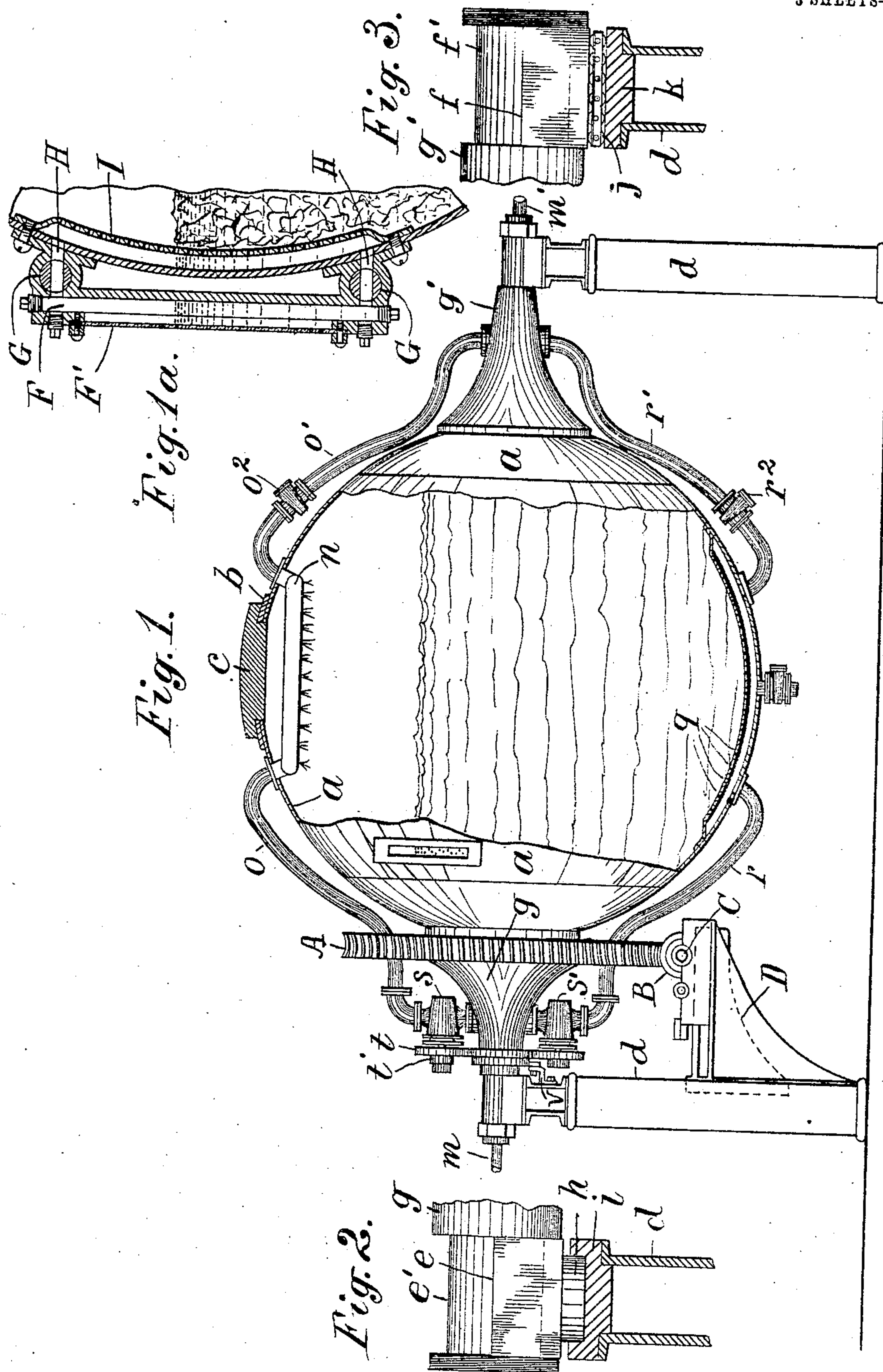


No. 870,562.

M. R. KENNEDY. PATENT
 ROTARY DIGESTER OR COOKER.
 APPLICATION FILED SEPT. 17, 1906.

3 SHEETS—SHEET 1.



Witnesses:
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PATENTED NOV. 12, 1907.

