(No Model.) 3 Sheets—Sheet 1.

J. F. BEHN & G. A. WEGNER.

CONGEALER FOR ICE MAKING MACHINES.

No. 505,588. Patented Sept. 26, 1893.

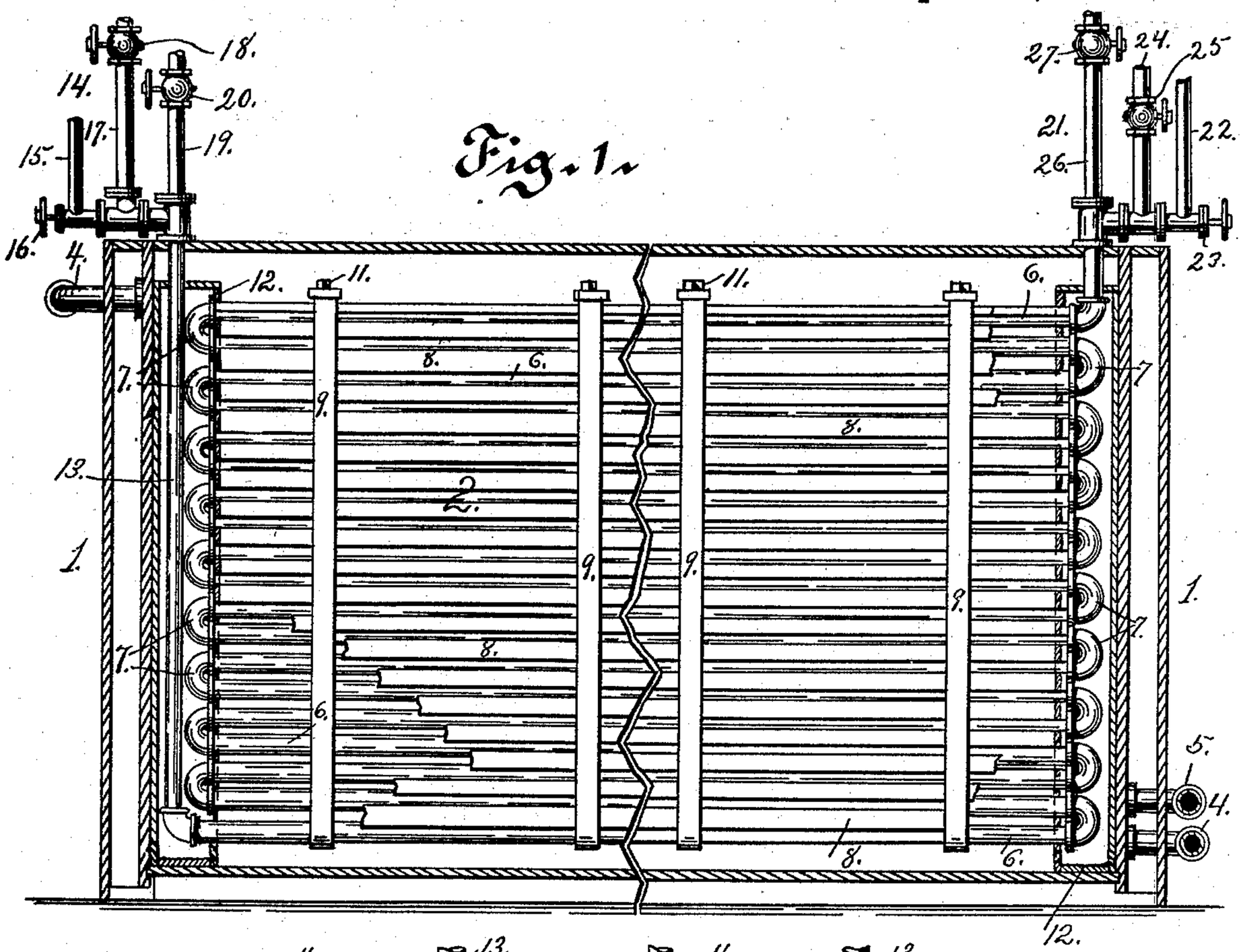

Fig. 1.

