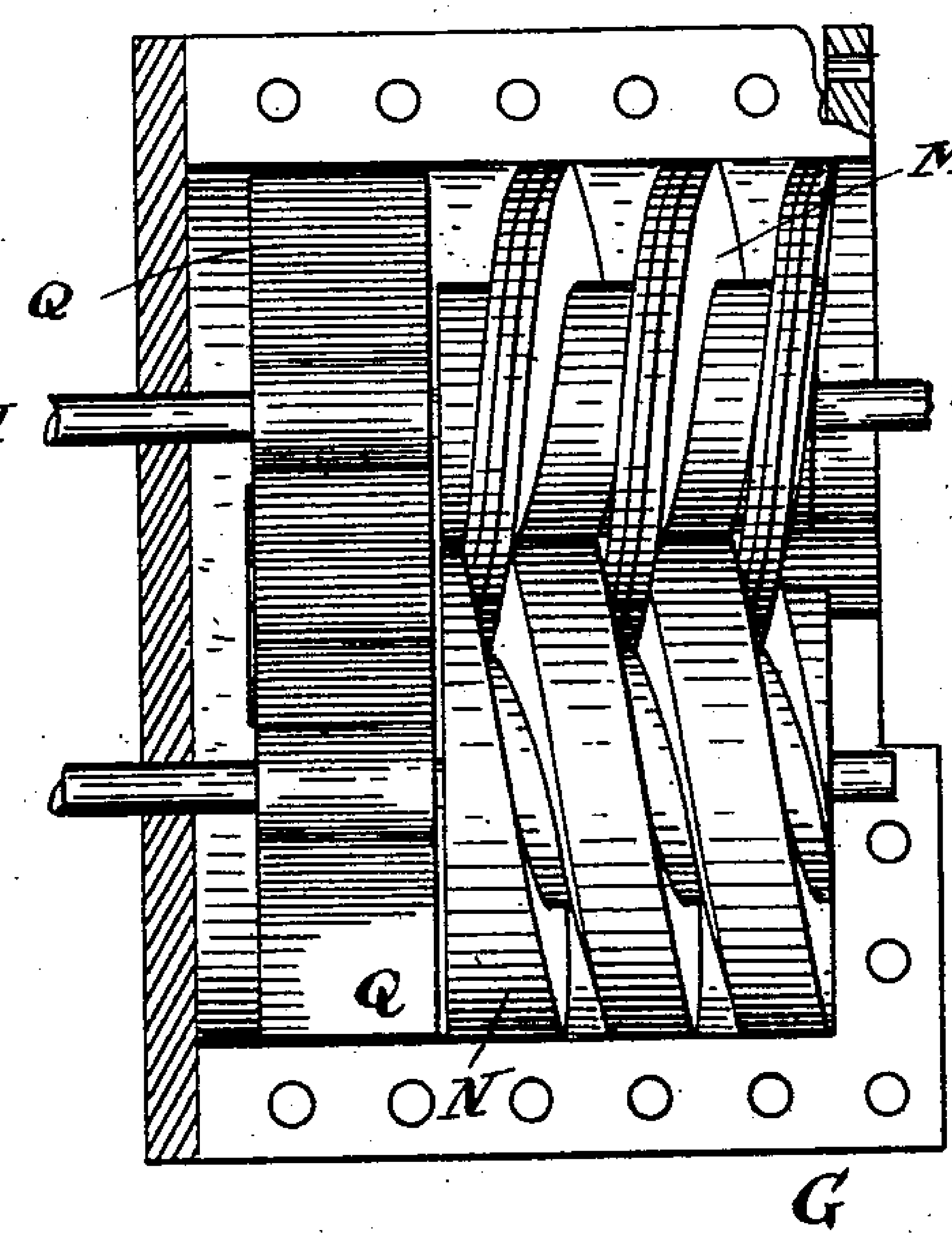


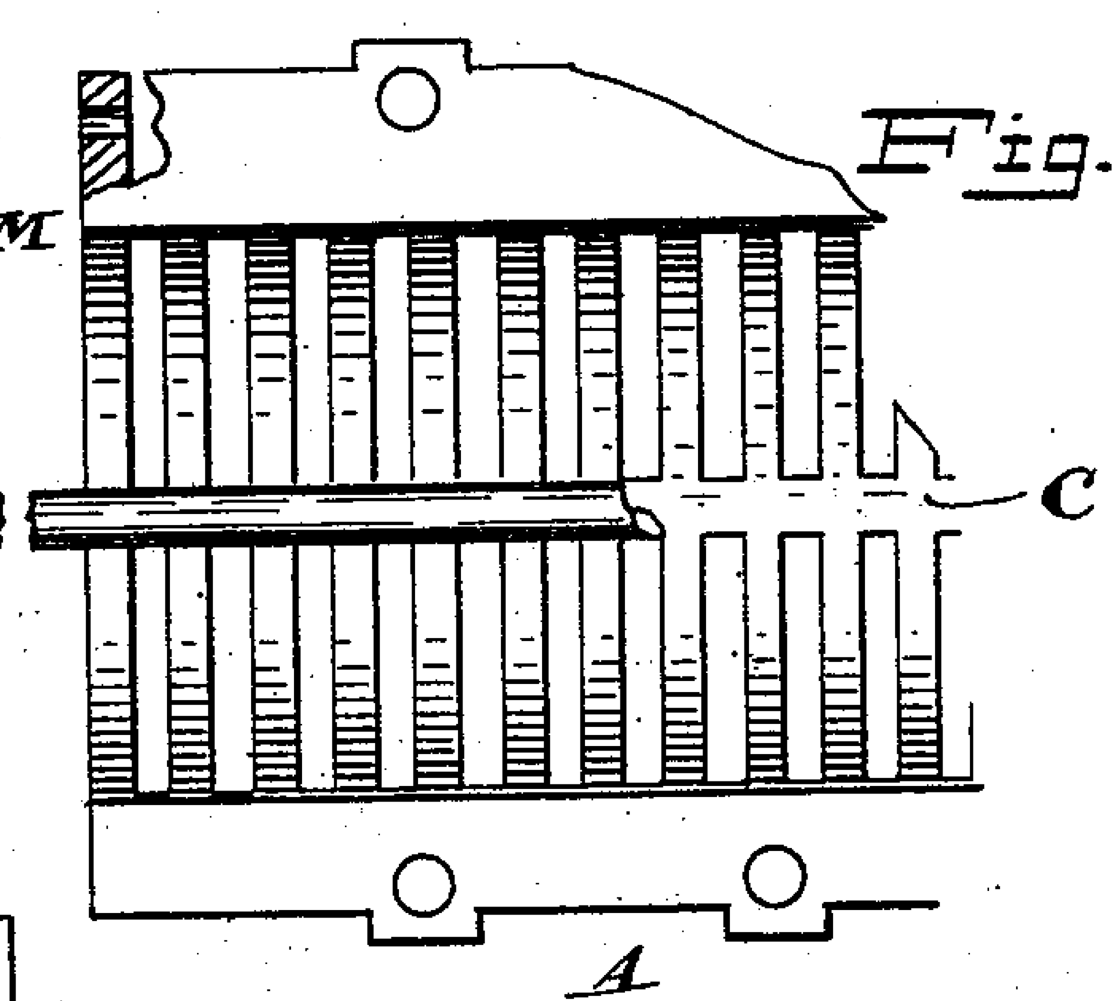


Fig. 6.

