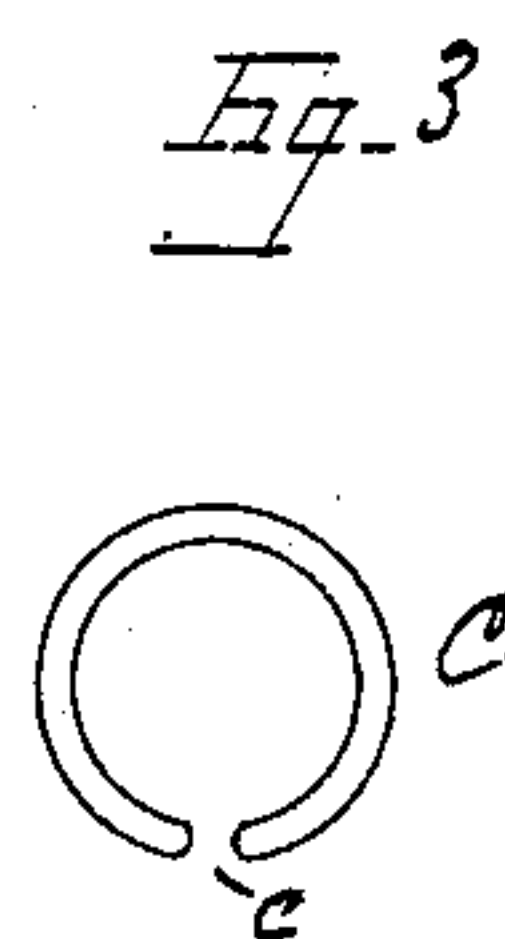
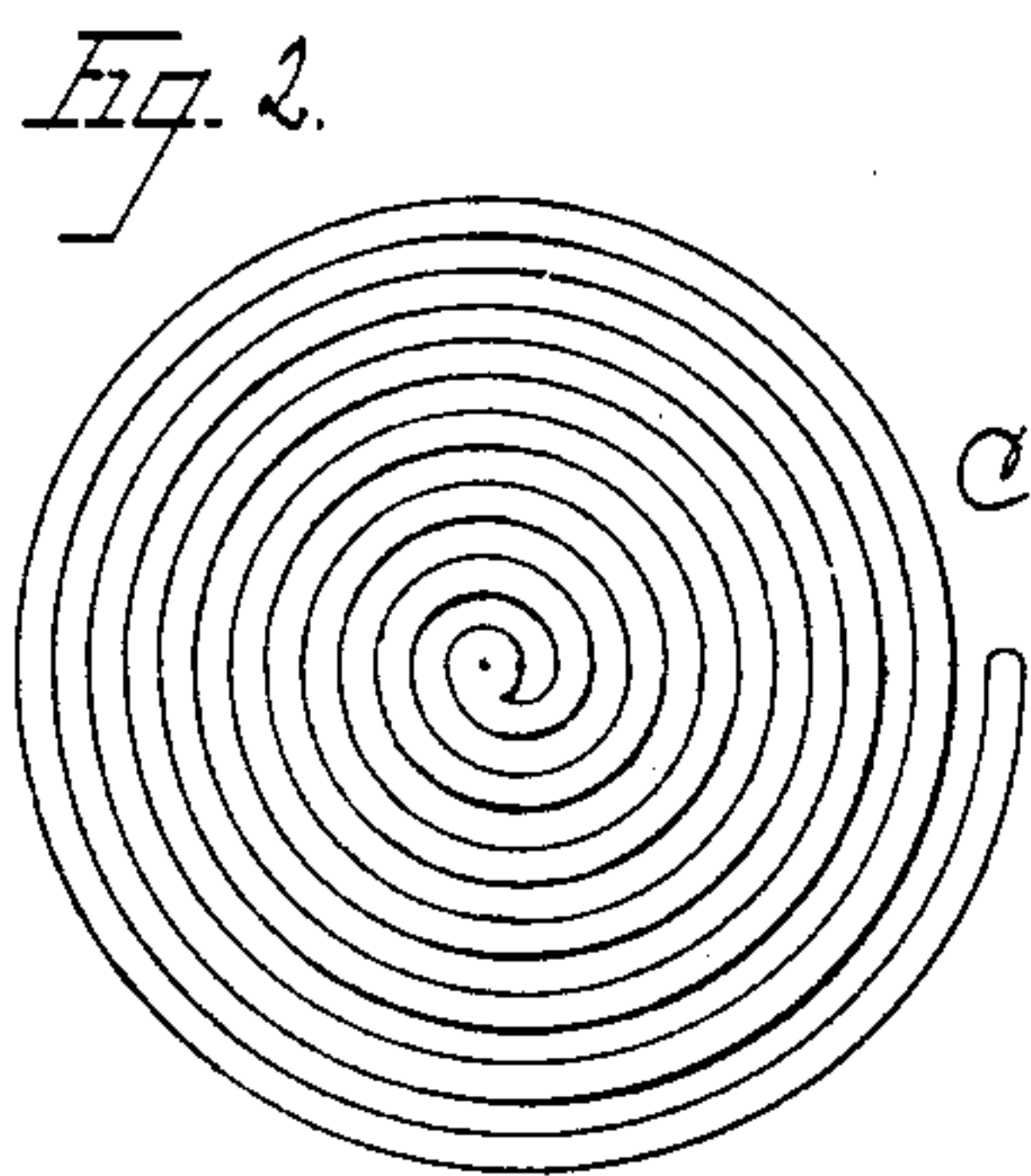