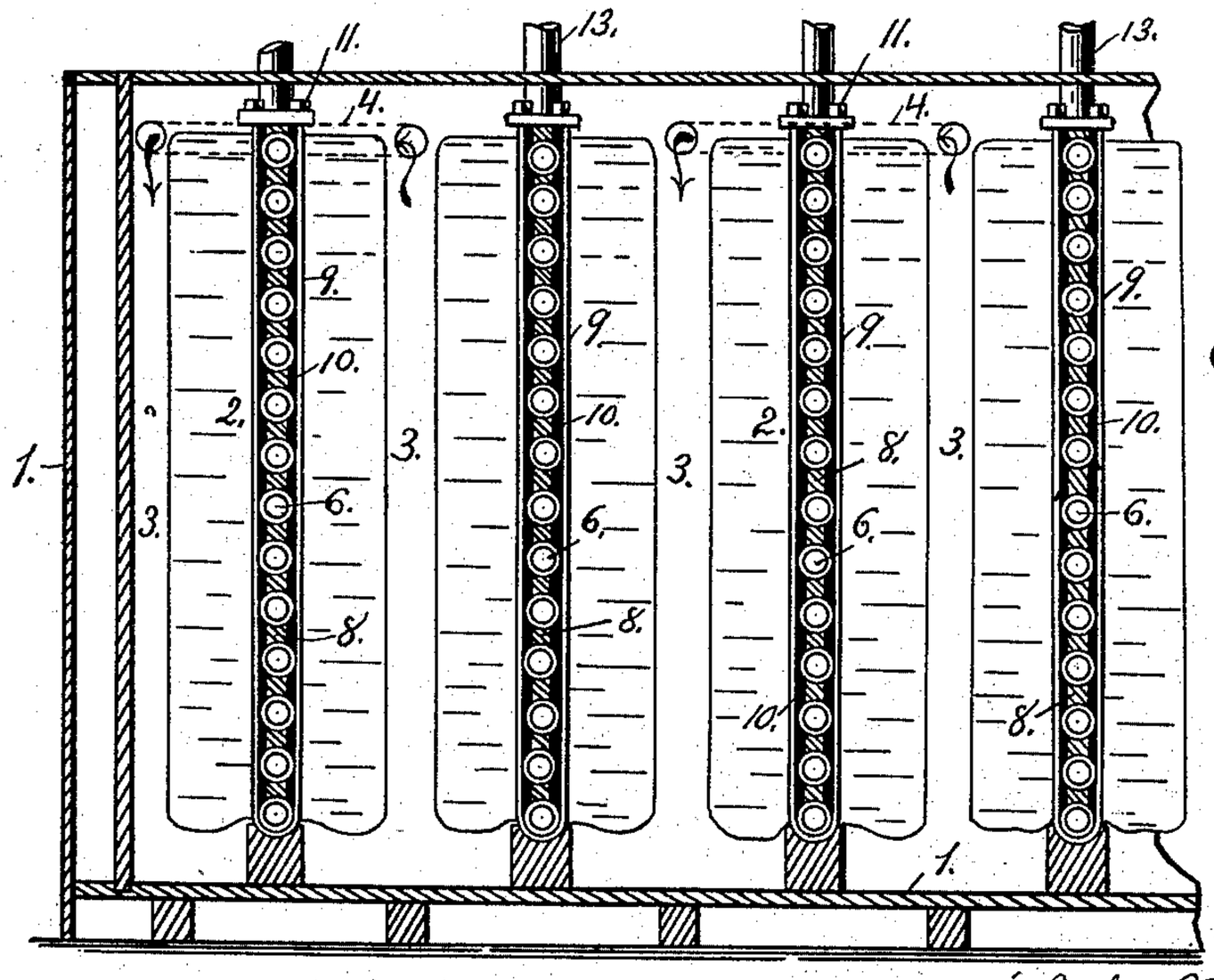

Fig. 2.

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By their Attorneys, Miller and Hoddick.

(No Model.) 3 Sheets—Sheet 2.

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Fig. 3.