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ROTARY DIGESTER OR COOKER.

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3 SHEETS—SHEET 2.

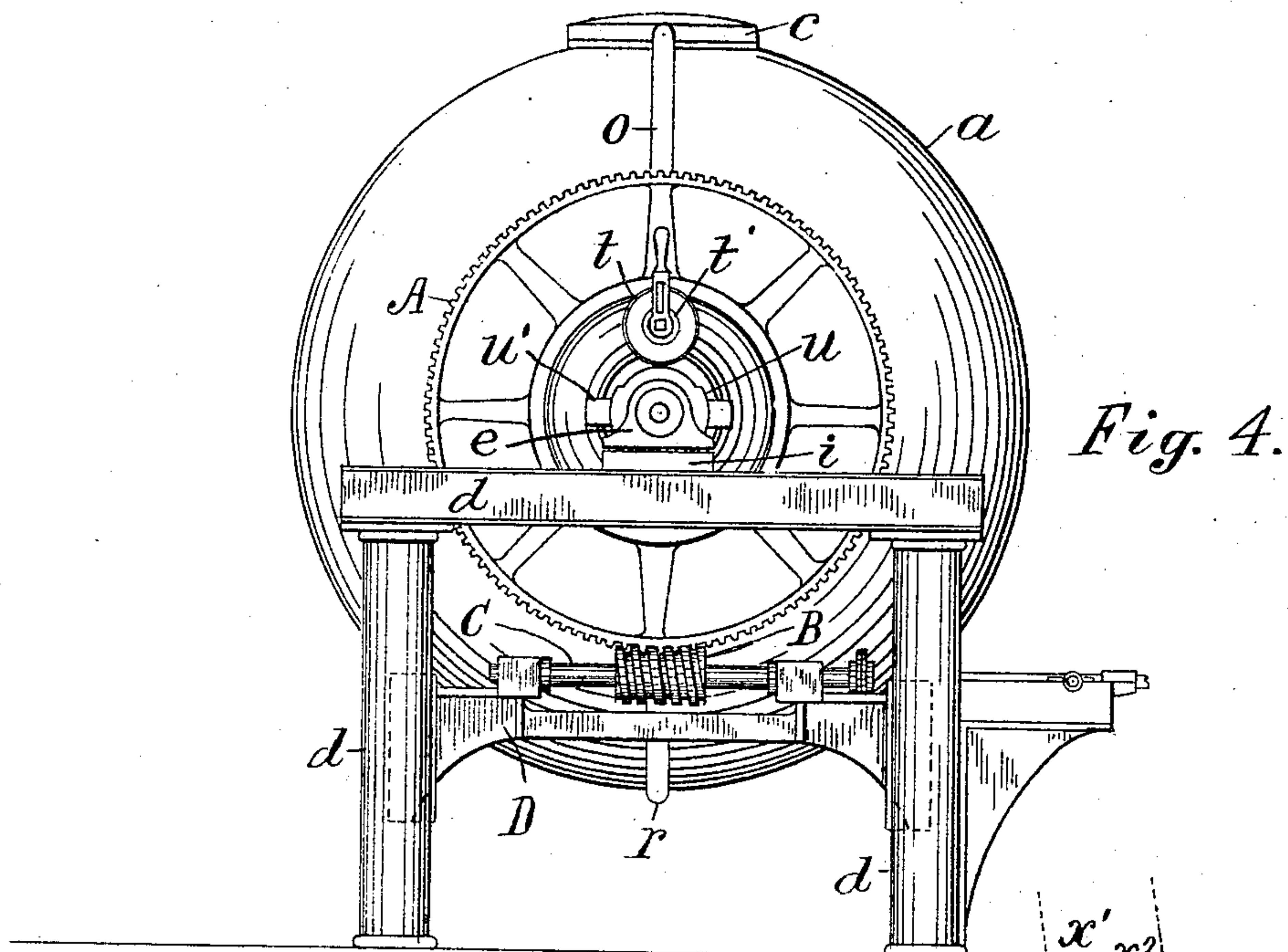


Fig. 4.

