# E. BENNETT.

## ANNEALING FURNACE.

No. 48,761. Patented July 11, 1865.

Fig. 1.

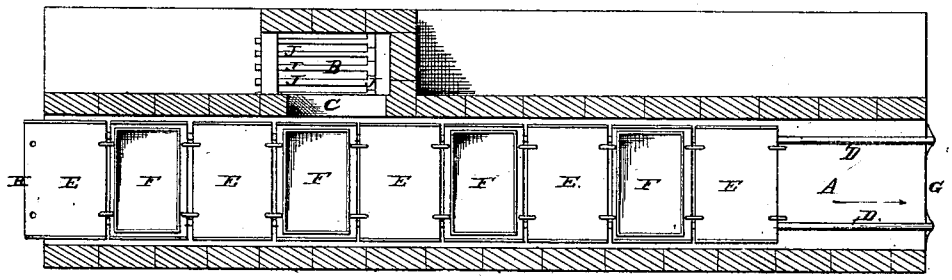
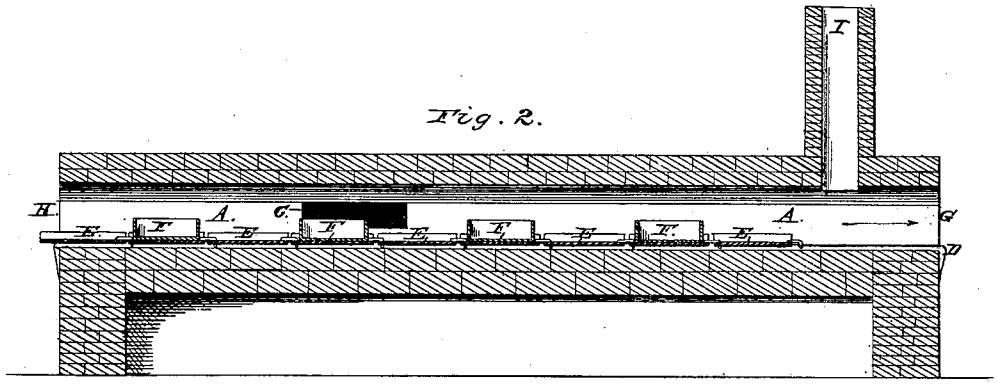



Fig. 2.




Witnesses:
C. D. Smith
W. F. Hall

Inventor.
E. Bennett
By Munn & Co
Attorneys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

# UNITED STATES PATENT OFFICE.

EDWIN BENNETT, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO HIMSELF AND WM. T. GILLINDER, OF SAME PLACE.

## IMPROVED ANNEALING-FURNACE.

Specification forming part of Letters Patent No. **48,761**, dated July 11, 1865.

*To all whom it may concern:*

Be it known that I, EDWIN BENNETT, of the city and county of Philadelphia, and State of Pennsylvania, have invented a new and useful Improved Annealing-Furnace for Glassware, technically called a "Leer," (Ure;) and I do hereby declare the following to be a full, clear, and exact description of the nature, construction, and operation of the same, reference being had to the accompanying drawings, which are made part of this specification, and in which—

Figure 1 is a plan, the roof of the leer being removed. Fig. 2 is a vertical central longitudinal section of the same.

Similar letters in the different figures refer to corresponding parts.

The object of my invention is to anneal more perfectly the articles of glass exposed in the leer, and, though not necessarily limited to such, my device has special reference to thin articles, such as lamp-chimneys. The devices, though a common object is sought to be attained, are twofold, but not substitutes the one for the other. They are, first, an improvement in the method of heating the leer by placing the furnace in such a position longitudinally of the leer that it will discharge its heat into the same at a point between the feed and the discharge end of the leer, the design of which will be made apparent in a subsequent portion of this specification; second, an improved method of charging the leer by the use of trays.

To enable others skilled in the manufacture of glass to construct and use my invention, I will proceed to describe it.

A is an annealing-furnace or leer, having a heating-furnace, B, which discharges its heat through the opening C into the leer.

