

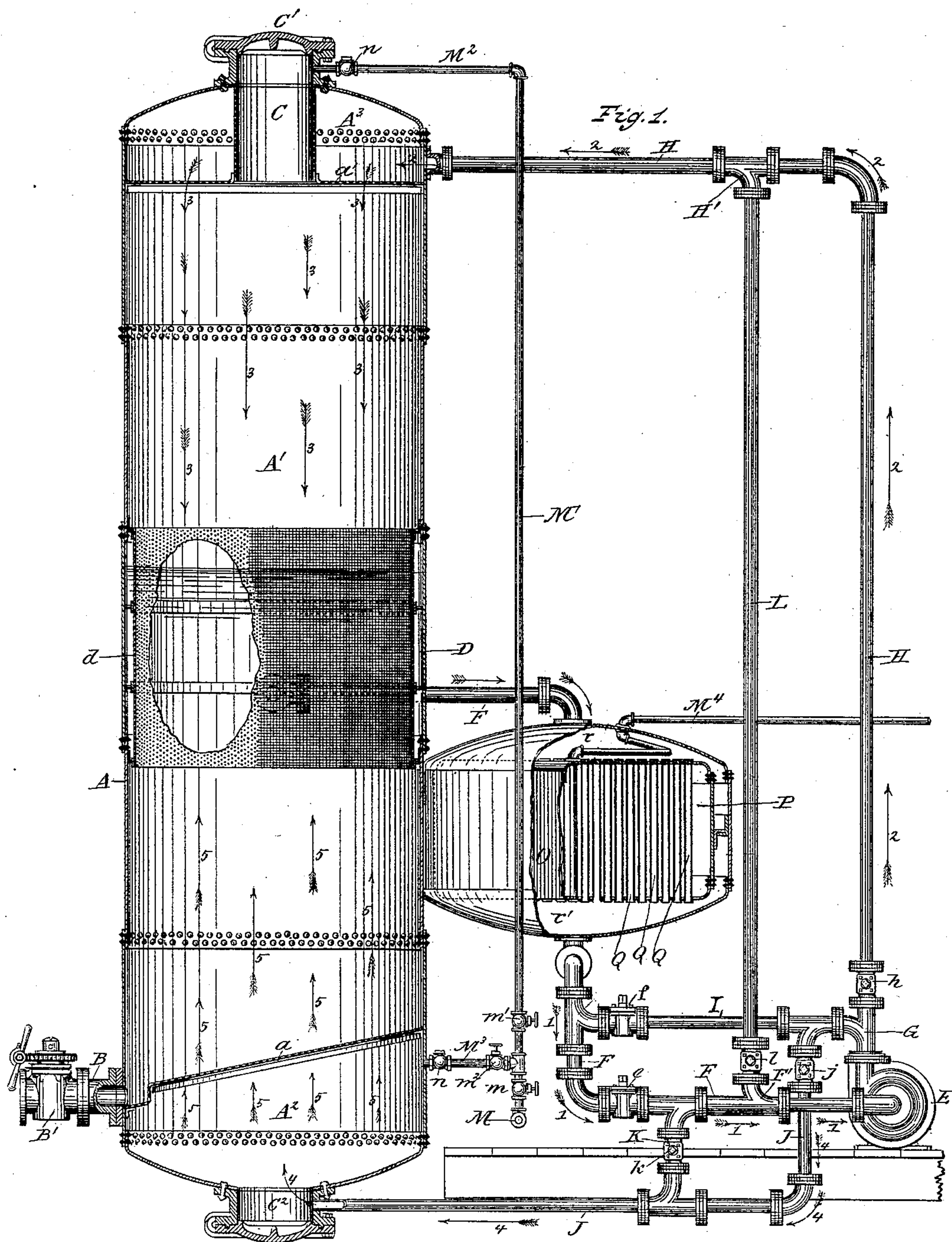
(No Model.)