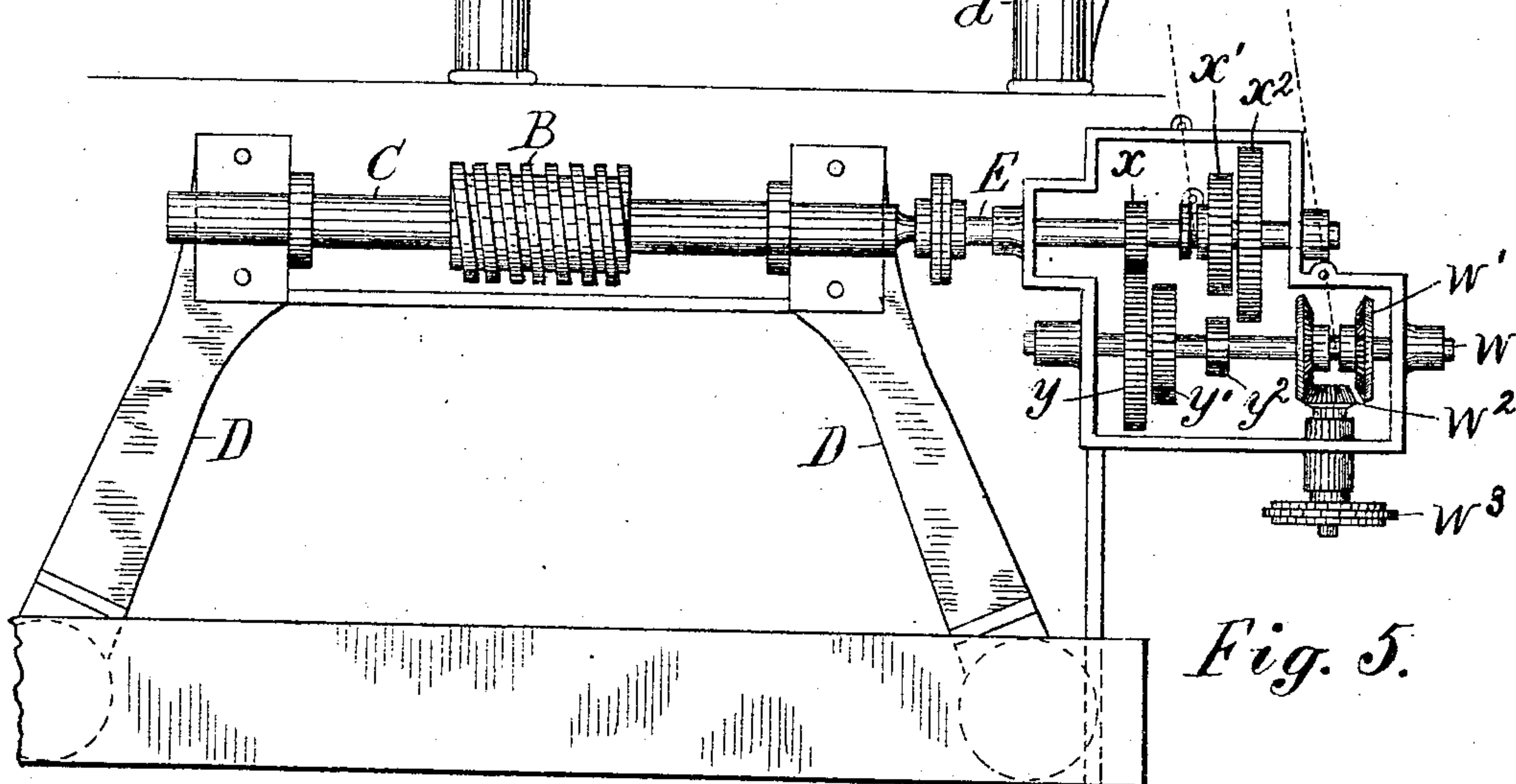


Fig. 5.

