

No. 612,341.

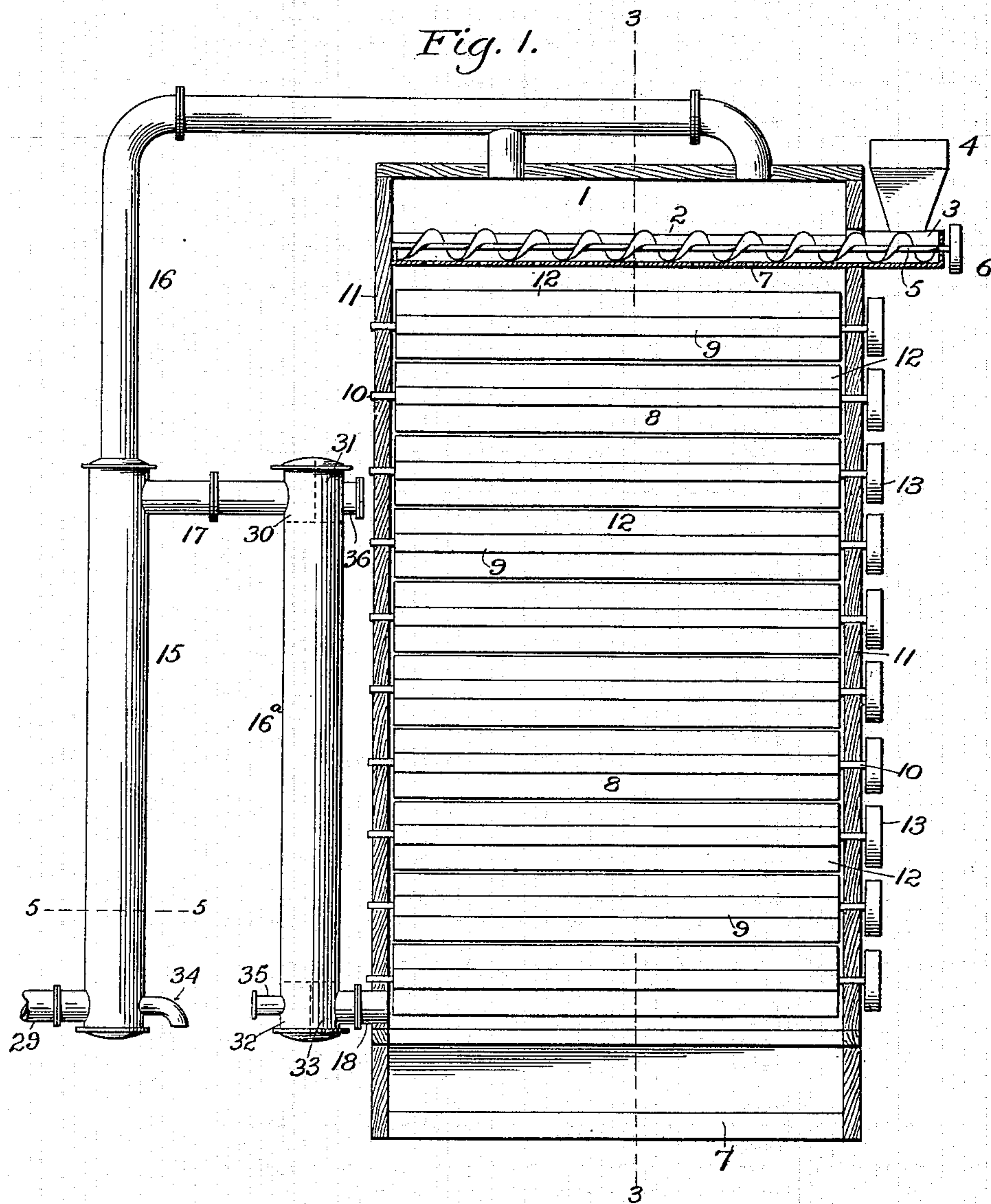
Patented Oct. 11, 1898.

