

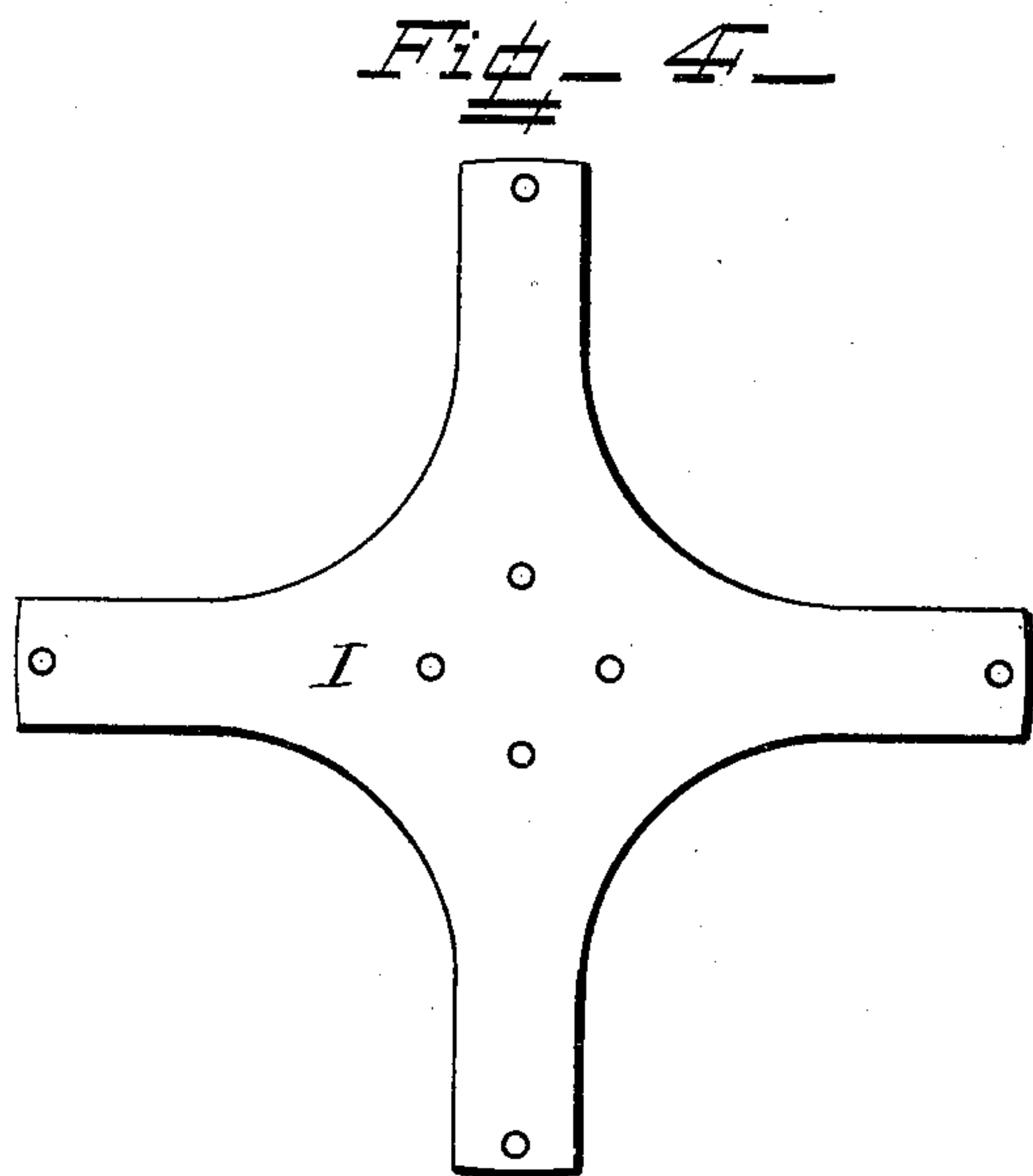
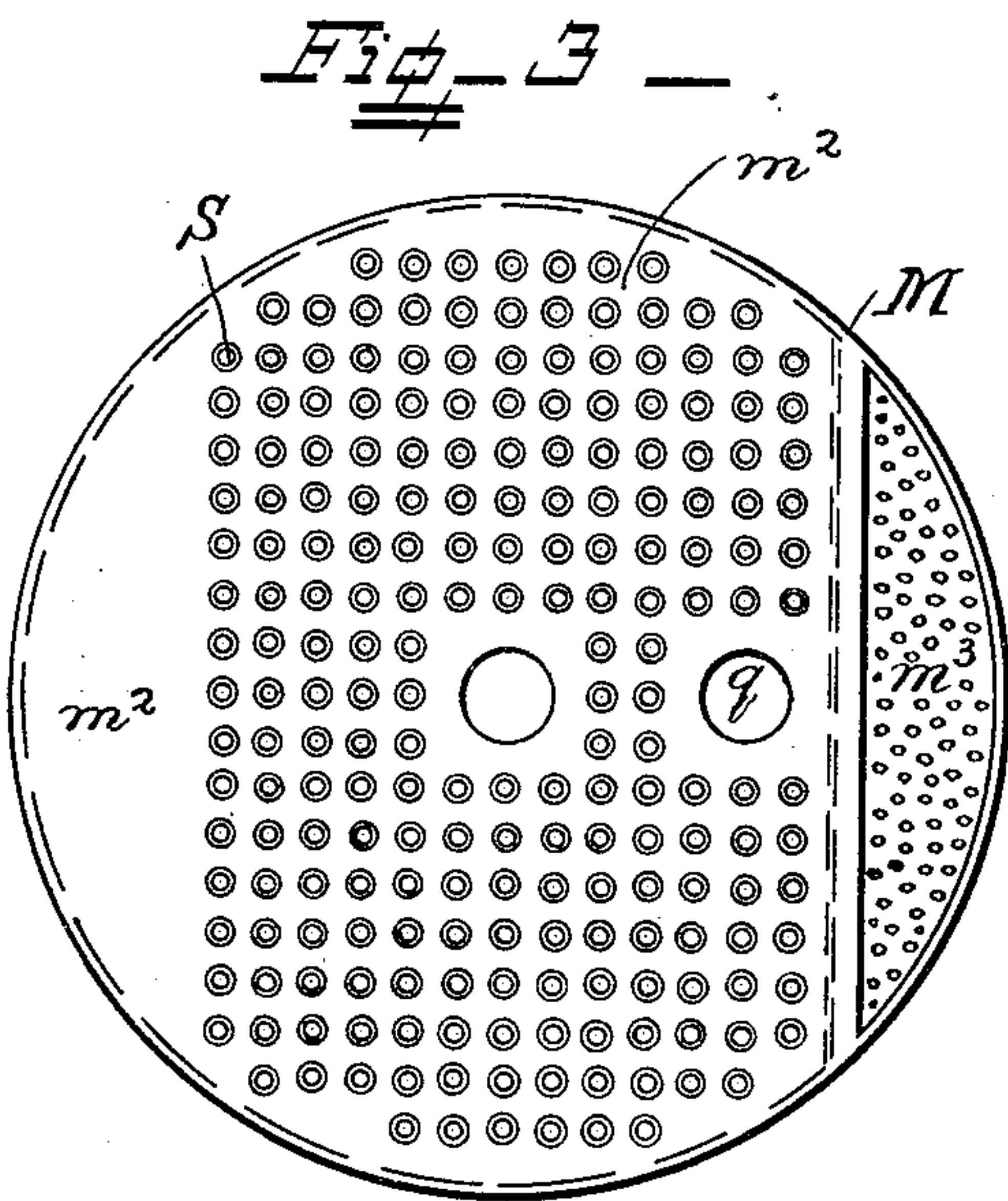