E E are joints or sections of the shifting-floor, which support the trays F F, containing the glassware. These sections are made with hooks and eyes or other detachable fastenings, and are pushed through the leer in the direction of the arrow on the tracks D D, being detached at the end G, carried round and attached again at H, so as to make an approximately continuous motion of the sectional platform, from the discharge end of which a tray is removed as another is placed at the feed end. The chimney I carries off the smoke, and the fuel is burned upon the grate-bars J, the furnace occupying a position between the end of the leer for the purpose of making a gradually-decreasing heat to each end, and though I do not state any definitive distance, yet it may be one-third of the length of the leer from the feed end.

The usual practice in glass-making is to place the article while yet hot on a section of the moving-floor of the leer, to which it is carried by a boy as soon as detached from the tube of the glass-blower. The leer is heated from the feed end and gradually decreases in heat to the discharge end, the intention being to place the ware, while still retaining as much as possible of the heat at which it was manipulated, upon the hot platform of the leer, and as the ware accumulates push the platform farther and farther along until the piece, reaching the discharging end, is removed, having by the gradual cooling attained a greater power of withstanding concussion and increased infrangibility. This is the usual plan, and is so familiar to the class of persons to whom my specification is addressed that it may be considered trite and unworthy of special comment; but my improvements will be best understood by a comparison with the usual method of procedure.

The plan described is attended with several difficulties when light ware is under treatment, because it cools so rapidly, owing to its thinness, that it will hardly retain its heat till it can be placed upon the platform.

In glassware which is unannealed thin articles are not so liable as thick ones to fracture from the innate forces arising from the contraction in cooling, and it has been common to place lamp-chimneys, for instance, in the market without their having undergone any treatment for annealing, or what I suppose to be an operation for allowing the particles of glass to assume very gradually the relative positions to which they are entitled in the cooling mass, instead of by unequal and comparatively sudden contraction to flaw or splinter the ware. While a thin lamp-chimney will stand considerable jar after being cooled in the open air, an article of heavier construction will fly to pieces from innate repulsion under the same circumstances, and

cannot, while hot, be safely brought into contact with any good conducting material, as the latter will infallibly, by the sudden absorption of the heat of the glass, cause a fracture at the point of contact, it being, in fact, as is well known, the ordinary means of detaching the ware from the pipe of the blower. A wooden table is used, covered with ashes or sand, on which to drop the ware, and from thence it is removed by an attendant to the leer, in the hot or feed end of which it is placed and gradually pushed or worked to the discharge end. As I have said, the process with light lamp-chimneys is frequently to lay them aside directly from the blower and pack for transportation without annealing, which would be impossible with heavy ware, and even with chimneys involves a loss which I estimate at from eight to ten per cent. before packing, and an additional loss in transportation, besides producing a frangible article not so satisfactory to the purchaser, and consequently reflecting upon the producer in more ways than one. The difficulty of getting such light ware to the leer in time from a large number of operators and the expense of keeping a boy for each workman to run to the leer with each article have made the manufacturer rather endeavor by the extreme thinness of his ware to reduce its tendency to fracture than to make a somewhat better article involving one more manipulation in its production. It is true that by the addition of lead a greater degree of elasticity may be imparted; but this is an expensive material. In my improved process the glassware—chimneys, for instance—are dropped as fast as they are made into trays, which, when sufficiently filled, are carried and laid upon the platform of the leer and pushed along in the usual manner, but with this essential difference in the application of the heat, that the ware which is laid in at the feed end is gradually heated as it approaches the furnace in its course through the leer, and after passing that point of greatest heat is gradually cooled as it advances toward the discharge end. Thus the lamp-chimneys may be nearly or entirely cold and so frangible that they would be utterly useless as merchantable articles; but on exposure in the leer to a heat which gradually raises them to their plastic temperature and then gradually subsides, the particles of glass are allowed to assume their relative position without such irregularity or violence as to cause fracture.

By this means I gain a great practical advantage in economy of time and labor, as I am not under the necessity of placing the thin ware in the leer while retaining its first heat, but allow it to accumulate at pleasure in the trays, and then remove the full trays to the platform of the leer, heated and cooled as has been described.

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

1. Placing the furnace so as to discharge its heat at such a point between the feed and discharge ends of the leer as that the heat shall be graduated toward both ends, for the purpose described.

2. The use of trays for the purpose of receiving the ware and for charging and discharging the leer.

To the above specification of my improved glass-leer I have signed my name this 26th day of April, 1865.

EDWIN BENNETT.

Witnesses:

EDWARD H. KNIGHT,

C. D. SMITH.