B. J. HOBSON.
DRIER.

(Application filed Feb. 10, 1897.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES
James F. Duhamel
A. M. Ogden

INVENTOR,
BEN J. HOBSON,
By John Hedderburn
Attorney

No. 612,341.

B. J. HOBSON.
DRIER.

Patented Oct. 11, 1898.

(No Model.)

(Application filed Feb. 10, 1897.)

2 Sheets—Sheet 2.

Fig. 2.

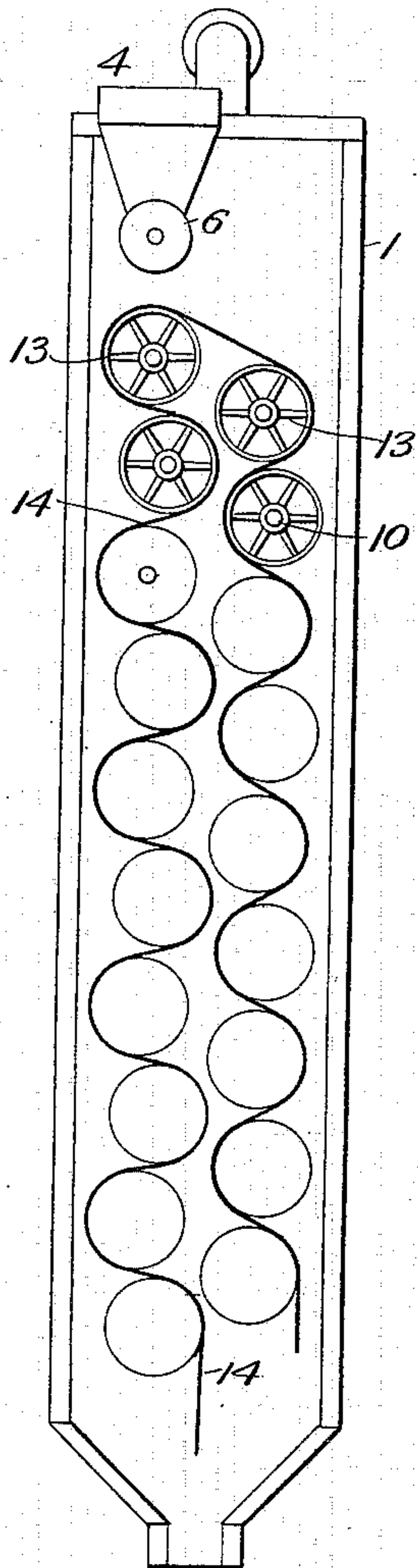


Fig. 3.

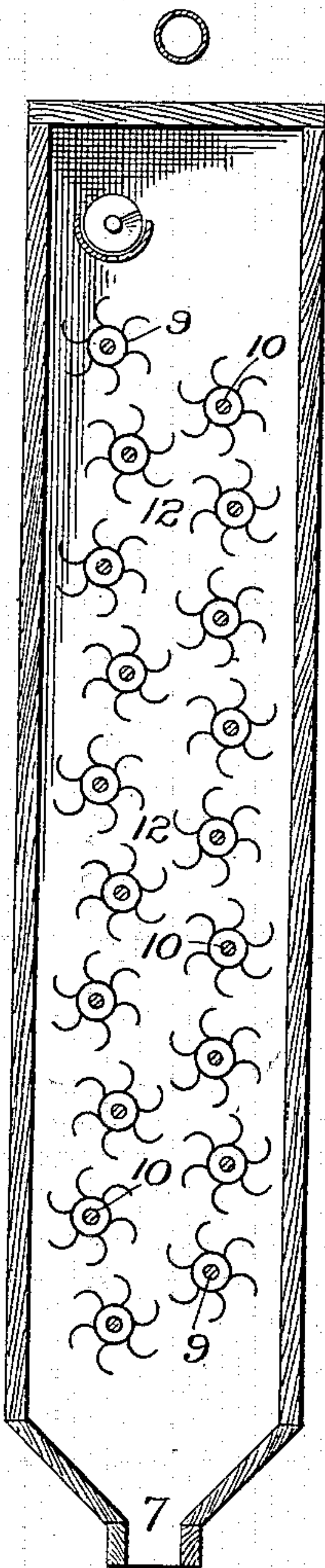


Fig. 4.