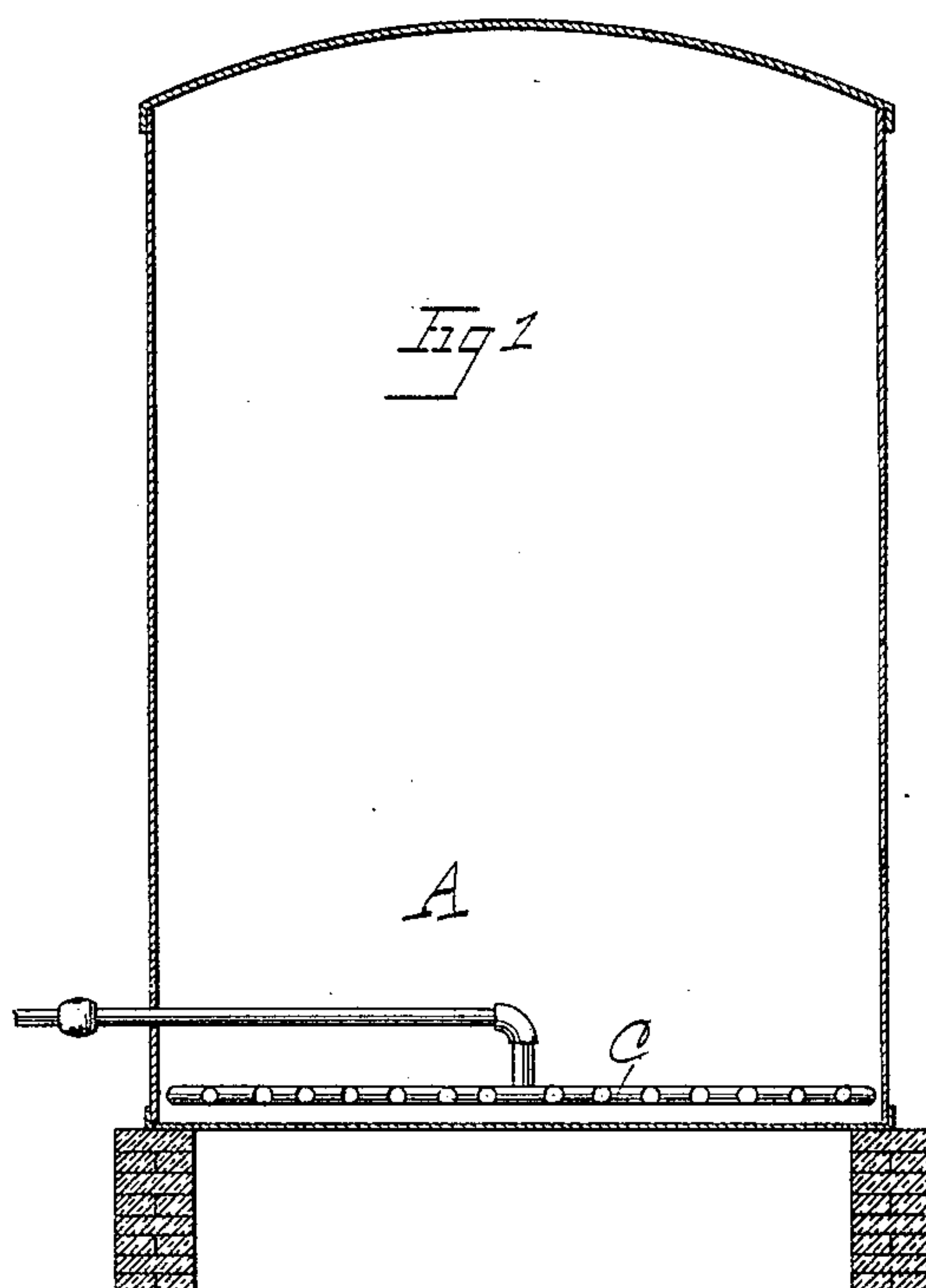