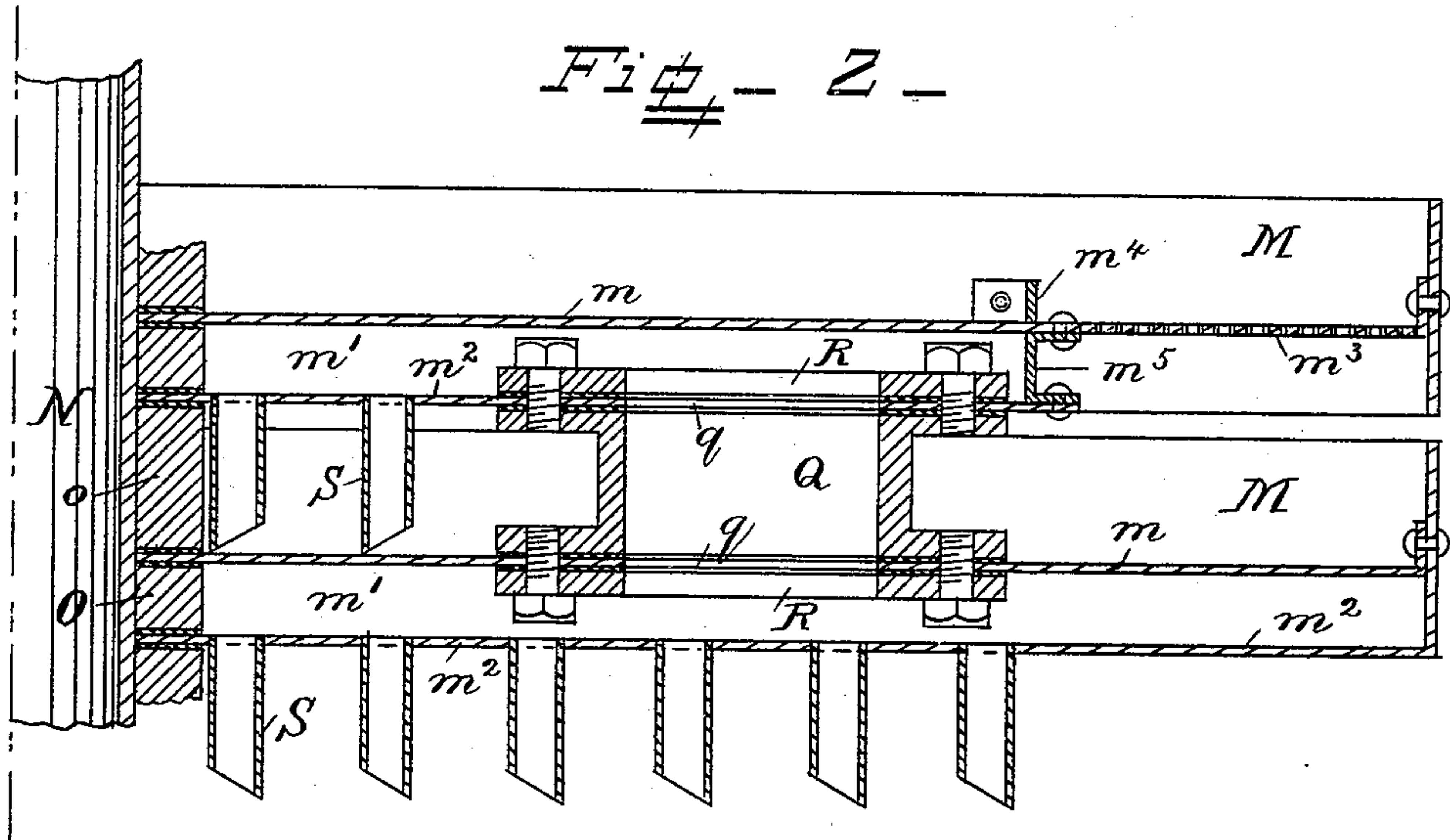
(No Model.)