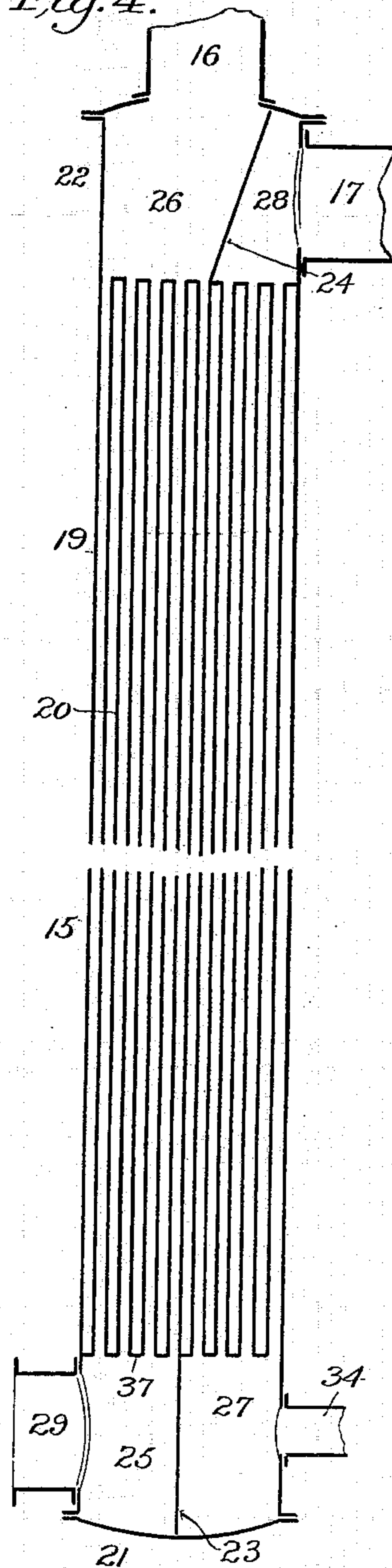
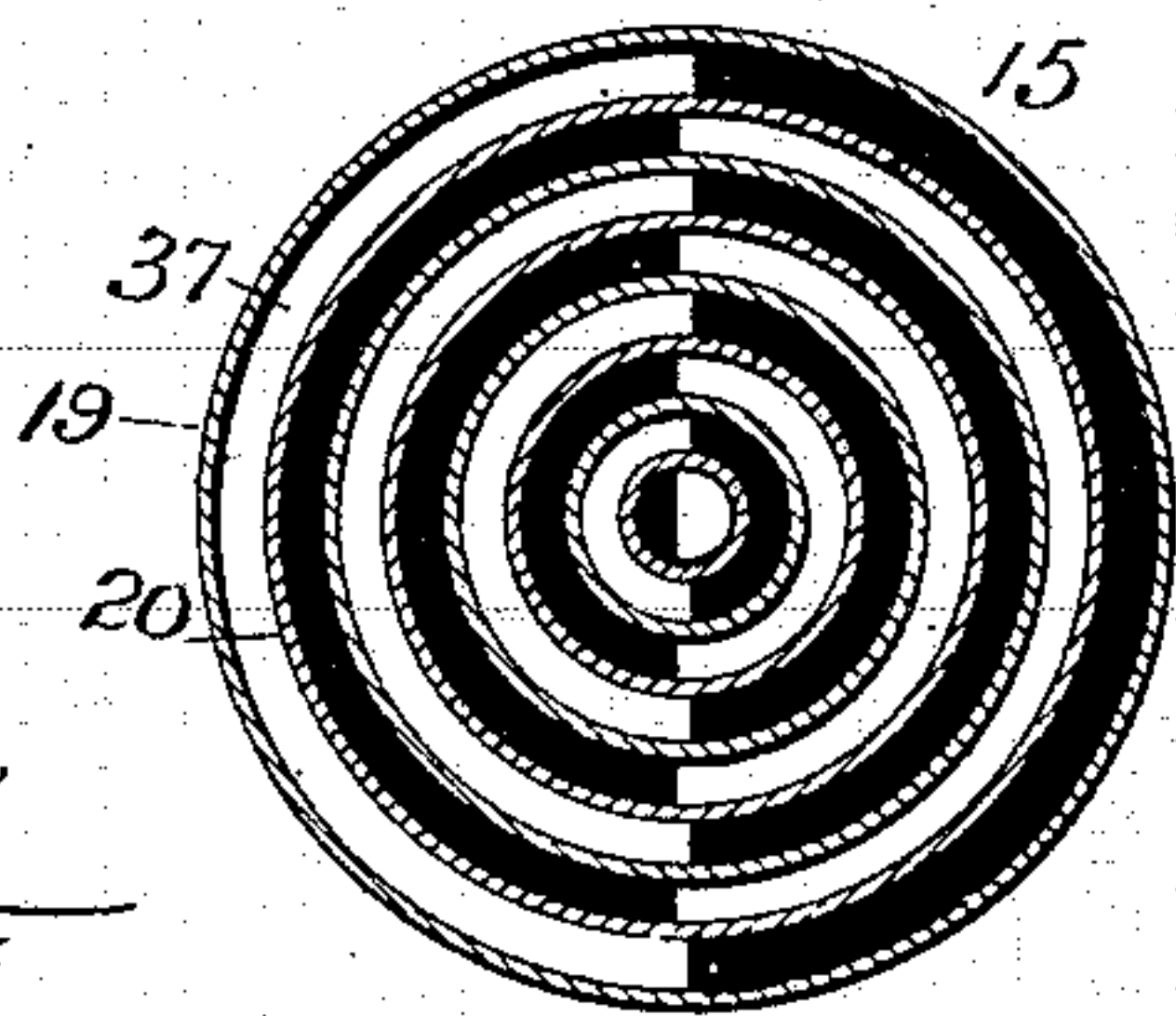