Fig. 5.

Fig. 7.

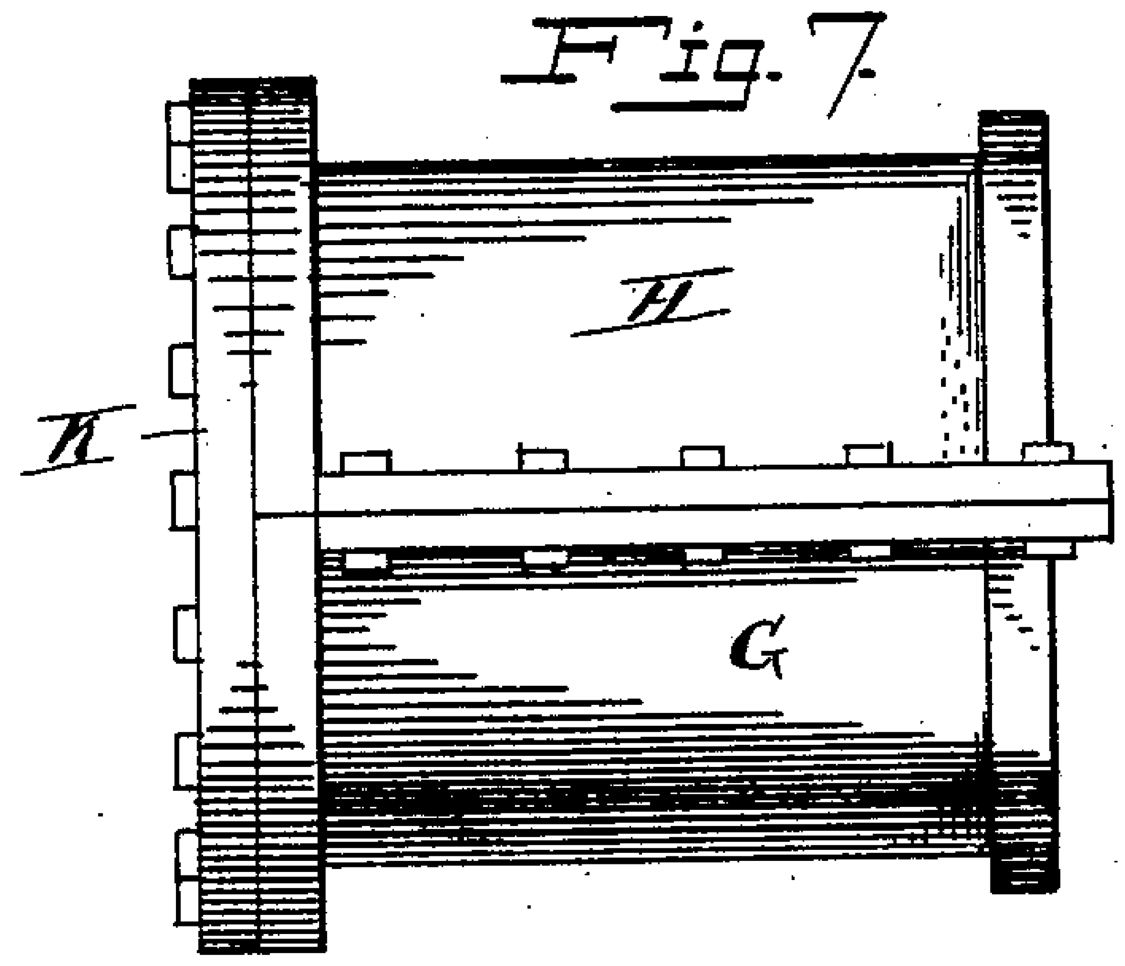


Fig. 8.