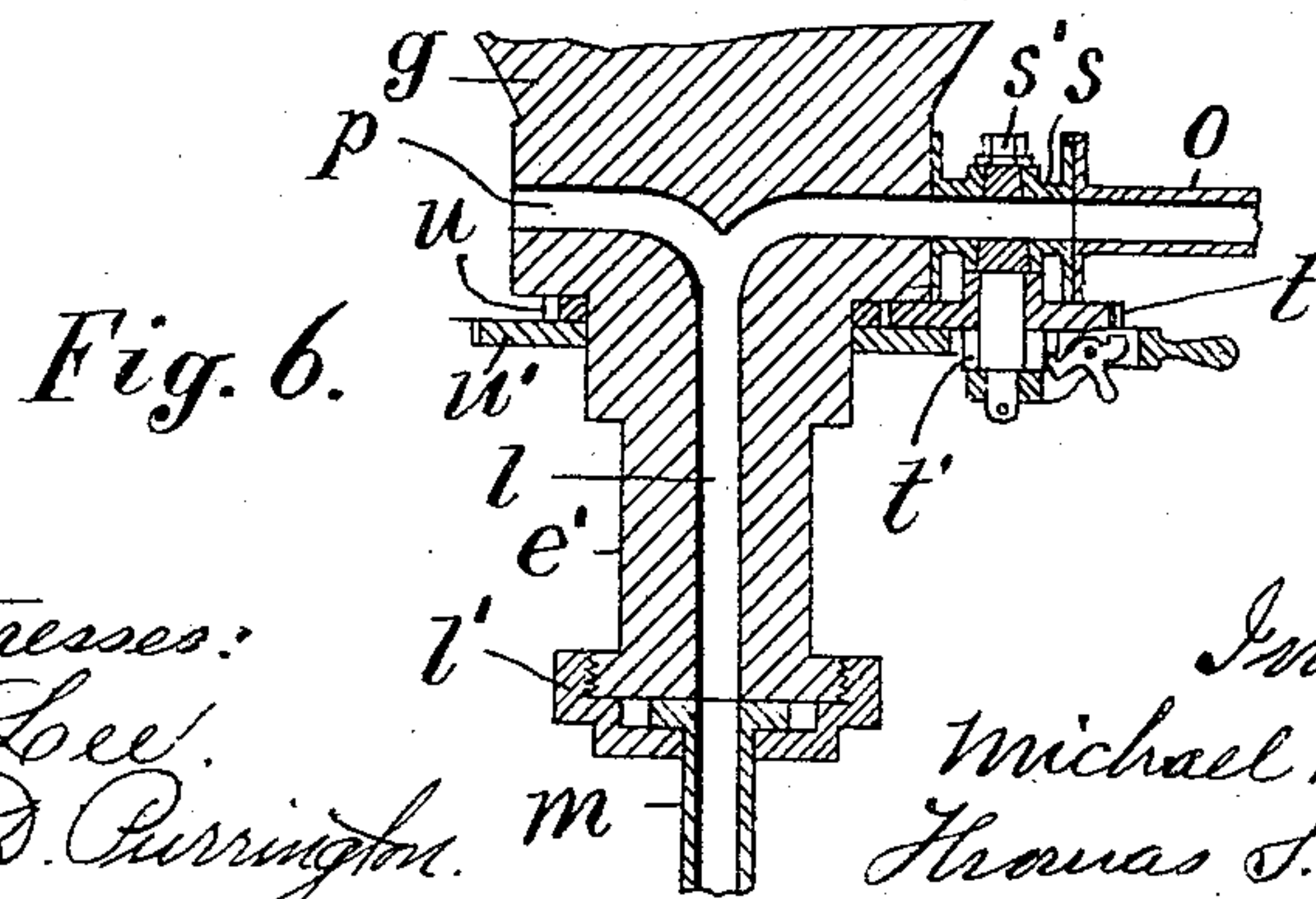


Fig. 6.