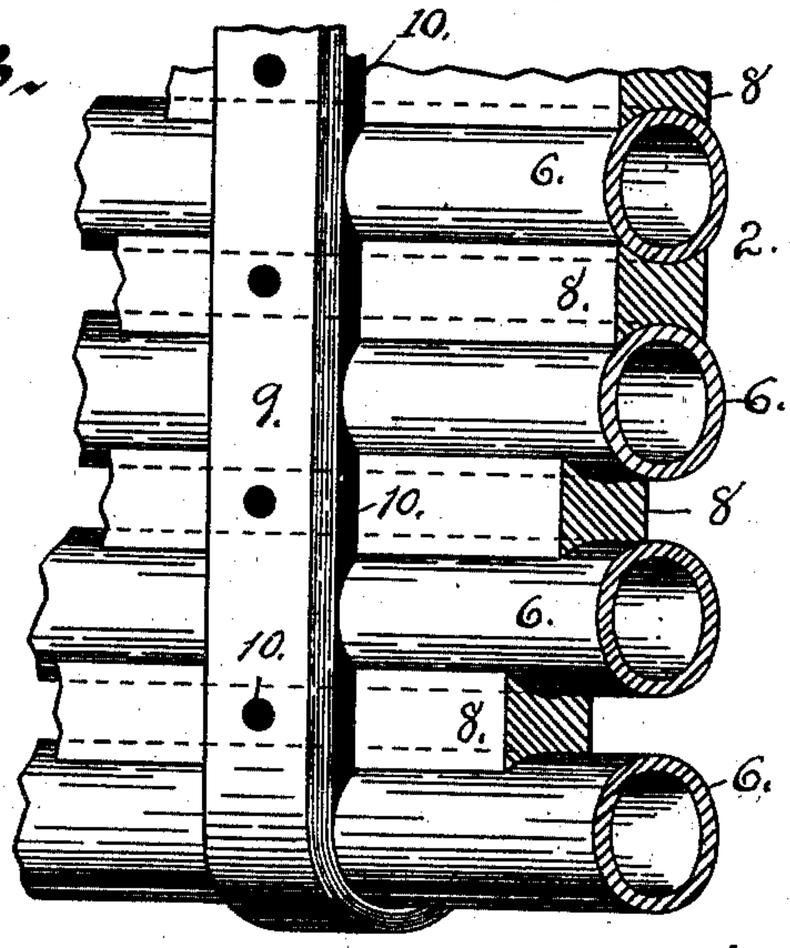


Fig. 4.