2 Sheets—Sheet 1.

A. SELKIRK.
DIGESTING APPARATUS.

No. 487,784.

Patented Dec. 13, 1892.



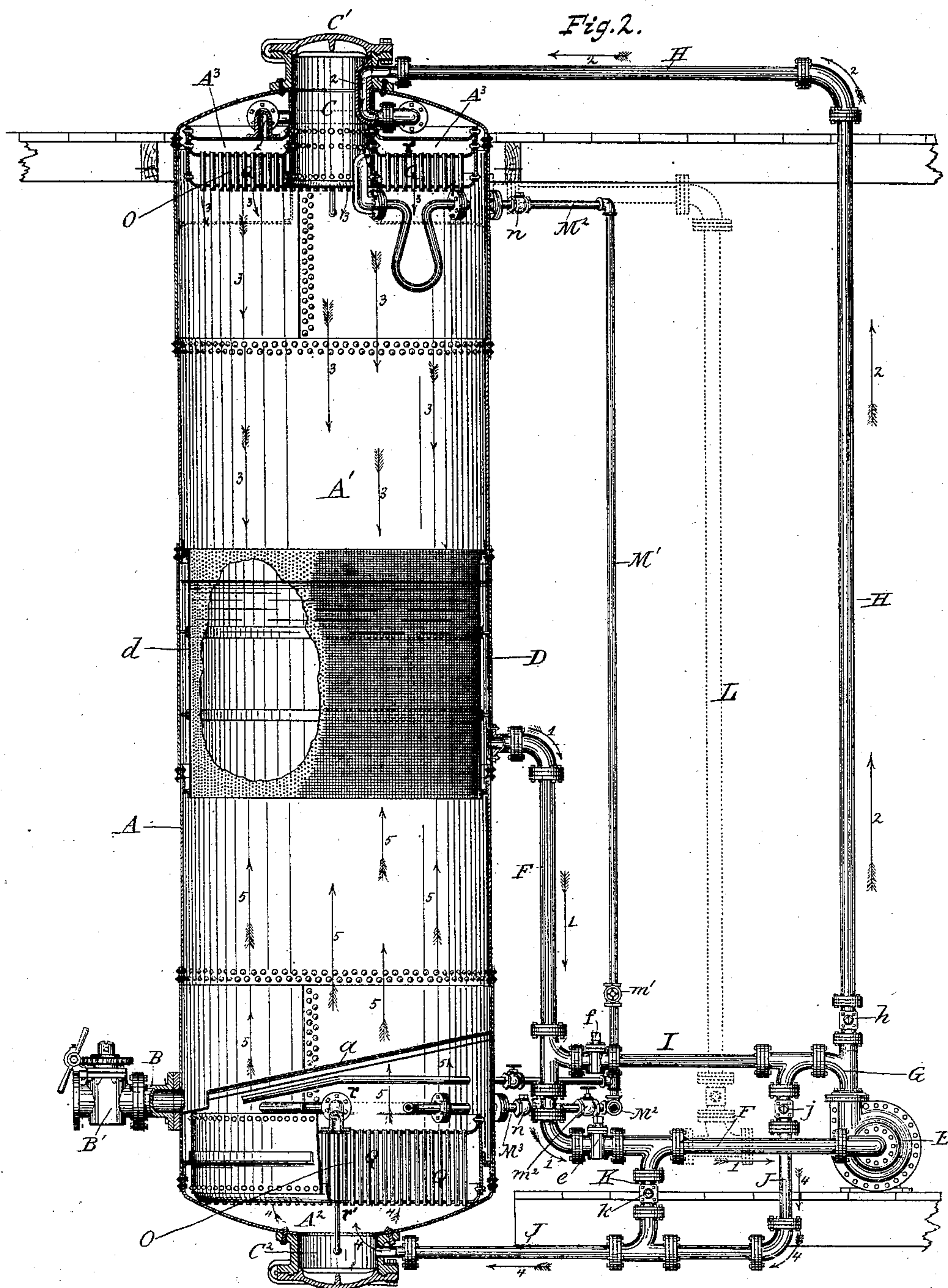
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Inventor.

