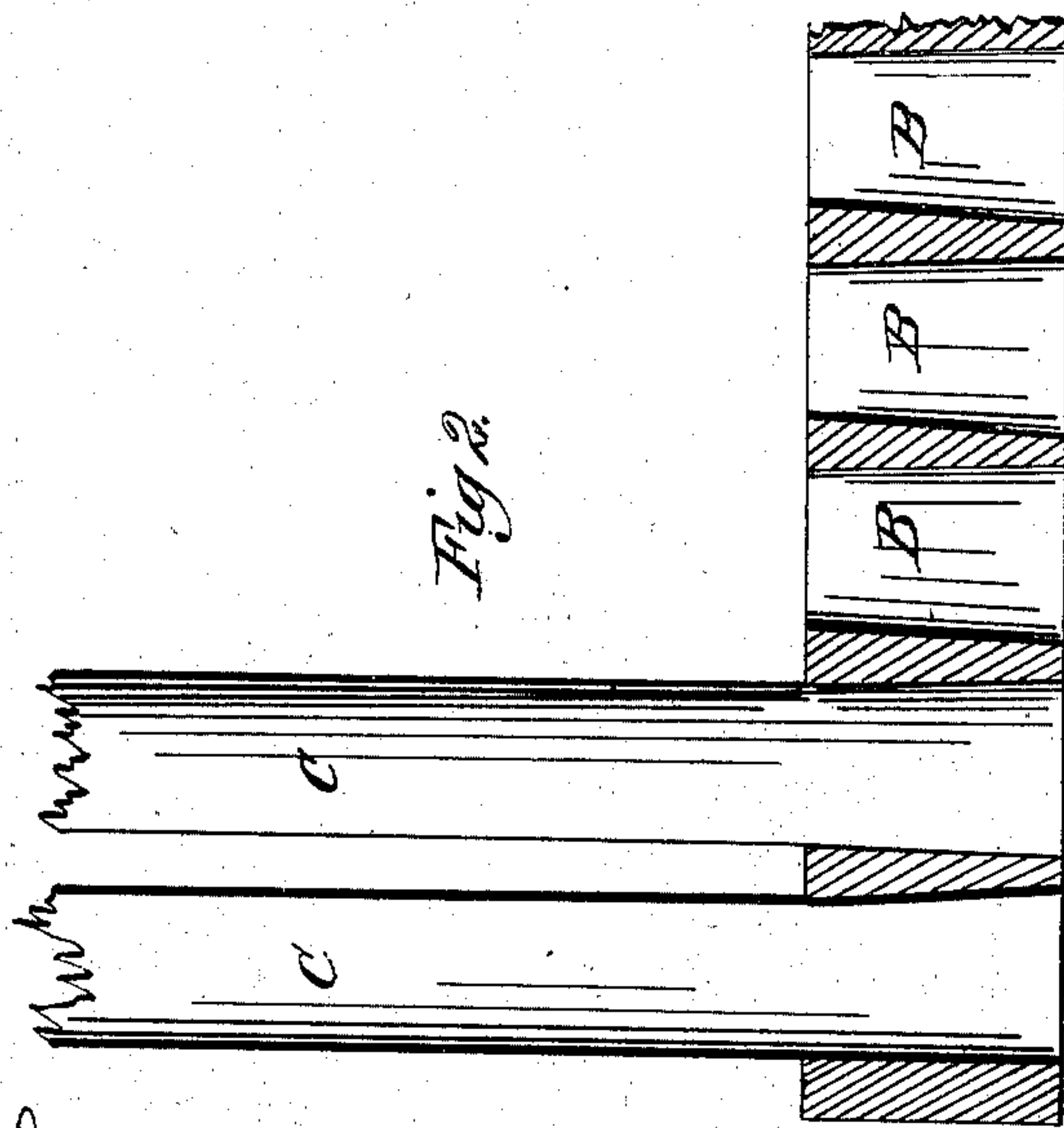