Fig. 5.



WITNESSES

James F. Duhamel
A. M. S. S. S. S.

INVENTOR,

BEN J. HOBSON,
By John Shepherdson
Attorney

UNITED STATES PATENT OFFICE.

BEN J. HOBSON, OF CINCINNATI, OHIO.

DRIER.

SPECIFICATION forming part of Letters Patent No. 612,341, dated October 11, 1898.

Application filed February 10, 1897. Serial No. 622,758. (No model.)

To all whom it may concern:

Be it known that I, BEN J. HOBSON, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Driers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it ap-
10 pertains to make and use the same.

My invention relates to improvements in a drying apparatus, and has for its object to produce a drying apparatus and means whereby heated air passed to the drier is heated
15 initially by the hot air escaping from the drier and is further heated by a circulation of hot water, waste steam, or the like, whereby the water or steam usually escaping from factories and ordinarily wasted is utilized for
20 the purpose of developing heat units to be utilized in the drying process.

To the accomplishment of these and other objects my invention consists in the combination, with a drier, of a novel construction of
25 heating apparatus designed to enable the air to be initially heated by the current of air from the drier, and, further, by an intercircuitation with waste fluid at a high temperature, as hereinafter described and claimed.

30 In the accompanying drawings, forming a part of this specification, Figure 1 is a general view of my apparatus complete. Fig. 2 is an end view of the drier, showing the manner of gearing the agitator-shaft pulleys.
35 Fig. 3 is a section on the line 3 3 of Fig. 1, and Fig. 4 is a vertical section of the initial heater. Fig. 5 is a section on the line 5 5 of Fig. 1, but on a somewhat enlarged scale.