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Inventor.

UNITED STATES PATENT OFFICE.

ALEXANDER SELKIRK, OF ALBANY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO
ROBERT WHITEHILL AND DANIEL WARING, OF NEWBURG, NEW YORK.

DIGESTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 487,784, dated December 13, 1892.

Application filed May 31, 1889. Serial No. 312,750. (No model.) Patented in Germany August 15, 1888, No. 46,940; in England August 16, 1888, No. 11,848; in France August 16, 1888, No. 192,466; in Belgium August 16, 1888, No. 82,939; in Norway August 20, 1888, No. 1,043; in Sweden August 21, 1888, No. 1,900, and in Austria-Hungary February 20, 1889, No. 33,742 and No. 54,310.

To all whom it may concern:

Be it known that I, ALEXANDER SELKIRK, a citizen of the United States, residing at Albany, in the county of Albany and State of New York, have invented certain new and useful Improvements in Digesting Apparatus, which apparatus may be used in the performance of a process for disintegrating vegetable substances, (for which I have obtained patents in the following countries, viz: Great Britain, No. 11,848, dated August 16, 1888; Austria-Hungary, No. 33,742 and No. 54,310, dated February 20, 1889; Germany, No. 46,940, dated August 15, 1888; France, No. 192,466, dated August 16, 1888; Belgium, No. 82,939, dated August 16, 1888; Norway, No. 1,043, dated August 20, 1888, and Sweden, No. 1,900, dated August 21, 1888,) of which the following is a specification.

My improvement relates to a digesting apparatus for the treatment of vegetable substances with cooking liquors and for dissolving the soluble portions of the same.

The object of this invention is to provide in connection with a digesting apparatus in which is maintained a dual circulation—such as is described and claimed in applications Serial No. 282,012, filed August 4, 1888, and Serial No. 312,749, filed May 31, 1889—means for heating the liquor during its passage or its return passage to the digesting-chamber without reduction of its strength; and to this end the invention relates especially to the digesting apparatus described and claimed in application Serial No. 312,749, filed May 31, 1889, above mentioned; and it consists in the several combinations hereinafter described and claimed.

In the accompanying drawings, forming part of this specification, Figure 1 represents my improved digesting apparatus with a liquor-heating device exterior to the digesting-vessel and connected with the same by means of a pipe-circuit and a pump which can be employed in the practice of this invention. Fig. 2 is a sectional elevation of the digesting apparatus embodying this invention and

illustrating a heating device contained within the digesting-vessel.

The same letters of reference refer to like parts throughout both the views.

In the drawings, A represents a digesting-vessel made of iron or steel, with its parts united together so as to resist an internal pressure of from sixty to one hundred and fifty pounds (more or less) of steam.

C is a manhole through which the material and treating liquor will be introduced, and C' is the cover of the same, secured in place by suitable bolts. C² is a similar manhole provided in the lower head of the digesting-vessel and provided with a suitable cover secured by bolts.

A' is the digesting-chamber.

A² is the lower liquor-chamber, and A³ the upper liquor-chamber, which chambers are separated from the digesting-chamber by suitable perforated plates or devices *a* and *a'*.

D is an annular liquor-chamber situated about midway between the opposite ends of the digesting-chamber and having its internal wall *d* perforated, so that the said chamber D will communicate with the digesting-chamber A'.

B is a blow-off opening at the bottom of the digesting-chamber and is provided with a cock or valve B'.

F is the liquor draft-pipe, communicating from the annular liquor-chamber D to the pump E and is provided with valve *e*.

G is a branch pipe having connection by its branches with the discharge-pipes H and J, which are provided, respectively, with valves *h* and *j* and communicating, respectively, with the upper and lower liquor-chambers A² A³, as shown.

I is a pipe connecting a branch of pipe G at the outlet of the pump with the draft-pipe F and is provided with valve *f*.