2 Sheets—Sheet 2.

T. H. BUTLER.
ABSORBER FOR ICE MACHINES.

No. 377,189.

Patented Jan. 31, 1888.



Witnesses

W. D. Porter

W. Allen

Inventor

Thomas H. Butler.

By his Attorney

Herbert W. Jenner.

UNITED STATES PATENT OFFICE.

THOMAS H. BUTLER, OF HARRISBURG, PENNSYLVANIA.

ABSORBER FOR ICE-MACHINES.

SPECIFICATION forming part of Letters Patent No. 377,189, dated January 31, 1888.

Application filed June 13, 1887. Serial No. 241,202. (No model.)

To all whom it may concern:

Be it known that I, THOMAS H. BUTLER, a citizen of the United States, residing at Harrisburg, in the county of Dauphin and State of Pennsylvania, have invented certain new and useful Improvements in Absorbers for Ice-Machines; 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 appertains to make and use the same.

This invention relates to absorbers used in ice-machines of the class described in a separate application, Serial No. 240,905.

This invention consists in the novel construction and combination of the parts hereinafter fully described and claimed, whereby the operation of the absorber is rendered more uniform and economical.

In the drawings, Figure 1 is a vertical transverse section through the absorber. Fig. 2 is a vertical transverse section through portions of two of the troughs, drawn to an enlarged scale. Fig. 3 is a plan view, from below, of one of the troughs. Fig. 4 is a plan view, from above, of the arms which support the troughs.

A is the outer shell of the absorber, having the flanges *a* riveted to it.