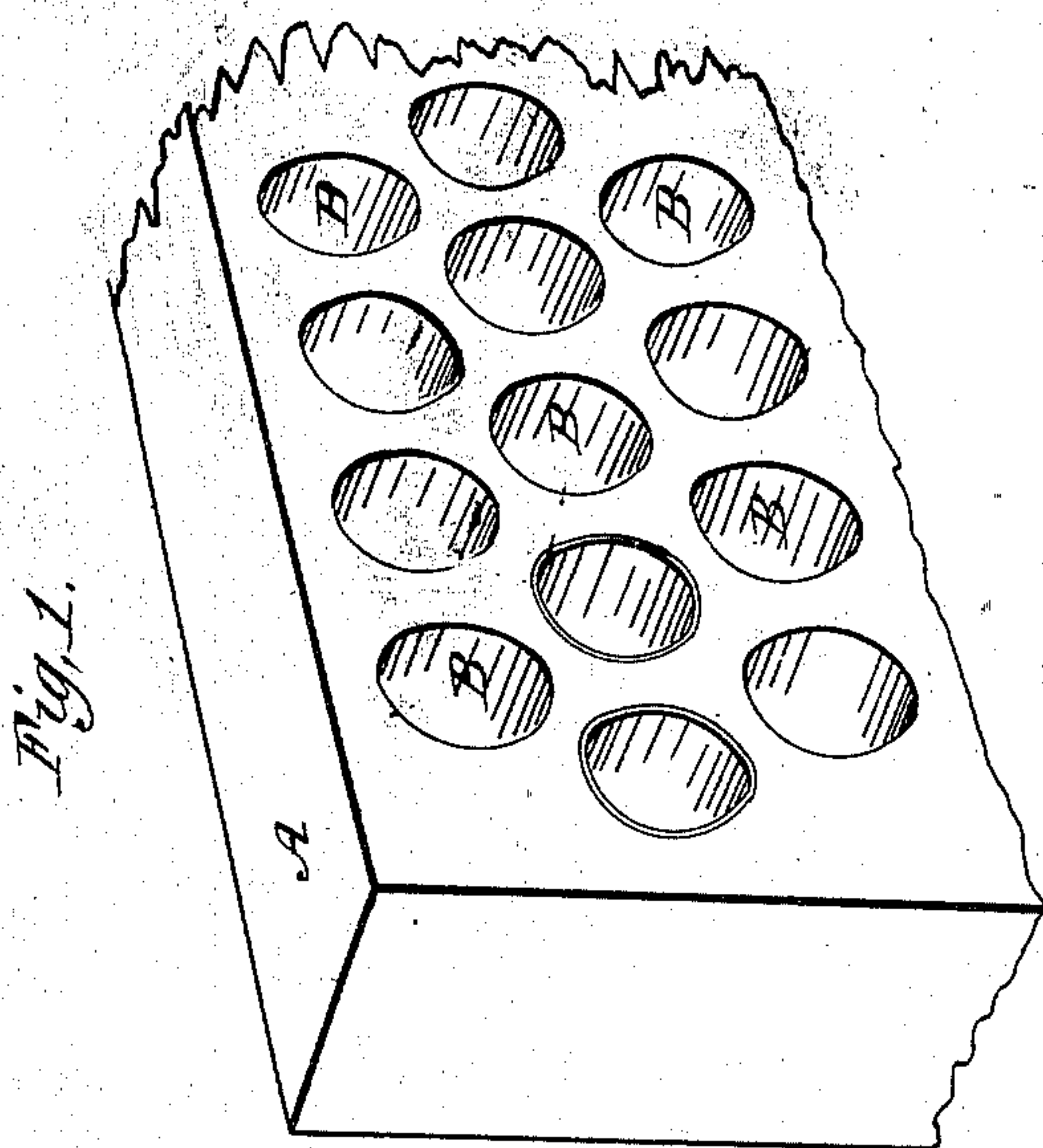