Referring to the numerals on the drawings,
40 1 indicates a drier of any suitable size or shape provided near its upper end with a horizontal conveyer-casing 2, surmounted at its extremity 3 upon the outside of the drier by a suitable hopper 4.

45 5 indicates a spiral conveyer within the conveyer-casing and provided upon the extremity of its shaft beyond the end of the casing with a pulley 6 for imparting rotary movement thereto.

50 7 indicates the outlet-opening, extending across the bottom of the conveyer and of comparatively small size.

8 indicates a series of agitators extending entirely across the drier and arranged in double alternating rows, as clearly illustrated
55 in Fig. 2 of the drawings. The agitators 8 constitute an important feature of my invention, and a detail description is therefore necessary to a comprehensive understanding of the operation of the device. The agitators
60 are arranged as described, consisting, preferably, of elongated cores 9, from the opposite ends of which project the agitator-shaft 10, journaled in suitable bearings in the end
65 walls 11 of the drier.

12 indicates what I will call the "agitator-flanges," which are coextensive longitudinally with the cores and extend therefrom tangentially, being curved in cross-section in
70 a suitable degree substantially semicircular. Each core is provided with the desired number of flanges, which are obviously varied, according to the nature of the material to be
dried.

13 indicates a series of agitator-pulleys arranged upon one extremity of each of the agitator-shafts and designed to be actuated alternately in opposite directions by a belt 14,
75 passing alternately around the opposite sides of the pulleys of one row and back in reverse order around the opposite sides of the alternate pulleys of the second row and deriving
80 its power from any suitable source. (Not illustrated.) It will thus be seen that material fed into the hopper 4 will be carried within the
85 spiral casing 2 by the conveyer 3 and will be precipitated upon the adjacent agitators, the flanges of which will receive the material and will deposit it upon the oppositely-rotating
90 agitator therebelow, which in turn will pass it to the succeeding agitators in like manner. The material will in this manner be thoroughly loosened or agitated to enable hot air
95 passed through the drier in a manner to be described to perform its office with facility and economy.

15 indicates what I will call an "initial" heater, communicating at its upper end with an exhaust-pipe 16, leading from the upper end
100 of the drier, and with the upper end of the secondary heater 16^a through a connecting-pipe 17, the secondary heater communicating at its lower end through a supply-pipe 18 with the interior of the drier, preferably near its

bottom. The initial heater 15 consists of a preferably cylindrical casing 19, within which are arranged a suitable number of concentric tubes 20, extending to within a suitable distance of the top and bottom of the casing to define terminal chambers 21 and 22 therein, which are subdivided by the transverse partitions 23 and 24, which subdivisions constitute ingress-chambers 25 and 26 at the opposite ends and upon the same side of the heater, and egress-chambers 27 and 28 upon the side of the heater opposite the ingress-chambers.

29 indicates an air-supply pipe leading from a suitable blower and communicating with the ingress-chamber 25, from which it is designed to pass through certain of the tubes 20 to the egress-chamber 28, located at the opposite end and upon the opposite side of the heater, from whence it is designed to pass through the connecting-pipe 17 to the ingress-chamber 30, located at one extremity of the secondary heater, the construction of which is identical with the construction of the initial heater and will not, therefore, be described with the same attention to detail. There is a series of concentric tubes within the secondary heater 16^a, constructed and arranged in a manner identical with the construction and arrangement of the tubes 20 and of proper length to accommodate ingress and egress chambers 30 and 31 at the upper extremity of the heater and ingress and egress chambers 32 and 33 at the opposite extremity of the heater arranged in a manner corresponding to the arrangement of similar chambers in the initial heater. The air which is led into the ingress-chambers 30 of the secondary heater in the manner described passes through the secondary heater within certain of the tubes and finally escapes through the egress-chamber 33 and pipe 18 to the interior of the drier, being heated initially by the hot air passing through the initial heater in an opposite direction and entering said heater from the exhaust-pipe 16 and passing thence through the tubes, alternating with those through which the air is passing through the drier, finally escaping from the exhaust-chamber 27 through the initial heater exhaust-pipe 34. The air supplied from the blower and heated within the initial heater by the advance circulation or the exhaust-air from the drier passes from the initial heater, as described, to the secondary heater, where its temperature is raised to the required point by the circulation through the secondary heater of hot water, exhaust-steam, or the like entering through the hot-water-supply pipe 35 and passing through the chamber 32, certain of the tubes, the egress-chamber 31, and finally overflowing through an overflow-nozzle 36.