B is the bottom of the absorber, bolted to the bottom flange, *a*, and provided with a pipe, *b*, through which the strong aqua-ammonia may be discharged.

D are legs which support the absorber at a convenient height above the ground.

E is the top of the absorber, bolted to the top flange, *a*, and provided with a central pipe, *e*, for the inlet of the spent ammonia-gas from the brine-tank coils.

F is a pipe projecting through the top E, and provided with the perforated distributor *f* for spreading the weak ammonia-liquor from the cooling-tank coils within the absorber.

G is a pipe connected to the top E, and provided with a stop-valve, *g*, for the escape of ammonia-gas when the pressure becomes too high.

H is an internal ring or flange secured to the shell by the bolts *h*. I are the arms which support the troughs, and are bolted to the ring H.

J is a short stem, having holes *j* in its sides, which stands in the bottom trough and is bolted to the center portion of the arms I.

K is the bottom trough. L is the top trough, and M are the intermediate troughs. The intermediate troughs, M, are all alike, and as many of them may be used as will be found to give the best results in practice.

N is a central pipe, for the inlet of ammonia-gas, screwed into the stem J at its lower end and united to the pipe *e* by the thimble *n* at the top.

Each trough M is provided with a false bottom, *m*, forming a gas-chamber, *m'*, underneath it and between it and the bottom *m*². A portion, *m*³, of the false bottom *m* is finely perforated, and a low partition, *m*⁴, extends across each trough and divides the perforated portion *m*³ from the rest of the trough. The end *m*⁵ of each gas-chamber is located under each partition *m*⁴, and connects the bottom *m*² with the false bottom *m*, that portion of the bottom *m*² which comes under the perforated portion *m*³ being cut away or left open.

O are distance-pieces which separate the bottom *m*² from the false bottom in each trough, and *o* are distance-pieces which separate the false bottom of each trough from the bottom of the trough next above it.

P is a nut having a washer, *p*, underneath it for tightening up all the troughs and distance-pieces after they have been threaded upon the central pipe, N, as shown in the drawings.

Q are pipes which are bolted between the false bottom *m* of each trough and the bottom *m*² of the trough next above it, holes *q* being formed in the bottoms *m* and *m*², so that the gas-chambers *m'* are placed in free communication with each other.

R are rings which are bolted to the flanges of pipes Q, so that tight joints may be made between them and the trough-bottoms which they unite.

India-rubber washers, or other equivalent packing-washers, are placed between the distance-pieces and pipes and the bottoms of the troughs, so that there can be no leak of either gas or liquor.

S are short bevel-ended pipes, which project from the bottom of the gas-chambers and

nearly touch the false bottoms of the troughs next beneath them.

T is a coil for cold water to circulate through, situated in the lower part of the absorber below the arms I.

The operation of the absorber is as follows: The cold weak ammonia-liquor from the cooling-tank coils enters through pipe F, and is sprayed onto the false bottom of the top trough, L. From thence the liquor flows over the low partition m^4 and through the perforated portion m^3 into the trough M next beneath it. In a similar manner the liquor passes through all the troughs M of the series, and through the bottom trough, K, into the lower part of the absorber. The spent ammonia-gas from the brine-tank coils enters through the central pipe, e, passes down through pipe N, through the holes j in stem J, and into the gas-chamber m' of the lowest trough, K. From thence the gas passes upward through each gas-chamber m' by the pipes Q until it gets to the gas-chamber of the top trough, L. The ammonia-gas in the outer gas-space of the absorber is absorbed by the surface of the liquor in the troughs, and the gas is also brought into intimate contact with the liquor in the troughs by passing downwardly through the short bevel-ended pipes S. It will be seen that this arrangement is such that the strongest and coldest gas is first brought into contact with the warmest and strongest liquor in the bottom trough, K, and is able to enrich it to the greatest extent possible. The lower part of the absorber is kept from being overheated by the incoming cold gas, which cools the liquor and gas surrounding the lower gas chambers, and thereby enables the liquor to absorb more gas.

U is a lower trough surrounding the lower part of the absorber and provided with the drain-pipe u .

V is an annular perforated spray-pipe surrounding the upper part of the absorber and provided with the cold-water-supply pipe v . The water from the spray-pipe runs down the outer surface of the absorber and greatly increases its absorbing capacity both by cooling it directly and by the cold produced by the evaporating water upon the exposed surface of the shell A of the absorber.