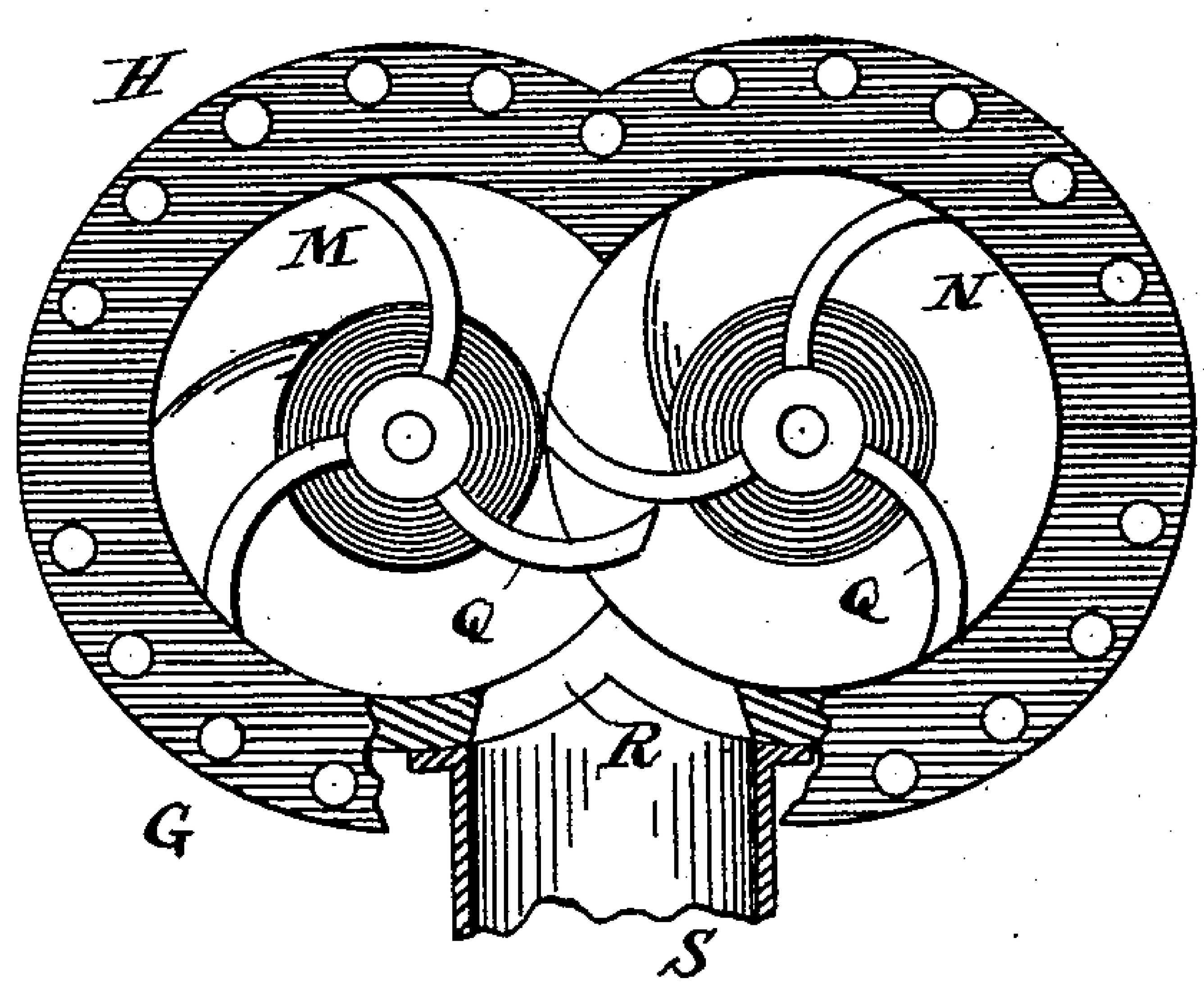
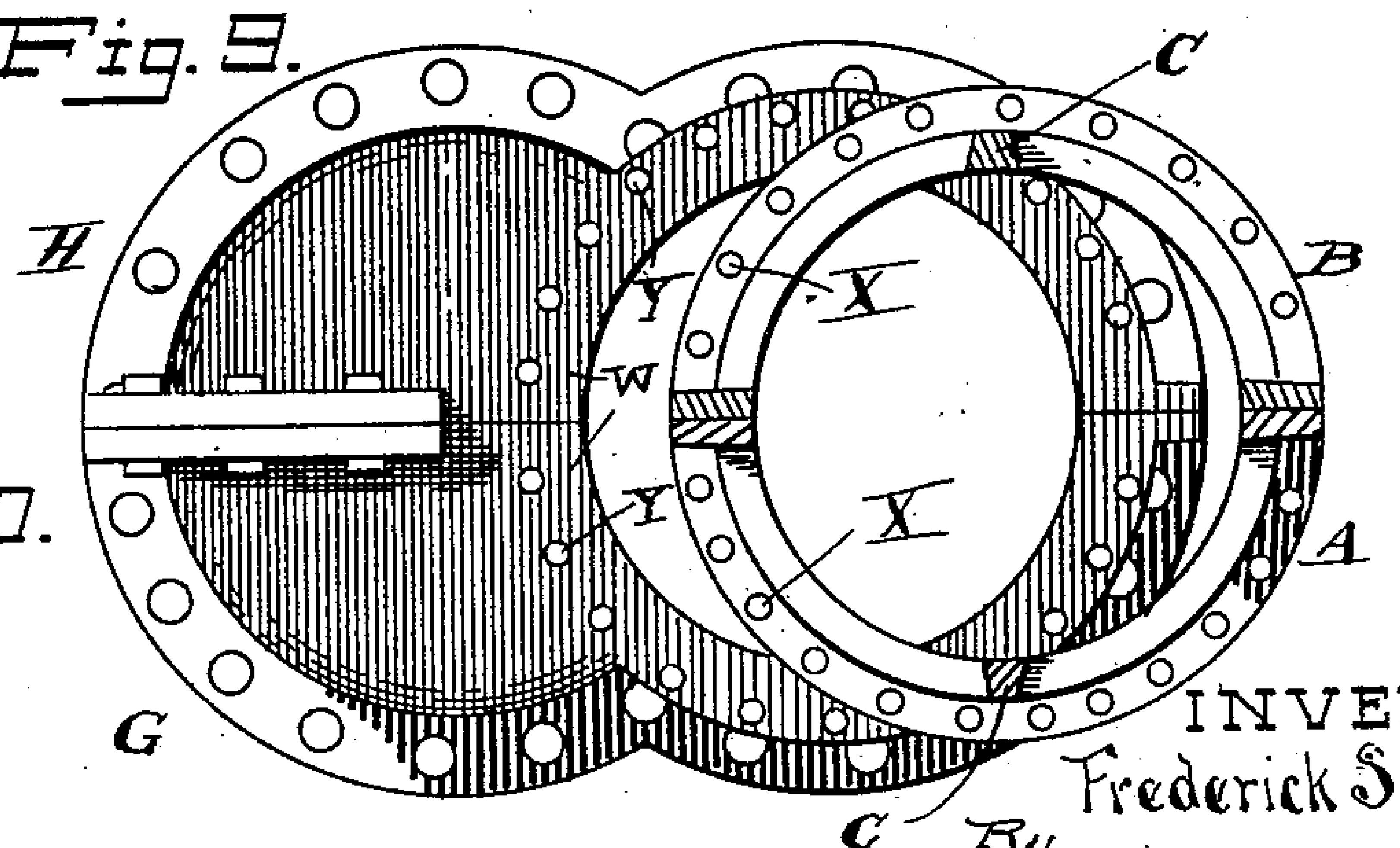


Fig. 9.



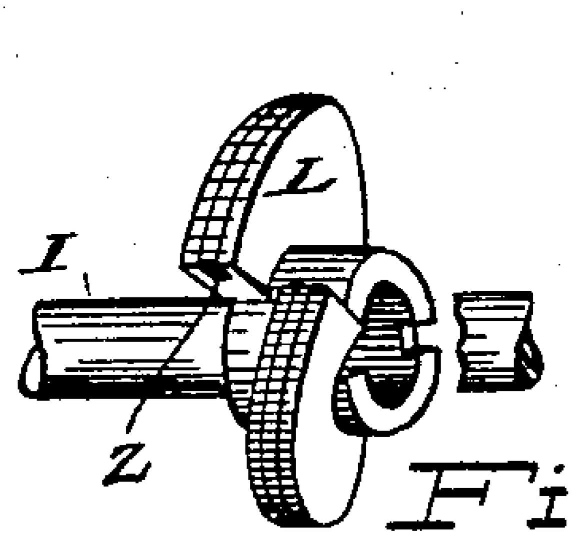


Fig. 10.