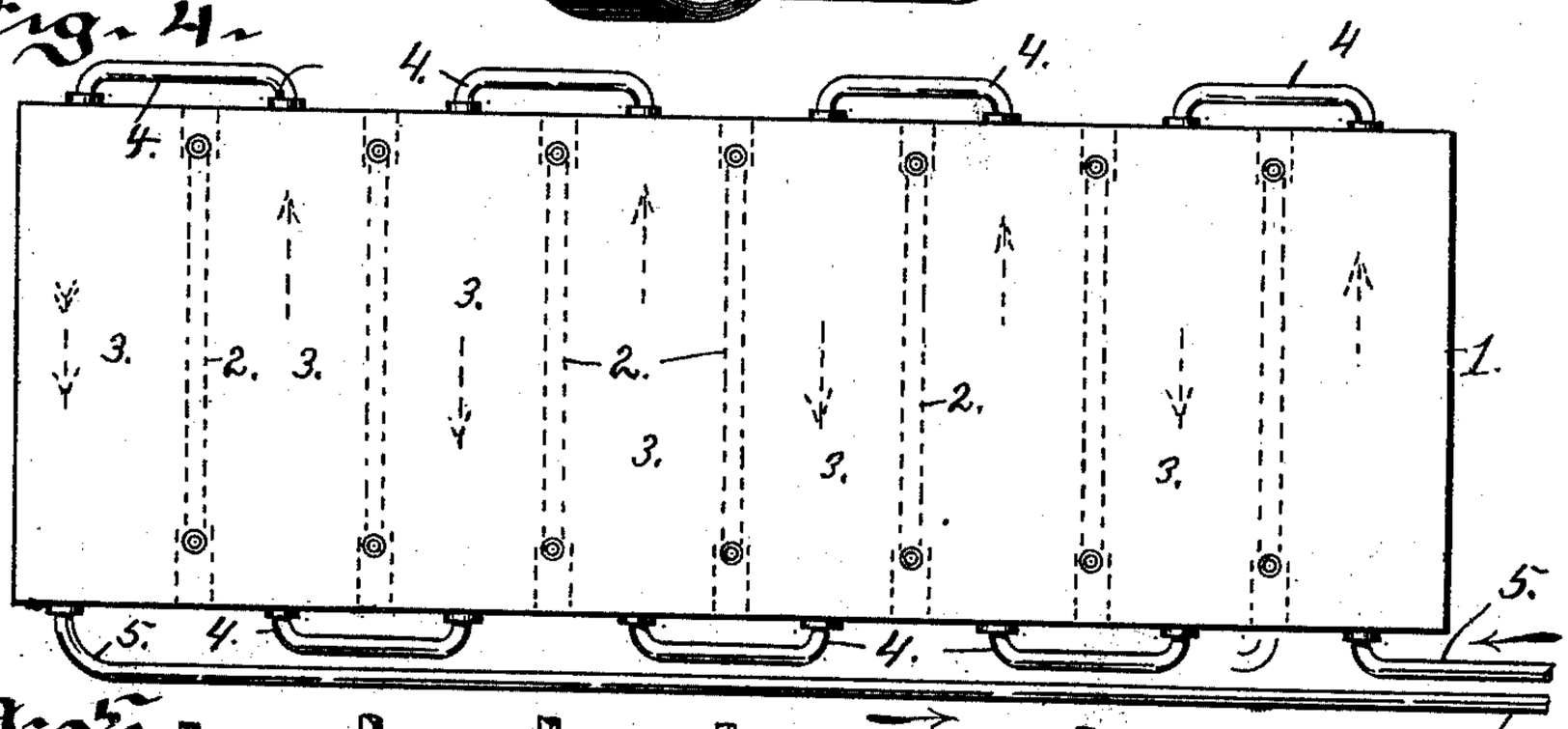
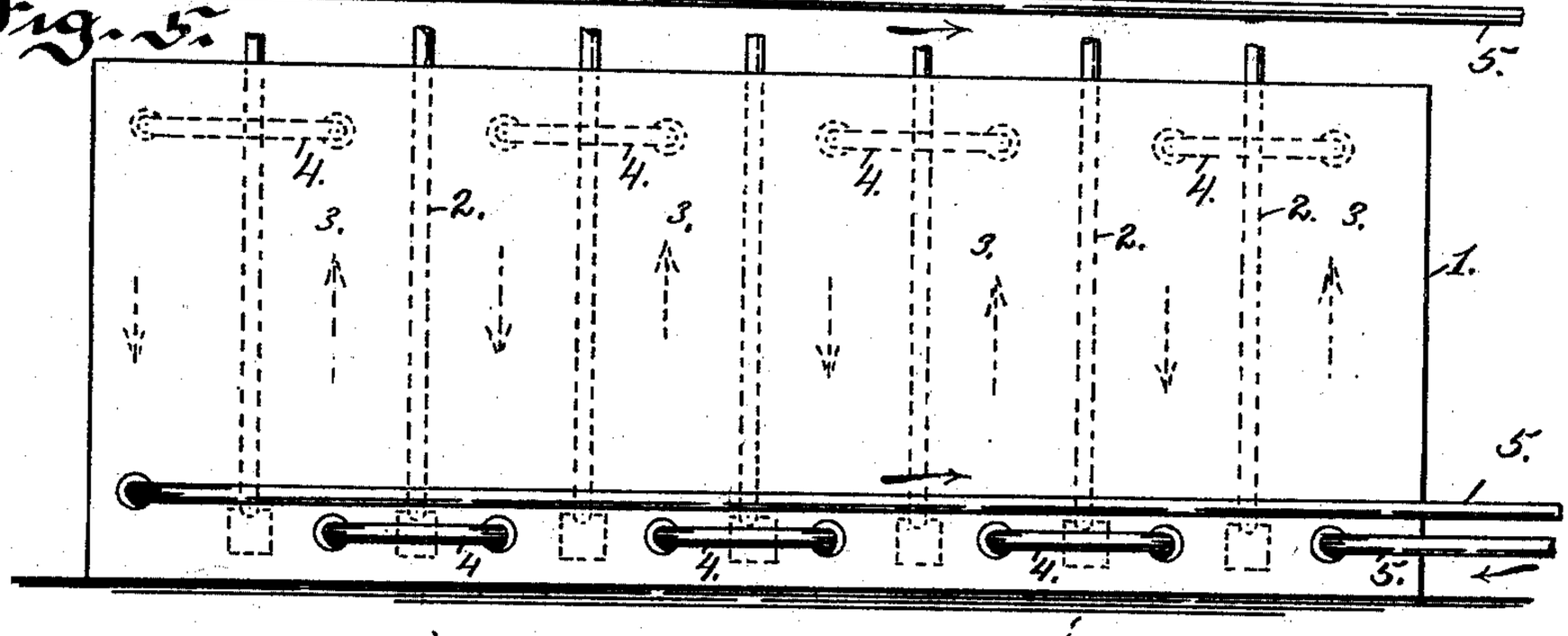


Fig. 5.