K is a pipe connecting horizontal limb of pipe F with the horizontal limb of pipe J and is provided with valve *k*.

L is a pipe, shown in Fig. 1 as connecting the horizontal limb of pipe H with horizontal

limb of pipe F and provided with valve L. This pipe L is indicated by dotted lines in Fig. 2 as connecting the horizontal limb of pipe F directly with the upper end of the digesting-vessel.

M is a live-steam pipe conducting steam from any suitable steam-generator (not shown) to the digesting-vessel. M' is a branch leading from the same and connecting with the pipes M² M³. These live-steam pipes are provided with valves *m*, *m'*, *m*², and *m*³ and are also provided with suitable check-valves *n*.

The above-described parts and elements form no part of this invention, but are the subjects of the applications for Letters Patent hereinbefore referred to.

In connection with the parts above described for producing the dual circulation of the liquor from the opposite ends of the digesting-chamber toward the middle portion the apparatus is provided with heating devices whereby the liquor may be heated and reheated during its circulation and its passage or return passage to the digesting-chamber and the temperature within the digester be maintained at any desired point throughout the cooking without reducing the strength of the liquor, as occurs when steam is directly supplied to the interior of the digester. As shown, these heating devices consist of a heater or heaters O. This heater is shown in Fig. 1 to be exterior to the digesting-vessel A, while in Fig. 2 are shown two heaters, contained one in each of the liquor-chambers. In either case they contain substantially the same elements for continuously reheating the treating liquor in its passage through the heated pipes of this heating device after being drawn from the digesting-chamber preparatory to being returned for circulation in dual currents through the charge. The essential elements in this heater are a heating-chamber P, containing the steam or other heating medium, and chambers *r* and *r'* on opposite sides of the heating-chamber, communicating with each other only through tubes or pipes Q Q, contained in the heating-chamber, in which liquor is heated during its passage, provision being made for the introduction and removal of the liquor to be heated and for effecting the circulation of the steam or other heating medium in the heating-chamber. The details of the construction of this heater need not be described herein, as they form no part of this invention and are the subject of a separate application, Serial No. 312,752, filed May 31, 1889, to which reference is made for a more full disclosure.

Although the heater and the arrangements shown are the preferred means for the purpose, other constructions may be used, many of which are well known and in common use for similar purposes. Another form of heater is shown by me in application for Letters Patent, Serial No. 282,012, filed August 4, 1888, and wherever the term "heater" is used in the description and claims of this case it

should be understood to mean and is intended to cover any heating device through which a stream of liquor may be passed and heated during its passage.

In Fig. 1 pipe F is shown to communicate from the annular liquor-chamber D to the upper chamber *r* in the liquor-heater O and the lower half portion of this pipe F as leading from the lower liquor-chamber *r'* in this heater to the inlet of the pump. In this arrangement of the heater O the liquor is drawn by the pump through the upper portion of the draft-pipe F into the upper chamber *r* within the outer shell R of the heating device O, and then through the series of liquor-pipes Q Q into the lower chamber *r'*, and then into the lower or horizontal portion of draft-pipe F and through the same to the inlet of the pump, to be discharged through the pipes H and J into the digesting-vessel, while in the arrangement shown in Fig. 2 this liquor-heater, located in the lower end of the digester, receives the liquor from the pipe J into the lower liquor-chamber *r'*, (in chamber A² of the digesting-vessel A,) from which it will have passage upwardly through the pipes Q Q into the chamber *r* above (and also contained in the chamber A² of the digesting-vessel) and then have passage upwardly through the perforated bottom *a* of the digesting-chamber to circulate upwardly through the latter, and the heater shown in the same figure at the upper end of the digester receives the liquor from the pipe H into the chamber *r* and discharges it from the tubes Q either directly on the mass of material in the digester or upon the perforated plate, (indicated by dotted lines,) which will deliver the liquor to the charge. In each of these arrangements the operation is substantially the same, the liquor in each case being forced through heating devices during its passage from the annular liquor-chamber D to the opposite ends of the digesting-vessel.