It will appear that I have produced an apparatus through which air is adapted to circulate and provided with means for heating the air by means of waste water or steam and

for causing the air so heated in passing from a drying-chamber to initially heat the air within the circulating system before it reaches the secondary heater on its way to the drying-chamber. In other words, I have produced a circulating system doubling upon itself and provided with heating means whereby the heat imparted to one portion of the circulating fluid is made to impart its heat to another part of the same circulation.

Having now described my apparatus generally and in detail with respect to certain portions thereof, I shall now proceed to a description of the construction of the initial heater by which I am enabled to pass the fluid therethrough in opposite directions and diagonally through a series of concentric tubes for the purpose of equalizing the temperatures of the oppositely-flowing liquids.

The partitions 23 and 24 extend between the ends of the heater-casing 19, and the ends of the tubes 20 have perfectly air-tight connection with both. The space between the tubes on one side of the partitions—we will say, for instance, within the chamber 25—are alternately closed, as by substantially semicircular plates 37. In like manner the opposite ends of the tubes upon the same side of the casing—namely, in the ingress-chamber 26—are closed by plates similar to the plates 37, but arranged alternately therewith in order that, as will be evident, the air passing into the open ends of the tubes within the chamber 25 cannot find egress into the chamber 26. The ends of the tubes within the chambers 27 and 28 are closed by the same means, the open tubes within the casing 27 corresponding to the open tubes within the casing 26, and the open tubes within the chamber 25 corresponding in like manner with the unobstructed tubes leading into the egress-chamber 28. The air from the blower will consequently pass into the alternate tubes through one-half of their end openings, and will thence pass to the chamber 28 at the opposite side and end of the initial heater, finding egress through the connecting-pipe 17 to the secondary heater, through which it passes from the chamber 30 to the chamber 33. The current of exhaust-air from the pipe 16 will likewise pass into the chamber 26 through the tubes alternating with those containing the air from the blower, and will find egress through the chamber 27 and pipe 34, initially heating, as before suggested, the current of air passing through the blower to the secondary heater, within which latter it is secondarily heated by a current of hot water, exhaust-steam, or the like passing through the pipe 35 to the chamber 31 and overflowing at the nozzle 36.

I do not desire to limit myself to the details of construction herein shown and described, but reserve to myself the right to change, modify, or vary such details within the scope of my invention.

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

1. In a heater designed for use in connection with an apparatus of the character described, the combination with a casing, of a series of concentric tubes within said casing, transverse partitions within the casing beyond the ends of the concentric tubes, and the means for closing the openings between the tubes alternately upon opposite sides of the partitions, substantially as specified.

2. In a heater designed for use in connection with an apparatus of the character described, the combination with a casing, of a series of concentric tubes within said casing,

transverse partitions between the opposite ends of the casing and the adjacent extremities of the tubes, means for closing the openings between the tubes alternately upon opposite sides of the partitions, and ingress and egress openings at each end of the casing respectively and upon opposite sides of the partitions, substantially as specified.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

BEN J. HOBSON.

Witnesses:

HARRY H. FULLER,
GEO. F. AHLERS.