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3 Sheets—Sheet 3.

Fig. 11.

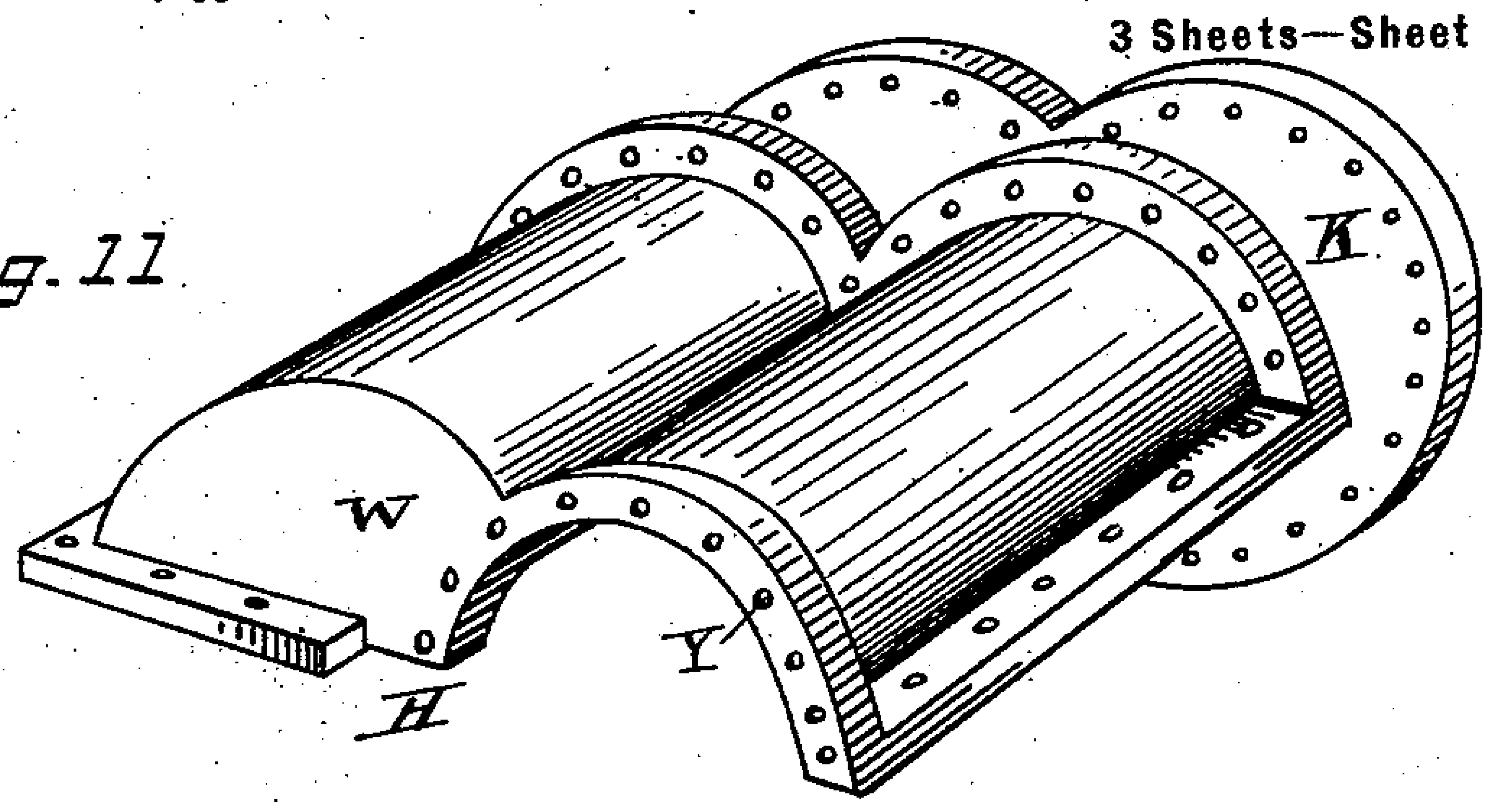
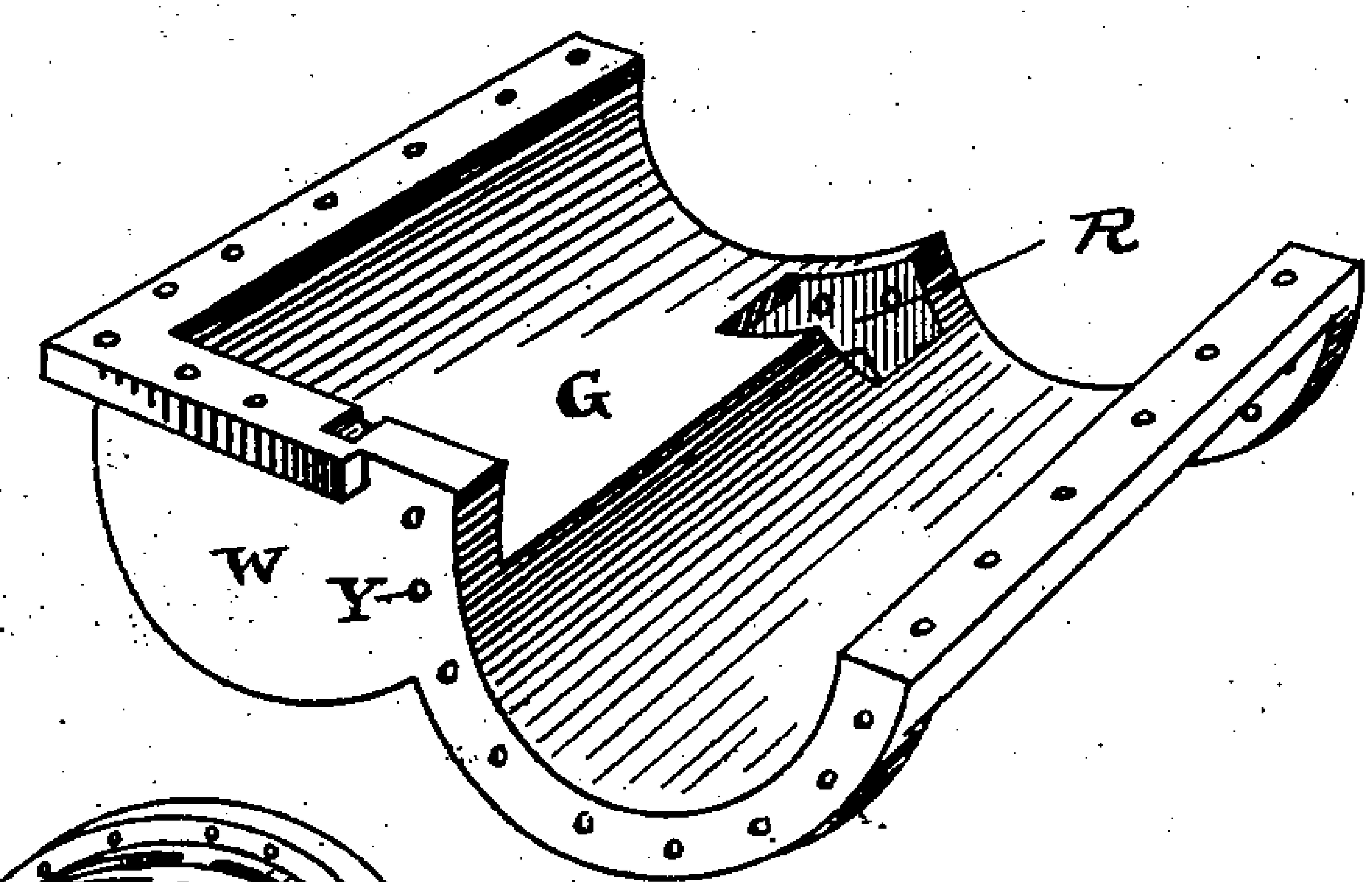