By my above-described improvements the treating liquor to be circulated through the mass of material within the digesting-chamber can be heated to a temperature corresponding with a steam-pressure of from sixty to one hundred and twenty pounds, more or less, as the nature of the material treated may require, and this treating liquor (by the action of the pump and the circuits of pipes F, H, and J) will be drawn from the annular chamber D (at about the middle of the digesting-vessel) and be forced to have passage through the liquor-heating devices, and under the force of the pump the liquor thus heated will be forced into the opposite ends of the digesting-chamber, and thence be circulated one portion upwardly through the interstices between the particles of the material of the lower half of the charge and another portion downwardly through the upper half of the same and drawn into the annular chamber D, and from thence be returned through the liquor-heating devices and the pipes to

be again reheated and again circulated with like dual circulation through the material as above described. I desire it to be understood that I do not limit myself to the particular arrangement or circuits of pipes shown by which a circulation of the treating liquors is had through the heating device and through the mass of material in the digesting-chamber with a dual circulation after being heated, as it is obvious that the parts of the heating device and also of the circuits of pipes may be changed without departing from this invention. Instead of a single pump being employed for producing the two directions of circulation of the liquor through the liquor-chamber two pumps can be employed, one pump (with a suitable circuit of pipes) for drawing the liquor from the annular chamber at midway between the ends of the digesting-chamber and forcing the same through heating devices and thence into the digesting-chamber at its lower end to be circulated upwardly through the material and another pump (and another suitable circuit of pipes) also drawing from the said annular chamber and passing the liquor through heating devices and thence into the upper end of the liquor-chamber to be sprayed down on the material for saturating the same in the upper half portion of the digesting-chamber.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a digesting apparatus, the combination, with a digesting-vessel containing a digesting-chamber, an annular liquor-chamber which is relatively between the ends of the digesting-chamber and separated therefrom by a perforated annular wall, and a liquor-chamber communicating with the lower end of said digesting-chamber by a perforated plate, of a circuit of pipes communicating from the outlet of the said annular liquor-chamber to the respective opposite ends of the digesting-vessel, a pump in said circuit of pipes, and a liquor-heating device between the outlet of the said annular liquor-chamber to the pipe-circuit and the inlets of the said circuit to said digesting-chamber for receiving

and heating the liquor before its final passage into the said digesting-chamber, substantially as and for the purposes set forth.

2. In a digesting apparatus, the combination, with a digesting-vessel having a digesting-chamber and a perforated wall supported about midway between the ends of said vessel from the solid wall of the same and forming with said solid wall an annular chamber, of a circuit of pipes connecting the said annular chamber with the respective opposite ends of the digesting-vessel, a pump inducing through said pipe-circuit a dual circulation of the liquor through the digesting-chamber from its ends toward its middle portion, and a heating device or devices interposed in the pipe-circuit and between the outlet from said annular chamber to said pipe-circuit and the opposite ends of the digesting-vessel for receiving and heating the liquor before it is applied to the charge from the opposite ends thereof, substantially as and for the purposes set forth.

3. In a digesting apparatus, the combination, with a digesting-vessel which has an annular liquor-chamber at about midway between its ends, liquor-chambers respectively in its opposite ends, and a digesting-chamber communicating with said annular liquor-chamber through a perforated annular wall and with the respective end liquor-chambers through perforated plates, of a pump, a pipe leading from said annular liquor-chamber to the inlet of the pump, discharge-pipes leading from the outlet of the pump to the respective opposite end liquor-chambers, and a liquor-heating device interposed in the circuit of pipes and located outside of the digesting-vessel and through which the liquor will be forced by the action of the pump to have passage before being discharged into the opposite end liquor-chambers for a dual circulation through the charge, substantially as and for the purposes set forth.

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Witnesses:

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CHARLES SELKIRK.