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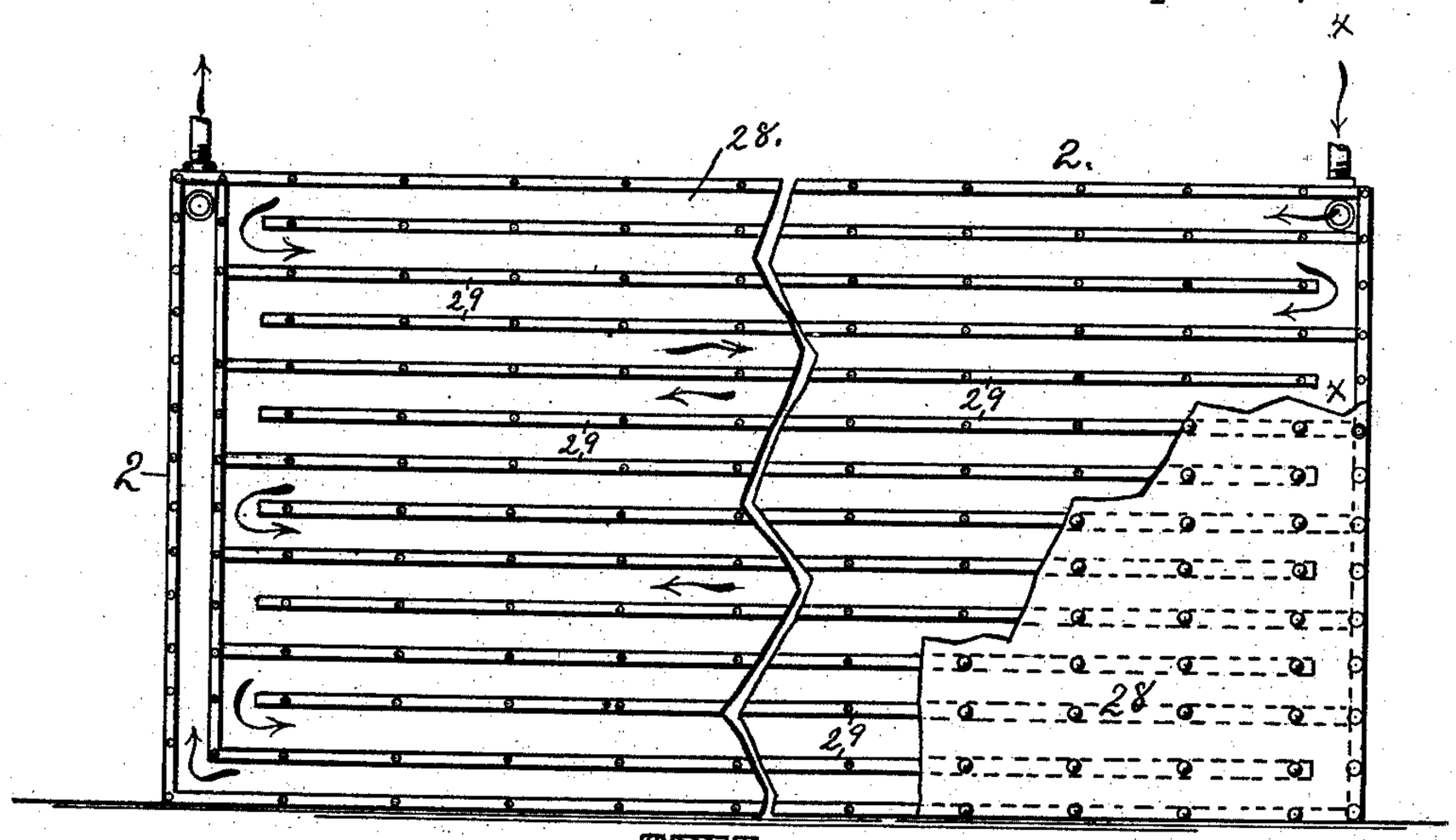

Fig. 7.

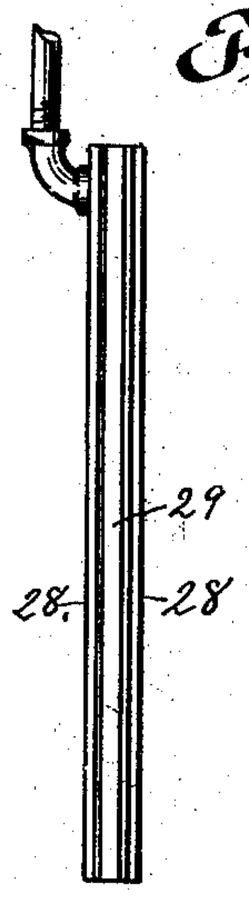

Fig. 8.