Fig. 12.



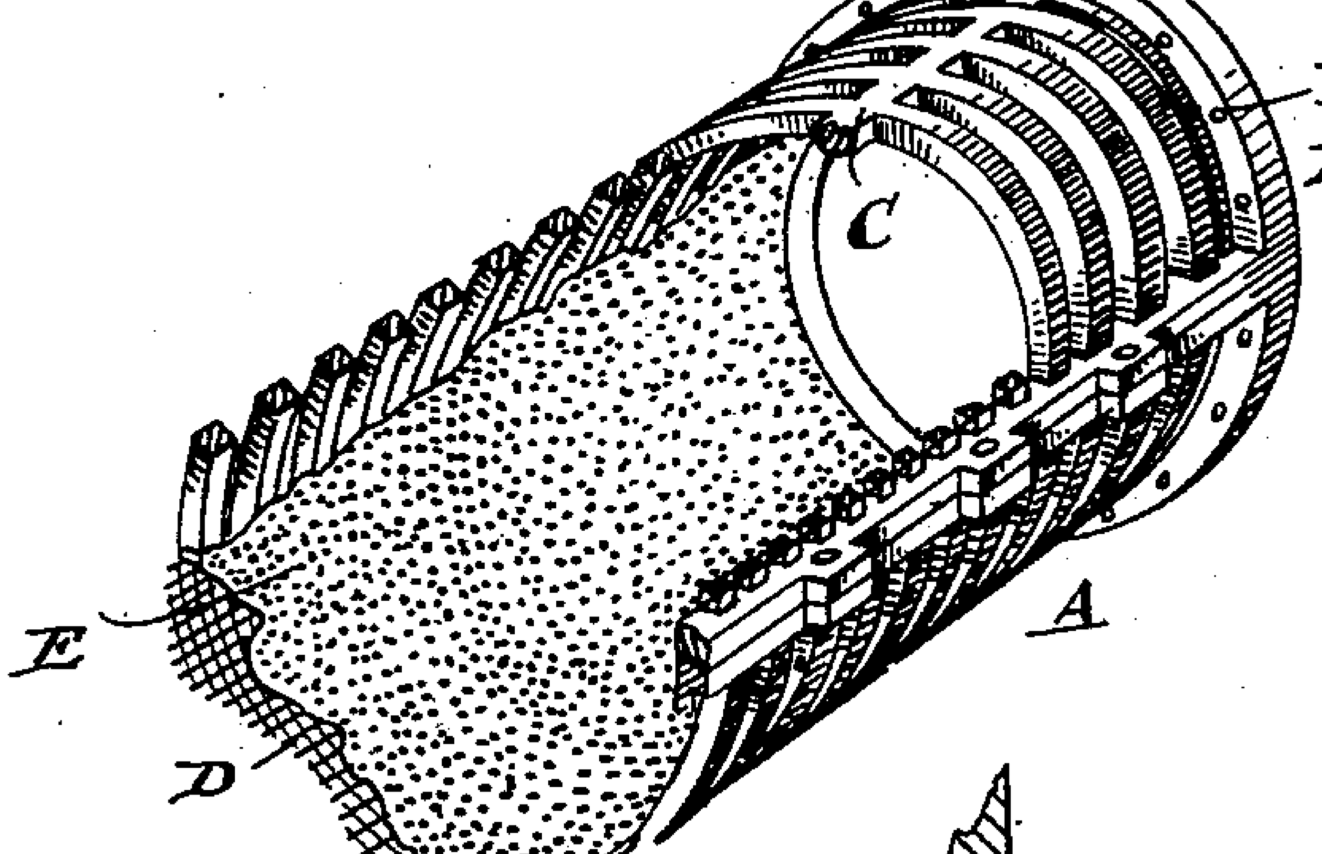


Fig. 13.

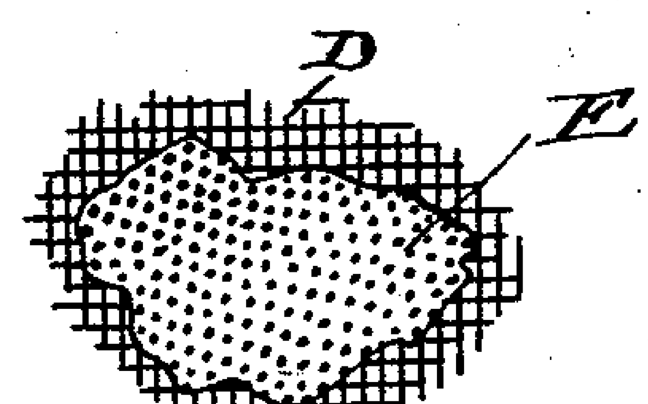


Fig. 15.