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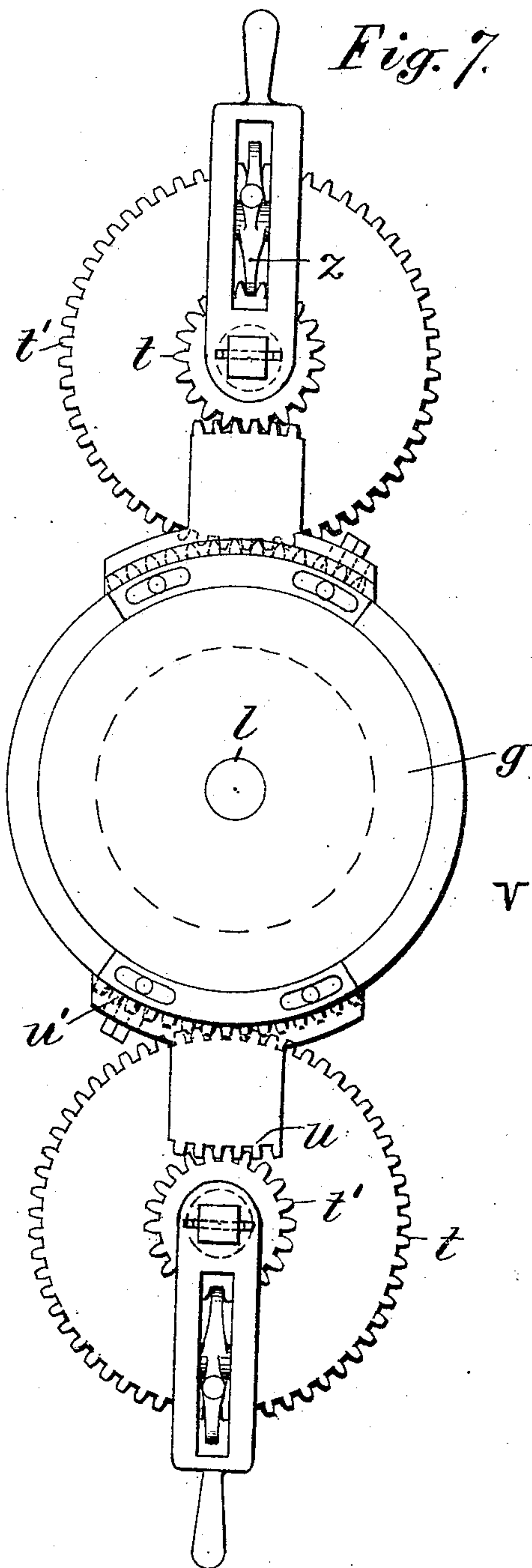
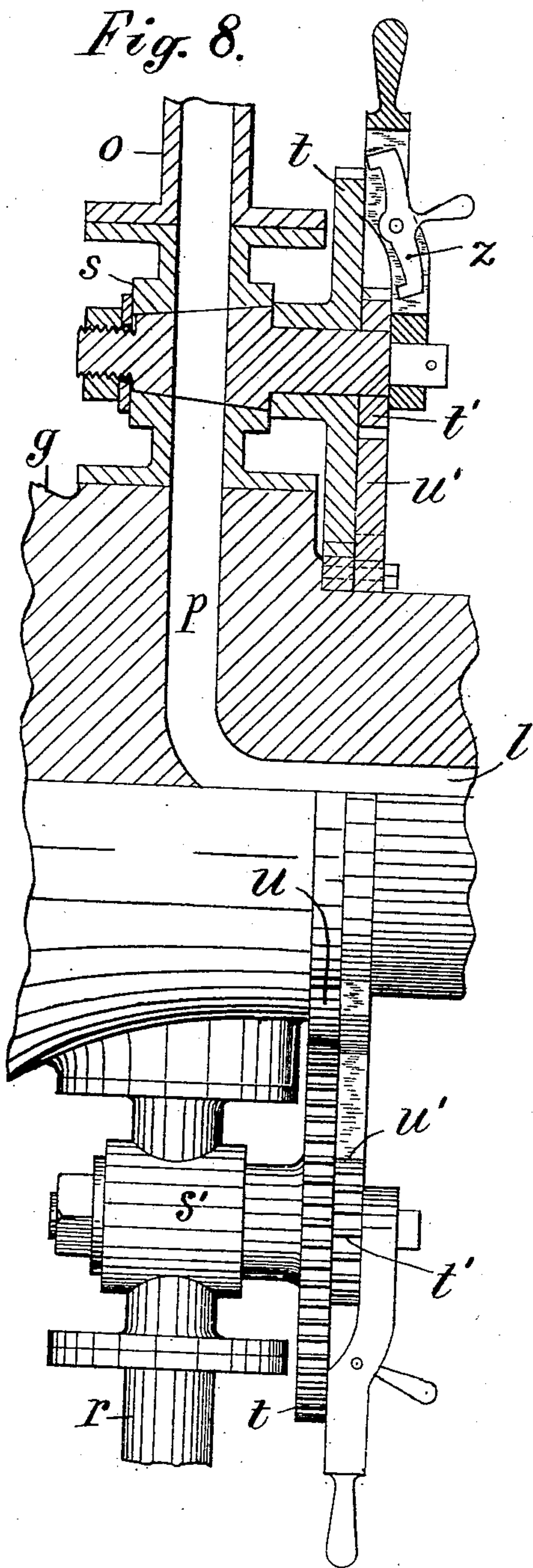
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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ROTARY DIGESTER OR COOKER.