No. 32,522.

PATENTED JUNE 11, 1861.

W. A. LIGHTHALL.  
CONSTRUCTION OF TUBE SHEETS.



Witnesses.

*W. B. Chase.*  
*John F. Rodman*

*Inventor*  
*Wm. A. Lighthall*  
*by Francis S. Lorr*  
*att'y*



# UNITED STATES PATENT OFFICE.

WILLIAM A. LIGHTHALL, OF NEW YORK, N. Y.

TUBE-SHEET FOR COOLERS AND CONDENSERS.

Specification of Letters Patent No. 32,522, dated June 11, 1861.

*To all whom it may concern:*

Be it known that I, WILLIAM A. LIGHT-  
HALL, of the city, county, and State of New  
York, have invented certain new and useful  
5 Improvements in the Construction of Tube-  
Sheets for Tubular Coolers and Condensers;  
and I do hereby declare that the following  
is a full and exact description of the same,  
reference being had to the accompanying  
10 drawing and to the letters of reference  
marked thereon, in which—

Figure 1 is a perspective, and Fig. 2 a  
sectional view of a section of a tube sheet.

The present method of constructing tube  
15 sheets for tubular coolers and condensers is  
to form them from a solid sheet or plate of  
wrought or cast metal in which the apertures  
for the reception of the tubes are drilled or  
bored out. This method requires a consider-  
20 able period of time to complete a tube sheet  
of the size ordinarily required (say two feet  
or more in diameter) and involves a great  
expense, from the great number of apertures  
of small diameter required to be drilled to  
25 receive the necessary number of small tubes  
in the apparatus named, and from the care  
and attention required on the part of the  
workmen engaged in drilling the apertures  
to get them in their exact position—the  
30 wrong drilling or misplacement of a single  
aperture being sufficient to render the sheet  
valueless, and to cause the time and money  
spent upon it to be lost.

My improvement is intended to produce  
35 these tube sheets with perfect exactness and  
accuracy and at limited expense (compared  
with the plan above named) by casting them  
of iron or other metal or composition of  
metals in proper green or dry sand molds  
40 with the holes or apertures for the tubes  
cast in them, either by setting "dry sand"  
cores of proper size in the mold, or by  
"green sand" cores left in the mold by the  
withdrawal from it of the pattern; the holes

or apertures thus formed in the cast plate 45  
being ready for the reception of the tubes as  
soon as the sand adhering to them has been  
removed by the use of a common "reamer."

A is a broken section of the cast sheet,  
showing the apertures B for the reception of 50  
the tubes C—the latter being secured in  
place and made water or steam tight by any  
desired process. The head A can be cast in  
either dry or green sand molds and be made  
of any metal or composition that may be 55  
preferred, but for most purposes cast-iron is  
preferable on account of its cheapness and  
strength.

The apertures B may be made by "green  
sand" cores left in the mold by the with- 60  
drawal of the pattern from the mold—the  
apertures in the pattern being made in the  
usual manner—or by "dry sand" cores set  
in the mold in holes or depressions left by  
"prints" placed on the pattern; the latter 65  
mode being preferable for heads of an inch  
or more in thickness, having apertures in  
them of less than an inch in diameter, on  
account of the green sand cores of the di-  
ameter and length required to form such 70  
apertures, being destitute of the necessary  
strength to withstand the flow of metal into  
the mold in the process of casting the sheet.

I am aware that it is common in the art  
of founding to cast plates with apertures in 75  
them made by green or dry sand cores, and I  
do not therefore broadly claim casting such  
plates, but

What I do claim as my invention and de-  
sire to secure by Letters Patent is— 80

Constructing tube sheets for tubular cool-  
ers and condensers in the manner herein set  
forth.

WM. A. LIGHTHALL.

Witnesses:

FRANCIS S. LOW,

JOHN S. HOLLINGSHEAD.