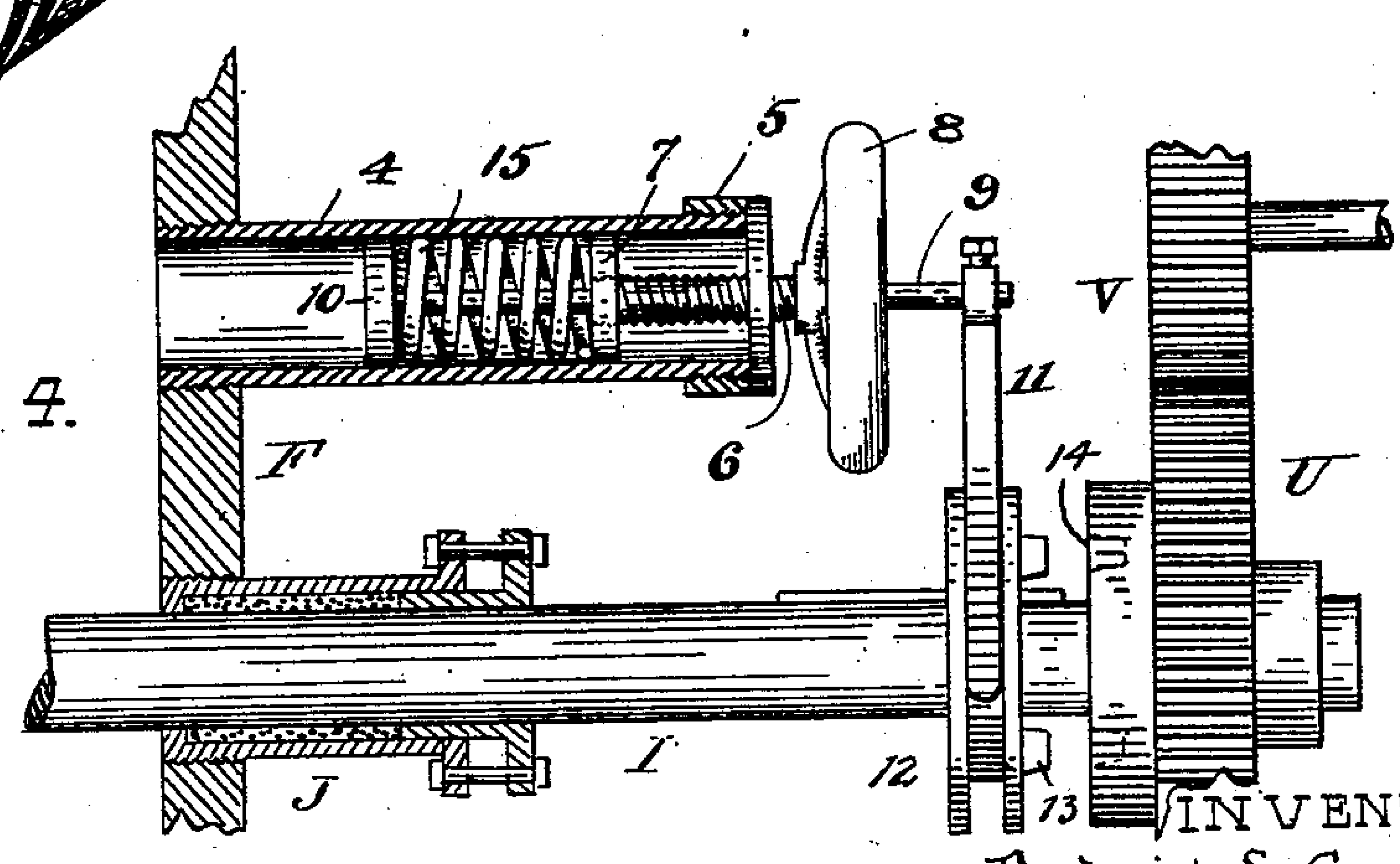


Fig. 14.

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UNITED STATES PATENT OFFICE.

FREDERICK S. GUY, OF PEORIA, ILLINOIS.

FILTER-PRESS.

SPECIFICATION forming part of Letters Patent No. 714,174, dated November 25, 1902.

Application filed August 30, 1901. Serial No. 73,799. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK S. GUY, a citizen of the United States, residing at Peoria, in the county of Peoria and State of Illinois, have invented certain new and useful Improvements in Filter-Presses; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

This invention pertains to filter-presses for the separation of distillery-slop and other products of like consistency.

The object of my invention is to construct a press that will be continuous in its action, so that the slop may be run into it continually and separation of the water and solid portions will take place and both be carried away without stopping the press. This has been attempted many times in many different ways by me and others; but when the ideas were put into an actual working machine the results looked for were not forthcoming. The thick material could not be sufficiently compressed to extract all of the moisture or enough to make the machine of value, since the water would pass through such material to the exit for such solid portions and no way could be found to prevent the mixture of these parts. However, I have now constructed a practical working machine to accomplish the separation of the water from the solid particles in an easy and thorough manner, and the same may be readily understood from the accompanying drawings, in which—

Figure 1 is a plan view of the lower half of the machine, showing a surrounding casing in section. Fig. 2 is a view of the same except for the removal of the said casing and some of the interior working portions. Fig. 3 is a perspective view of the casing shown in Fig. 1, showing a receiving-pipe thereunder. Fig. 4 is a plan view of a driving mechanism for a conveyer and an automatic clutch mechanism. Fig. 5 is a plan view of two screws and a housing portion therefor. Fig. 6 is a plan view of a portion of half of a cylinder adapted for connection with the housing shown in Fig. 5. Fig. 7 is a side view of the housing shown in Fig. 5 and a top member connected therewith. Fig. 8 is a view of the front end housing, showing two sweeps or spiders therein. Fig. 9 is a view of the rear end of the housing, showing a cylinder for connection therewith. Fig. 10 is a side view of a portion of a conveyer. Fig. 11 is a perspective view of a top section of the housing shown in Figs. 7, 8, and 9. Fig. 12 is a perspective view of the bottom portion of the same. Fig. 13 is a perspective view of a portion of the cylinder shown in Fig. 9. Fig. 14 is a side elevation of a shaft for a conveyer and an automatic clutch mechanism for the same. Fig. 15 is a plan view showing a wire netting and screen for the conveyer.