It will be noticed that the ammonia-gas passing downward and out of the bevel-ended pipes S leaves the said pipes in a contrary direction to the current of weak ammonia-liquor which is flowing past the ends of the said pipes in the troughs into which they depend. All the ammonia-gas which enters the absorber through the central pipe has to pass through the liquid at some part of the absorber before it can enter the gas-space surrounding the troughs, there being no direct communication between the central pipe and the gas-chambers of the troughs and the gas-space in the absorber, except by the short pipes S, which always have their ends covered by the liquor in the troughs.

In addition to the above-described means for cooling the outside of the absorber and the water-coil in the lower part of the absorber there are three methods of inducing absorption constantly at work within it, first, the spraying of the liquor through the ammonia-gas by the distributor and the perforated portions of the false bottoms; second, the surface exposure of the liquor in the troughs, and, third, the mixing of the gas with the liquor by the short bevel-ended pipes.

The use of the cold-water coil in the lower part of the absorber is to reduce the heat of the strong aqua-ammonia due to absorption, and make it cool enough to be pumped.

What I claim is—

1. In an absorber, the combination of an inclosing shell, a series of troughs having false bottoms and gas chambers beneath them, supported within the said shell out of contact with it and with each other, so that the gas escaping from each trough may have free passage between the troughs and the shell, pipes connecting the said gas-chambers, gas-pipes depending from the bottom of each gas-chamber into the trough beneath it, a pipe discharging weak liquor into the top trough, and a pipe conveying cold gas direct into the gas-chamber of the bottom trough, substantially as and for the purpose set forth.

2. In an absorber, the combination of an inclosing-shell, a series of troughs having false bottoms and gas-chambers beneath them, supported within the said shell out of contact with it and with each other, so that the gas escaping from each trough may have free passage between the troughs and the shell, pipes connecting the said gas chambers, gas-pipes depending from the bottom of each gas-chamber into the trough beneath it, a pipe discharging weak liquor into the top trough, a pipe conveying cold gas direct into the gas-chamber of the bottom trough, and a coil within the said shell below the bottom trough for circulating cold water through the strong aqua-ammonia, substantially as and for the purpose set forth.

3. In an absorber, the combination of an inclosing-shell, a series of troughs having false bottoms and gas-chambers beneath them, pipes connecting the said gas-chambers, gas-pipes depending from the bottom of each gas-chamber into the trough beneath it, a pipe discharging weak liquor into the top trough, distance-pieces separating all the bottoms of the troughs, and a pipe passing centrally downward through the said troughs and distance-pieces and conveying cold gas direct into the bottom trough, substantially as and for the purpose set forth.

4. In an absorber, the combination of a series of troughs, each provided with a false bottom and a gas-chamber below the false bottom, a low partition across the false bottom above the end of the gas-chamber, a perforated portion in the false bottom for spraying the liquor which flows over the said partition, a series of short pipes depending from the gas-chamber

into the trough beneath it, and a gas-pipe connecting each gas-chamber with the gas-chamber next beneath it, substantially as and for the purpose set forth.

5 5. In an absorber, the combination of an enclosing-shell, the arms secured to the shell, a series of troughs having false bottoms and gas-chambers beneath them, supported by the said arms, the perforated stem secured centrally
10 within the lowest trough, the central gas-pipe passing through the troughs and secured into the said stem, distance-pieces separating the troughs and surrounding the central pipe, a nut for tightening up the troughs and distance-
15 pieces screwed upon one end of the central pipe, pipes connecting the gas-chambers of the troughs, gas-pipes depending from the bottom of each gas-chamber into the trough beneath it, and a pipe discharging weak liquor into the
20 top trough of the series, substantially as and for the purpose set forth.

6. The combination, with an absorber of the character described, provided with a series of troughs for bringing the gas and liquor into

intimate contact, and having a gas-escape space 25 around the said troughs between them and the inner surface of the absorber-shell, of a pipe for spraying cold water upon the outer surface of the shell of the absorber, thereby increasing its absorbing capacity, as set forth. 30

7. The combination, with an absorber of the character described, provided with a series of troughs for bringing the gas and liquor into intimate contact, and having a gas-escape space 35 around the said troughs between them and the inner surface of the absorber-shell, of an annular perforated spray-pipe surrounding the upper part of the shell of the absorber and a shallow trough encircling the lower part of the said shell, whereby the cold water may be con- 40 stantly applied to the outer surface of the shell, substantially as and for the purpose set forth.

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

THOMAS H. BUTLER.

Witnesses:

JAMES I. CHAMBERLIN,
R. S. CARE.