No. 870,562.

Specification of Letters Patent.

Patented Nov. 12, 1907.

Application filed September 17, 1906. Serial No. 334,951.

To all whom it may concern:

Be it known that I, MICHAEL R. KENNEDY, a citizen of the United States, of Dansville, county of Livingston, and State of New York, have invented certain new and useful Improvements in Rotary Digesters or Cookers, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The present invention relates to that class of rotary cooking receptacles or digesters which are, in the manufacture of paper stock, termed "rotaries" or "digesters," as they are constructed to tightly inclose a charge of the material with a suitable liquor, and to rotate for mixing the materials together.

The digester is heated in treating the materials, and the invention consists partly, in a particular construction for the receptacle and its bearings to compensate for expansion and contraction of the digester under variations of temperature; partly, in an arrangement of the gearing to provide for expansion and contraction; partly, in the means for supplying steam and liquor to the digester and withdrawing it therefrom; and partly, to the means for rotating the digester in opposite directions and at various speeds, when required by the condition of the charge.

In the annexed drawing, Figure 1 is a side elevation of the apparatus; Fig. 1^a is a vertical section of the water gage upon an enlarged scale, with the adjacent portion of the digester shell; Figs. 2 and 3 are side elevations of the opposite bearings partly in section where hatched; Fig. 4 is an end elevation of the digester; Fig. 5 is a plan of the gearing for rotating the digester, and Fig. 6 a section of the trunnion and journal provided with one of the supply cocks. Fig. 7 is a front view, and Fig. 8 an edge view of the segmental gears for rotating the supply cocks upon the digester.

a designates the digester, shown of globular form, with manhole *b* at one side closed by cover *c*.

d designates framing supporting the bearings *e* and *f* of the digester journals *e'* and *f'*. The journals are formed upon trunnions *g* and *g'*, which are supplied with pipe fixtures for introducing steam and fluids into, and withdrawing them from the digester. The bearing *e* is shown in Fig. 2 pivoted by a vertical stud *h* upon a block *i* fixed on the framing *d*, while the bearing *f* is shown mounted upon anti-friction rollers *j* fitted to a seat *k* upon the framing. The anti-friction rolls permit the longitudinal movement of the bearing *f'* when the space between the journals is increased by the expansion of the digester, and the pivoting of the bearing *e* permits the trunnion of such bearing to turn upon the framing when the digester is distorted, as sometimes occurs by unequal expansion at the opposite sides. Each journal is formed with a central bore *l*, and swivel caps *l'* connect pipes *m* and *m'* movably with the op-

posite journals, so as to supply fluid to or withdraw it from such bores.

A spray pipe *n*, bent in annular form, is fitted within the digester around the aperture of the manhole, and pipes *o* and *o'* are connected therewith and extended outside of the digester to the bores *l* in the trunnions *g* and *g'*. Passages *p* connect such pipes with the bore.