The machine consists of a cylinder made in two sections A and B, (shown in Figs. 9 and 13,) secured together by means of flanges. The sections are cast with alternating spaces and bars, as indicated, the flanges at the sides serving to strengthen the entire member, as well as a web C at the top and bottom for the same purpose. Within the cylinder thus formed is placed a lining of wire-netting or other suitable open backing D, and upon that is laid a lining of fine gauze or perforated sheet metal E. Upon one end of the cylinder is bolted a head F, while at the other is a housing for two screws, one having a right and the other a left hand thread adapted to run together, for the purposes hereinafter stated. This housing consists of two halves G and H, as shown in the several figures, the patterns for which are formed by placing parts of two cylinders together, giving the appearance shown in Fig. 9. This housing is flanged at the rear end, to which is bolted a head K. The other end has the cylinder A B, as already described. When assembled, the said cylinder is in line with one of the bores of the housing, and a shaft I runs entirely through both bores and has its bearing at one end in a stuffing-box J and at the other in the end of the housing. Said shaft carries a conveyer L, which is made in detachable sections, one of which is shown in Fig. 10. These sections are so constructed that any number of them may be strung on the shaft, so that the flights may be lengthened or shortened at will. The shaft portion within the housing carries a screw M, which engages with a screw N in the other bore of the housing. These screws fit into each other, as shown, the thread of one fitting snugly into the groove of the other, so that when running toward each other, as they must in order to fit and work at all, there will be no passage for fluid therethrough, and this is a most important point in my invention. These screws are made to run toward each other by means of the gear-wheels O and P on their shafts, and these cause just the right movement of the screws to have their threads properly mesh. Behind each screw on the shaft is a spider or sweep Q, and beneath is an opening R for the exit of the solid portions of the slop. This is clearly shown in Figs. 8 and 12. In the former figure is shown a spout S for receiving and carrying away the material finding its exit through said opening R. As shown in Fig. 1, the conveyer L revolves away from the observer, as also does the screw M, while the screw N revolves toward the observer; but in Fig. 2 the conveyer would revolve toward the observer, and if the screws M and N were the reverse of those shown in Fig. 1 the former would revolve toward the observer and the latter away from him. In either case the material would be carried by the flights toward the exit R, and the spiders or sweeps would eject it. However, I prefer to construct the arrangement as shown in Figs. 2 and 8, whereby the screws M and N will revolve toward each other at the top, so that the spiders or sweeps Q, as shown in the latter figure, will descend upon the exit R and force the material out. The housing G H is bored out perfectly smooth, so that the screws will fit snugly and yet run freely. Furthermore, the angles left at the top and bottom by the screws are entirely filled by the points of the housing where the walls come together. In this way no material, not even water, can pass to the exit R except it is conveyed by the flights. When the material is pushed into the screw, it naturally tries to get past the screw N; but the thread thereof fitting so tightly against the thread and hub of the screw M it is quite impossible for it to do so, but must remain below the contacting points and be finally discharged in the manner described. The conveyer revolves within the strainer E and contacts therewith and in revolving keeps said strainer clear of the solid portions, so that the fluids can readily pass out through it. A pump T is connected with the cylinder through the head F, as shown in Fig. 2, and serves to supply the machine with slop to be separated.

The operation of the machine is as follows: The slop is pumped into the cylinder A B and pressure is kept up by said pump to the desired height, and the conveyer L, which receives its motion through the gears U and V at the front of the machine from any source of power, carries the slop toward the rear of the machine. Now since the cylinder is constructed of the separated bars throughout its entire length and circumference the water by its own weight, even without pressure from the pump, will freely pass through the gauze E and run away, thus leaving the solid portions to be carried rearwardly by the conveyer, and with the amount of openings for the escape of the water the fluids will pass away so rapidly that by the time the solid portions have been carried back to the open space between the conveyer and the screw M it has become practically dry. This of course is aided materially by the said screws M and N. These latter have a much less lead than the conveyer, and consequently do not carry away the material as fast as said conveyer supplies it. Consequently said screws actually form a barrier in a certain sense to the passage of the material, so that as the conveyer continually adds the pressure is kept up against the mass, thereby insuring perfect expulsion of the moisture. Evidently the pump-pressure aids materially in this action, also in that the slop must pass through the conveyer and being continually stirred the solid particles are always in suspension and do not clog the screen by sinking to the bottom. Said pump aids in forcing out the water by the continual pressure therefrom, as will be understood. By constructing the screws M and N as described and shown there is no route open for the water from the slop due to the pump-pressure except through the gauze and the spaces through the cylinder A B, and it must be seen that the handling of the slop and the separation of the two portions will be complete and thorough. It must be evident that when a body of the compressed solid parts has been formed the friction of the mass against the lining due to the pressure of the pump and conveyer will be considerable. Consequently the mass will be very solid and the water could not be forced through it, and especially since the means of exit for the water is so large. I am perfectly aware that a double-screw arrangement such as I describe has been used for pumping purposes; but to my knowledge it has never been used for other purposes, much less for a filter-press, and I therefore desire to make it my own for such uses.

As the dried material is carried back to the exit the sweeps Q force it out through the opening R and thence to the spout S, from whence it may be delivered to the usual drier.

So many attempts at reaching the results obtained by my device have been made and met with failure that it has been thought to be almost impossible to construct a continuous filter-press that will properly handle any kind of slop; but in my machine any kind of slop or material, whether thick or thin, can be treated with the same result. In assembling the parts of the press the halves G and H are bolted together by means of their flanges, thus closing one end of one of the chambers by the blind end shown in Figs. 9, 11, and 12 at W. The other chamber or bore is open to continue into the cylinder A B, which is secured to the housing by bolts or studs passed through the holes X in the flanged cylinder, Fig. 9, and the holes Y in the flange of said housing. The flights of the conveyer L are provided with a rubber tip Z, as shown in Fig. 10, whereby the fluids will be more effectually prevented from passing them. This may also be done in the case of the screws M and N, if desired; but this will not be found necessary.

I surround the cylinder A B with a metal casing 1, Figs. 1 and 3, which has a trough 2 at its bottom. Said trough is inclined toward one end, so as to carry the fluid to a spout 3 for delivery, as shown. The water from the slop is ejected from the cylinder in all directions, and the jacket or casing will receive it all and run it away. In Figs. 4 and 14 I show an automatic regulator for the press, which consists of a cylinder 4, opening into the head F. Said cylinder is closed by a cap 5, through which is screwed a threaded bar 6. The inner end of the latter carries a head 7 and the outer end a hand-wheel 8. The thread-bar is bored out, and a stem 9 passes through it. The inner end of the latter carries a head 10 and the outer end a fork 11, which straddles a clutch 12 on the shaft I. This clutch has the projections 13 thereon and revolves with said shaft, but is free to move along it, while the gear U, which has corresponding depressions 14, (shown in dotted lines,) runs loosely on the shaft and only drives the conveyer and screws when the clutch is in engagement therewith. A spring 15 is located within the cylinder 4 between the heads 7 and 10 and tends to keep the clutch away from the gear U; but this action would only be possible if the pressure within the machine should fall below a point where the spring would overcome it. In this case the gear U, though revolving, would not drive the conveyer. The tension of the spring can be regulated to operate at any pressure desired by turning the hand-wheel 8. This will compress the spring by forcing it more firmly against the head 10, which may be arranged to rest against a stop, or the clutch may be limited to a certain movement by a stop on the shaft. As long as the pump-pressure is kept up above the tension of the spring the conveyer and screws M and N will be operated, and should the latter members carry away the compressed portions faster than the slop is pumped in the pressure will lower and stop the conveyer until the pressure has been raised sufficiently to again throw the clutch in. If for any reason the pump should fail or the slop-supply be cut off, the machine will automatically stop until the proper conditions are again established. I do not wish to confine myself to the exact construction shown and described; but the principles under which the machine is operated will be clearly understood. The sweeps Q may be discarded and the device will operate with little or no trouble. It is important that the cylinder be constructed with separated bars or other equally open form whereby the fluids will easily pass out. The pump need not be used, if desired, since the slop could be entered by gravity and the results would be satisfactory, though the amount of the material ejected would be reduced in following this method.