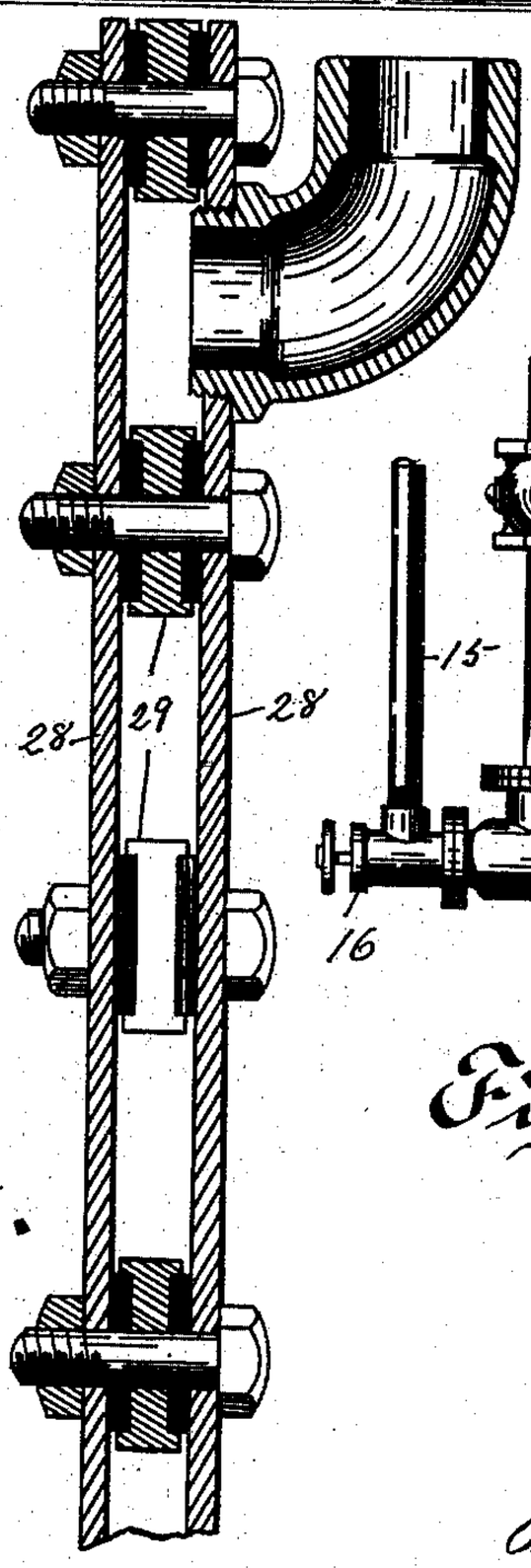

Fig. 9.

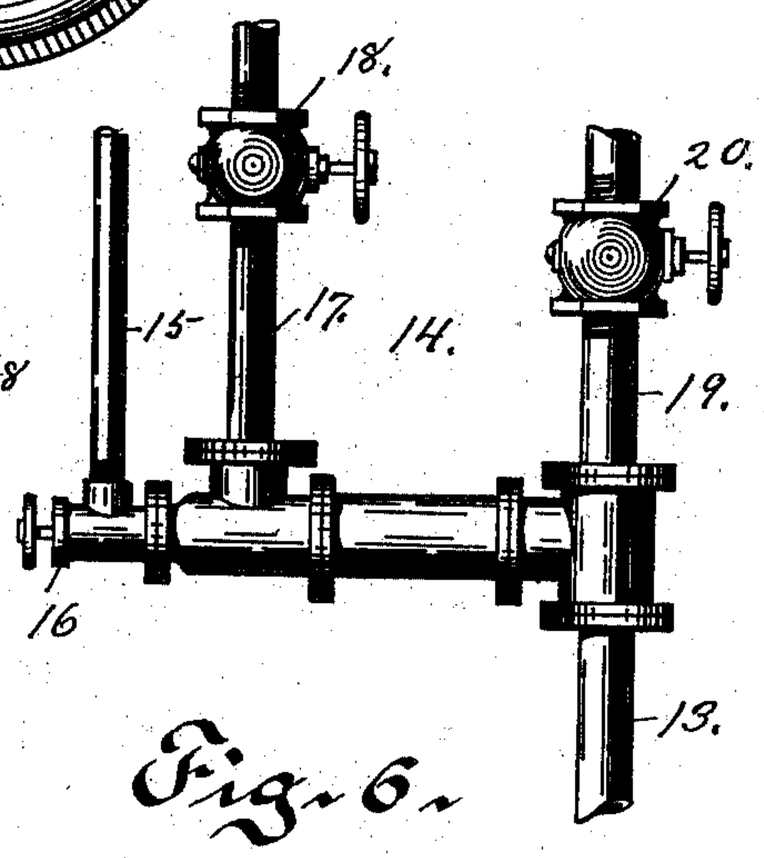

Fig. 6.