A perforated false bottom or strainer *q* is shown fitted within the shell of the digester opposite to the manhole, with a space between the same and the shell to receive fluid, and pipes *r* and *r'* connect such space respectively to the bores of the trunnions *g* and *g'*. Valves *o²* and *r²* are shown in the pipes *o'* and *r'*, and rotary plug cocks *s* and *s'* are shown inserted in the pipes *o* and *r* close to the trunnions, where their plugs are provided with gears *t* and *t'* of different sizes, to mesh with segmental gears upon the trunnion. Such segmental gears are shown in Figs. 7 and 8, and are formed with opposite segments *u* and *u'* adapted to mesh respectively with the gears *t* and *t'*. The teeth upon the segments are adapted to turn the cock one-half a rotation, the segmental gears being held stationary by a bracket *v* upon the framing *d*, as shown in Figs. 1 and 7.

The cock *s* is used to supply steam or chemical liquor, through the spray pipe *n*, to the material in the digester when an intermittent supply is desired, such fluid being preferably admitted when the digester is in the reverse direction to that shown in Fig. 1, with the spray pipe in the bottom, so that the fluid is ejected upward into the material.

The pipe *o'* may be used to supply a definite charge of fluid to the digester or may operate continuously.

The cock *s'* is used to introduce steam, liquor, or any other fluid under the screen below the mass of material, so as to force the fluid upwardly through the same, and the pipe *r'* is used with suitable suction upon the pipe *m'*, to withdraw the liquid from the receptacle; the strainer serving to drain the liquid from the material on its passage to said pipe.

The digester is shown provided upon the trunnion *g* with a worm-wheel A, and a worm B is shown mounted upon a shaft C which is sustained by brackets D upon the framing *d*.

Fig. 5 shows gearing to reverse the worm at diverse speeds so as to turn the digester in either direction, and at a greater or less velocity. The speed gearing consists of a reversing shaft *w* having bevel-gears *w'* adapted to shift upon the shaft, so that either meshes with a driving-pinion *w²*. Such pinion is shown connected with a shaft carrying sprocket-wheel *w³*.

A shaft E is shown coupled to the worm-shaft and provided with three speed-gears *x*, *x'* and *x²*, and the reversing shaft *w* is shown connected with corresponding gears *y*, *y'* and *y²*.

The gears y , y' and y^2 upon the drivers may be meshed in turn with the gears x , x' and x^2 , to drive the worm at three different speeds, and as such drivers are capable of reversal by the gears w' and w^2 , the digester may be turned in either direction at three different speeds.

The digester may be used in the treatment of wood, paper, straw and other materials in the manufacture of paper, and such materials may be treated in the rotary with chemical liquors, with steam, and such agents may be withdrawn through the pipe r' , and washing fluid inserted through the pipe o , r , or r' , so as to thoroughly free the material from any chemical agents before it is discharged.

The apparatus may be used for any purpose for which it is adapted, and as an illustration, one method of treatment with the digester may be practiced as follows:

A charge of material, as straw or wood chips suitably prepared for chemical treatment, is placed in the digester, and the chemical liquor required for the treatment is injected through the spray pipe n . Steam is then supplied through the spray pipe or through the strainer q to cook the material, the temperature being regulated by the pressure of the steam supplied. The digester is rotated by the gearing in one direction for a suitable length of time, and the direction of rotation is then reversed by reversing the driving-gear, so as to separate the particles which become matted together by a rotation in one direction. During the rotation of the digester, the steam within becomes condensed, and fresh steam is supplied through one of the cocks s or s' by connecting the pipe m with a steam boiler. If the cock s be opened the steam will, during half the revolution of the rotary, be injected through the spray pipe n above the mass of digesting material. If the cock s be closed and the cock s' be opened, the steam will upon the contrary be introduced one-half of the time during each rotation through the strainer q while upon the lower side of the receptacle, the steam thereon being forced upwardly through the material lying upon the strainer, and penetrating the same in every direction, thus thoroughly heating the mass and mingling the chemical liquor with the particles of material. When the material has been digested for a suitable period, the liquor can be drawn off through the pipe r , by checking the rotation of the receptacle with the strainer at the bottom, the cock r^2 being opened to discharge the liquor, and steam pressure being supplied through the spray pipe n to operate upon the surface of the material and expel the liquor therefrom by pressure.