By constructing a press in the manner described and providing the automatic regulator the machine may be left to itself and needs no regular attendant, as the older forms of presses do. This reduces the cost of operation. As to the cost of supplying new strainers it may be said that this is seldom necessary; but other devices must be refitted in this regard at great expense every few months.

I claim—

1. A filter-press comprising a receptacle for slop to be separated, means for moving the slop away from the inlet toward the compression-chamber and a right and a left hand screw located at the rear end of the machine, such screws adapted to fit tightly and revolve together and toward each other and also adapted to carry away the solid particles while preventing the passage of fluid therethrough.

2. A filter-press of the character described comprising a cylinder, a conveyer therein for receiving and carrying away the slop, screws beyond said conveyer adapted to tightly fit one another and revolve together and prevent the passage of fluid therethrough.

3. A filter-press of the character described comprising a cylinder for receiving slop, a conveyer within such cylinder for moving the slop, a right and a left hand screw beyond said conveyer, the same adapted to fit fluid-tight and revolve toward each other whereby while the fluid is prevented passing through them the solid compressed portions are carried away by the said screws for the purposes set forth.

4. A filter-press of the character described comprising an open-work cylinder having a perforated backing or lining therein, a conveyer within the cylinder adapted to revolve inside said lining, a right and a left hand screw behind the conveyer, the same adapted to fit tightly and revolve together toward one another and preventing passage of fluid therethrough and arranged also to carry away the compressed or solid portions of the slop, there being a space between the conveyer and the screws for compression purposes.

5. A filter-press of the character described comprising a cylinder, a conveyer therein for moving the slop from the inlet toward the outlet, a right and a left hand screw beyond said conveyer, the same adapted to fit fluid-tight and revolve together whereby the solid compressed portions of the slop are carried away while the fluids are held back, there being a space between the said screws and the conveyer for compressing the slop under treatment from said conveyer substantially as described.

6. A filter-press comprising a cylinder perforated or open over its entire surface for the escape of water, a perforated lining therein, a conveyer within said lining for moving the slop toward the rear of the press, an inlet for

the slop at the forward end of the press, a right and a left hand screw adapted to revolve together and toward each other and to fit fluid-tight, one of the screws adapted to receive the solid portions of the slop and carry them away, while preventing the passage of fluid therethrough, an outlet for the said solid portions and means for assisting in ejecting such portions substantially as described, there being a space between the conveyer and the screws for the purposes set forth and described.

7. A filter-press comprising a receptacle for slop to be separated the same having an open wall for the purposes explained a pump for entering the slop to such cylinder and maintaining a constant pressure thereon for the purposes described, a conveyer for stirring and carrying the slop away from the inlet and putting it under pressure, a right and a left hand screw fitted tightly together and adapted to revolve toward each other and prevent the passage of fluid therethrough, but also adapted to carry away the solid portions of the slop, an exit for the latter and means for ejecting the said solid portions therethrough substantially as set forth.

8. A filter-press of the character described comprising the cylinder A B, the housing G H attached thereto, the conveyer L within the cylinder, the right and left hand screws M and N within the housing, the former adapted to carry away the solid slop portions entering it, both said screws adapted to fit fluid-tight for preventing the passage of the fluids of the slop therethrough, there being a space between the conveyer and the screws M N wherein the slop is compressed and from where it is carried away by said screw M as described, the gears P and O on the shafts of the screws M and N respectively for causing the said screws to revolve toward one another, the pump T for entering the slop to the cylinder, the exit-opening R in the bottom of the housing G H and the sweeps Q on the shafts of the screws all arranged and operated substantially as described.

9. A filter-press of the character described comprising the cylinder A B, the housing G H attached thereto, the conveyer L within the cylinder, the right and left hand screws M and N within the housing, the former adapted to carry away the solid slop portions entering it, both said screws adapted to fit fluid-tight for preventing the passage of the fluids of the slop therethrough, there being a space between the conveyer and the screws M N wherein the slop is compressed and from where it is carried away by said screw M as described, the gears P and O on the shafts of the screws M and N respectively for causing the said screws to revolve toward one another, the pump T for entering the slop to the cylinder, the exit-opening R in the bottom of the housing G H, the sweeps Q on the shafts of the screws, and the casing 1 all arranged and operated substantially as described.

10. A filter-press comprising a cylinder, a conveyer therein, a pump for entering slop to the cylinder, a double screw arranged substantially as described and shown to run together in a fluid-tight manner to prevent passage of fluid to and through the exit for the solid slop portions, said screws adapted to carry away said solid portions and an automatic regulator consisting of a pressure-cylinder attached to the cylinder or body of the press, a spring-actuated piston-head therein adapted also for movement by the pressure of slop within the main cylinder, said piston-head adapted to connect and disconnect the driving mechanism of the conveyer substantially as set forth and described and for the purposes explained.

11. In a filter-press, a cylinder for receiving slop to be separated, a revolving compression-screw therein for receiving the slop, there being openings in the cylinder for escape of the fluids, said screw adapted to keep the openings free to permit exit of such fluids therethrough and also to push the solid portions along the cylinder toward an outlet for such solid portions, a pair of revolving screws at the rear end of the cylinder between the first screw and the outlets for the solid portions, such screws adapted to work together fluid-tight to prevent passage of the fluids of the slop to the said outlet but said screw receiving and carrying the solid portions to such outlet.

12. In a filter-press, a cylinder having perforations therein its entire length, a revolving screw therein, a strainer between the screw and the cylinder and within which and against which the said screw is adapted to turn, an imperforate cylinder at the rear of the perforated cylinder, the same forming a continuation of the said first cylinder, a third cylinder also imperforate and lying by the side of the first imperforate cylinder, the two latter communicating with one another as shown, said third cylinder having no connection with the perforated cylinder, a revolving screw within each of the imperforate cylinders, one being a right and the other a left hand screw adapted to revolve together in a fluid-tight manner to prevent passage of fluids therethrough while receiving and ejecting solid slop portions as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

FREDERICK S. GUY.

Witnesses:
FRANK T. MILLER,
J. H. BLUTCH.