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UNITED STATES PATENT OFFICE.

JOHN F. BEHN AND GUSTAVUS A. WEGNER, OF BUFFALO, NEW YORK.

CONGEALER FOR ICE-MAKING MACHINES.

SPECIFICATION forming part of Letters Patent No. 505,588, dated September 26, 1893.

Application filed February 18, 1890. Serial No. 340,898. (No model.)

To all whom it may concern:

Be it known that we, JOHN F. BEHN and GUSTAVUS A. WEGNER, citizens of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Congealers for Ice-Making Machinery; and we 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 appertains to make and use the same, reference being had to the accompanying drawings, and to figures of reference marked thereon, which form a part of this specification.

Our invention relates to improvements in congealers for ice machines and more particularly to that form of congealer in which the artificial ice is formed on plates.

We are aware that various kinds of freezing plates have been employed, the majority of which consist of pipe coils inclosed within a hollow plate, said plate being filled with a non-congealable liquid (such as salt solution, &c.) and a volatile-gas being expanded within said pipe-coils.

Our invention dispenses entirely with the non-congealing liquid and auxiliary plate thus bringing the pipe coil or plates in which the volatile liquid is expanded in more direct contact with the water to be congealed. We are also aware that several attempts have been made in this direction none of which however having been proved successful.

Our invention consists of a series of gas-tight pipe-coils, or hollow plates through which a volatile-gas is circulated and expanded, said coils or plates being placed within a tank or receptacle containing the water to be congealed which water is given an artificial agitation.

It further consists in the arrangement of the feed, discharge or suction, and hot-gas pipes (with their operating valves,) connected to each end of the pipe-coils or hollow plates which enables us to make ice of an equal thickness throughout the entire area of the plate without loss of time or adding to its expense. By this peculiar arrangement we are also able to quickly detach the ice (after being formed) from the coils or plates.

We will now proceed to definitely describe the manner in which we have carried out our invention.

In the drawings: Figure 1, is a vertical cross-section of a congealer showing one of our improved coils forming a plate in position. Fig. 2, is a partial vertical longitudinal section of the same showing several freezing-plates in position. Fig. 3, is a detail view showing the construction of our improved freezing plate when pipe-coils are employed. Figs. 4 and 5 are a top view and side elevation respectively of the congealer to show the arrangement of apparatus for the artificial agitation given to the water to be congealed. Fig. 6, is a detail view of one of the feed, suction, and hot-gas connections. Fig. 7, is a side elevation of a modified form of freezing plate partially broken away to show construction. Fig. 8, is an end view of the same and Fig. 9, is a detail view showing the construction of the modified form.

Referring to the drawings: (1) is a congealer in which is placed a series of freezing-plates (2), at suitable distances apart forming the water compartments (3). These compartments (3) are connected to each other by the pipes or passages (4), and the compartments at the ends of the congealer are connected by a pipe or passage (5) which pipe is connected to a pump (not shown) for giving motion or agitation to the water passing from one compartment to the other, this being the water to be congealed; for instance, the water enters the first compartment to the right (see Figs. 4 and 5) through the pipe (5) at or near its bottom on one side and passes out at or near its top on the opposite side entering the next or adjoining compartment on the same level, the water passing out of this compartment at or near its bottom on the opposite side and leading to the next compartment and so on until it reaches the compartment at the opposite end of the congealer where it passes into the pipe (5). By means of this construction a slow continuous agitation of the water is obtained, thus producing crystallized ice without the aid of any of the mechanical contrivances now used for that purpose.

The freezing-plates (2), as shown in Figs. 1, 2, and 3, are formed by a series of metal pipes (6), placed in as close proximity to each other