By connecting the outlet in the trunnion g' with a receiving tank materially lower than the digester, the liquor flowing downward through a pipe to such tank operates as a siphon to produce a suction or partial vacuum under the strainer q which assists in the removal of the liquor from the material in the digester. When the liquor is thus drawn off, the material may be washed by closing all of the cocks except the cock s' and supplying washing water to the strainer during half of each rotation while at the bottom of the digester; so that the washing water is forced upwardly through the water, thus penetrating the same and effectually removing the remainder of the liquor. Such washing water is drawn off in the same manner as the liquor by opening the

pipe r' and supplying steam through the spray pipe n to press upon the surface of the material. When the material is washed and the wash water withdrawn, the digester may be inverted and the material discharged through the manhole b .

A latch z is shown in Figs. 7 and 8 attached to the spindle of the valves s and s' , and adapted to engage the spindle with either of the gears t or t' , thus varying the speed of rotation, and the number of openings of the cock during each rotation of the digester.

The injection of steam or other fluid into the digester at various points in the rotation may be regulated according to the requirements of the treatment.

Difficulty has heretofore been experienced in determining the water level within a rotary digester containing fiber and pulp, as such fiber or pulp is liable to enter the passages leading to a glass water-gage or gage-cock, and thus obstruct the movement of the fluid. In Fig. 1^a, I have shown a means of overcoming this difficulty in applying a glass water-gage to the shell of the digester, F representing the tube of the gage faced with plate glass F' , and connected by cocks G with apertures H at different levels upon the digester shell a . These apertures are screened by a perforated sheet metal screen I which extends not only over the apertures, but over the space between the same, thus forming a chamber within which the liquid may be strained from the pulp in the receptacle and thus circulate with freedom in the tube of the gage.

The various attachments described herein render the rotary fan more efficient in operating upon the material and greatly diminish the labor or attendance necessary to operate the same.

Having thus set forth the nature of the invention what is claimed herein is:

1. A rotary cooker having journals at opposite ends with bearings adapted to yield under the expansion and contraction of the cooker.
2. A rotary cooker having journals at opposite ends with a bearing upon one of said journals adapted to swivel horizontally to compensate for expansion of the cooker.
3. A rotary cooker having journals at opposite ends with a bearing upon one of the said journals having a bed with anti-friction rolls supporting the said journal to permit longitudinal movement.
4. A rotary cooker having journals at opposite ends with one of the journals held from longitudinal movement and a bearing from the opposite journal permitting longitudinal movement to compensate for expansion of the cooker.
5. A rotary cooker having journals at opposite ends with one of the journals held from longitudinal movement, a gear-wheel upon the trunnion adjacent to such journal, means for rotating such gear-wheel, and a bearing for the opposite journal permitting longitudinal movement to compensate for expansion of the cooker.
6. A rotary cooker having trunnions with journals at opposite ends, a manhole for inserting a charge in the cooker, means extended through the trunnion for supplying fluids to the charge within the cooker, and means for rotating the cooker at various speeds as required by the condition of the charge.
7. A rotary cooker having trunnions with journals at opposite ends, a manhole for inserting a charge in the cooker, means extended through the trunnion for supplying fluids to the charge within the cooker, and means for rotating the cooker in opposite directions at various speeds when required by the condition of the charge.
8. A rotary cooker supported on trunnions and having a manhole in one side for inserting a charge, a pipe extended into the cooker with connection through the trun-

nion to supply fluid to or withdraw it from the cooker, a valve in said pipe having a rotary plug with cog-wheel thereon, and a stationary cog-wheel held concentric with the movement of the cooker for rotating such valve when the cooker rotates.

5 9. A rotary cooker supported on trunnions and having a manhole in one side for inserting a charge, a pipe extended into the cooker with connection through the trunnion to supply fluid to or withdraw it from the cooker, a
10 valve in said pipe having a rotary plug with cog-wheel thereon, and a stationary segmental cog-wheel held stationary about the trunnion to rotate the valve intermittently when the cooker revolves.

10. The combination, with a rotary digester containing pulp or fiber mixed with liquor, of a glass water-gage having apertures extending through the shell of the digester at different levels, and a screen I extending over the apertures and over the space between the same, to form a chamber within which the liquid may be strained from the pulp and circulate in the tube of the gage.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

MICHAEL R. KENNEDY.

Witnesses:

PARLEY M. HAMMOND,
DAISON D. PURRINGTON.