as possible and being connected by close return bends (7), the intervening spaces between the pipes being closed by close fitting metal strips (8), more clearly shown in Fig. 3, it being important to have said strips as narrow as practical so as to expose as much pipe surface to the water as possible. The pipes and strips are then rigidly secured together by the clamps (9), and nuts (11) and the small intervening spaces between said clamps and the metal strips (8) are filled with metal (10) cast through small holes in the clamps (9) as seen in Fig. 3, thus preventing the formation of ice within these spaces which would otherwise offer serious obstruction to the final removal of the ice. To the lowest pipe in the coil is connected the vertical pipe (13). This vertical pipe (13) with the return bends (7) of the coil are inclosed in wooden boxes (12), and the remaining spaces filled with a water tight and non-conducting material thus preventing these fittings from coming in contact with the water to be congealed, which would otherwise offer serious obstruction to the final removal of the ice. The clamps (9) being arranged at certain distances apart upon the freezing plates leave a furrow or groove upon the surface of the ice after it has been removed thus assisting in cutting the ice into more convenient sizes. The vertical pipe (13) leading from the bottom pipe (6) of the coil or plate projects up through the top of the congealer and to which is connected an arrangement, (14,) consisting of the feed pipe (15), with valve (16), the discharge or suction-pipe (17) with valve (18), and hot-gas pipe (19) with valve, (20,) which in combination with a similar arrangement (21), on the opposite side of the congealer and connected to the "uppermost" pipe of the coil, enables us to reverse the current of volatile or expanding gas (as seen in Fig. 1); it also enables us to introduce the hot-gas for melting the ice formed on the plate into both ends of the coil simultaneously.

In operation when it is desired to make artificial ice with our improved congealer, the coils or plates (2) being placed at suitable distances apart and forming the chambers or compartments (3), these compartments are filled with the water to be congealed and being connected by the passages (4), the end compartments being connected by the passage (5) connected to a pump (as above described) a current or agitation is given to the water. The volatile gas is then admitted into the coils or plates through the feed-pipe (22), and valve (23), which serves to regulate the supply of liquid gas. This liquid gas after passing successively from one pipe to the other through the coil and expanding therein passes out through the vertical tube (13), thence through the suction-pipe (17) and valve (18), where it is led back to the suction side of the compressor or absorber (not shown) to be reliquefied. When it has become necessary to reverse the current of the expanding gas the feed valve (23) and suction valve (18) are closed and the feed valve (16), and suction-valve (25) are opened, the volatile gas then entering the coil or plate (2) through the feed-pipe (15), and valve (16), passing down through the vertical tube (13) and thence through the coil from the bottom to the top passing through the suction pipe (24) and valve (25) thus reversing the current of the expanding gas in an opposite direction to that first described. By this reversal of the course of the expanding gas as above described a cake of ice is formed of equal thickness throughout the entire area of the coil or freezing plate. After ice of the desired thickness has been formed all feed and suction valves are closed and the hot-gas taken from the compressor or still (not shown) is admitted at both ends of the coils or plates through the pipes (19), (26), and valves (20), (27.) As soon as the ice cake has become loosened the valves (20) and (27) are closed and the ice-cakes removed. The tank is again filled with water and the hot-gas remaining in the coils or plates having been condensed into a liquid state is vaporized by opening the suction valve (18), thus establishing communication by means of suction pipe (19) to the suction side of the compressor or absorber. By the evaporation of said gas a quantity of heat is withdrawn from the water around the coils or plates and no feeding of expanding gas is necessary until the gas is removed. Then feed valve (16) is again opened and the operation just described repeated.

In Figs. 7, 8 and 9, we have shown a modified form of plate forming the dividing wall or partition (2); this form of freezing plate differs only, from the one described in its construction, its operation being identical. The side walls of these plates are formed of sheet metal (28) (as shown in Fig. 9) the metallic plates being riveted or bolted together as shown; said bolts passing through narrow metal strips (29), secured between the plates. These metal strips form gas-tight partitions from one passage to the other by reason of their recessed side surfaces which are filled with suitable packing material (such as rubber, &c.) and are so placed as to form channels or passages with openings at alternate ends, (see Fig. 7,) thus giving the expanding gas the same circulation or course as in the other construction.

We claim—

1. In a congealer for ice making machinery hollow gas-tight freezing-plates consisting of a coil or succession of continuous passages through which a volatile-liquid is circulated and expands, said coil or hollow-plate being connected at both ends of the coil or passages to feed, suction, and hot-gas passages, the freezing-plates being arranged within a tank at suitable distances apart forming compartments which compartments are filled with water and communicate with each other by

short passages so arranged that the water passes from one compartment to the other at or near its bottom on one side of the compartments and passes out at or near its top on the opposite side or vice-versa, the water being drawn from one end of the congealer and forced into the other end, substantially as shown.

2. In a congealer for ice making machinery a hollow-freezing plate consisting of pipes connected by return bends, the space between said pipes being filled with close-fitting strips, the whole being made rigid and bound together by clamps and the intervening spaces between said clamps, pipes and strips being filled with any conducting material that will remain insoluble in water, substantially as and for the purpose stated.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

JOHN F. BEHN.
GUSTAVUS A. WEGNER.

Witnesses:
O. E. HODDICK,
CHAS. M. HARRINGTON.