(No Model.)

R. J. HOFFMAN.  
EVAPORATING APPARATUS.

No. 405,738.

Patented June 25, 1889.



Witnesses  
Edw. H. Perry  
J. L. Middleton

Inventor  
R. J. Hoffman  
by Eli Spear  
Attorney

# UNITED STATES PATENT OFFICE.

ROSS J. HOFFMAN, OF BINGHAMTON, NEW YORK.

## EVAPORATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 405,738, dated June 25, 1889.

Application filed January 16, 1888. Serial No. 260,824. (No model.)

*To all whom it may concern:*

Be it known that I, ROSS J. HOFFMAN, of Binghamton, in the county of Broome and State of New York, have invented a new and useful Improvement in Evaporating Apparatus; and I do hereby declare that the following is a full, clear, and exact description of the same.

My invention relates to apparatus for reducing hydrocarbon oils to lower gravity.

The apparatus to which my invention appertains consists, substantially, of a vessel or still fitted to contain the oil and to be subjected to heat, by which the lighter hydrocarbon vapors are driven off. With this class of apparatus and in the treatment of oils therein there is a liability at some stage in the process that the oil will burn upon the bottom or heated sides of the still or other vessel, thereby discoloring and injuring the product.

The object of my invention is to provide means for preventing this; and my invention consists, essentially, of a perforated pipe or passage in the bottom of the still or against the part subjected to heat, having the perforations on the under side of the pipe, or on that side next to the part subjected to heat, the pipe being connected with a steam-supply, so that the steam will be directed against the bottom or side of the still and the oil thereby driven away from the bottom and prevented from burning thereon.

The accompanying drawings show a vertical transverse section of a still containing my invention in Figure 1. Fig. 2 shows a plan view of the coil of pipe. Fig. 3 shows an enlarged section of a perforated pipe.

In the drawings, A represents a suitable still for the distillation of hydrocarbon oils. Underneath it is the apparatus for applying heat, which in this case is represented as a fire-box and grate. In the lower part of the still and close to the bottom thereof is a coil of pipe C, having outside connections with any suitable source of steam-supply, either superheated or otherwise. The pipe is represented in the drawings as a coil; but it may be of any suitable form, provided it is arranged to substantially cover the entire surface of the bottom of the still. It may be coiled spirally or be led back and forth, as

may be found most convenient to suit the shape of the bottom of the still. The pipe is placed as near as practicable to the bottom without touching it, and may be raised from the bottom only the distance required by the thickness of the pipe-coupling—say one-fourth of an inch; but the distance is not essential, so long as the conditions hereinafter specified are maintained. For the purpose of keeping the bottom of the still clear of the oil during the operation of the process, it is essential that the streams of steam should impinge against the whole of the bottom, so that their effect may be to keep the whole bottom clear, as they strike against it and force or drive the oil away from the bottom. As the action of the steam is by the force with which it issues from the orifices from the pipe, the distance of the pipe from the bottom will depend upon the size of the orifices, their number in a given amount of surface, and the force of the steam. The result will be accomplished even if the pipe rests directly upon the bottom of the still; but it is essential that the orifices in the pipe should open toward the bottom or the heated part, so that the steam may be directed toward the part to which the heat is applied. The coil of pipe is indicated in section in Fig. 3 at C, and the orifices therein at c.

The apparatus has been described as a still in which the heat is applied underneath. Obviously, however, the pipe may be applied in the same manner to any surface, whether inclined or vertical, of the still, on the outside of which or around which the heat may be applied, the same condition being maintained that the steam from the numerous orifices in the pipe shall be directed against the inner surface of the heated wall and shall substantially cover in its action the whole of that heated surface against which the oil rests.

I am aware that it is not new to discharge steam within a still in the process of distilling hydrocarbon oils for the purpose of carrying off the lighter vapors.

I am aware of the patent of Trewby and Fenner, No. 252,981, granted by the United States Patent Office on the 21st of January, 1882, for an apparatus for the distillation of coal-tar, in which patent pipes are shown arranged within the still and near its bottom,



with small nozzles seated upon the pipes parallel to the bottom, or perhaps at a slight inclination to the bottom, for the purpose of maintaining a film of steam underneath the heavy viscid matters in the distillation of coal-tar, and to keep them from coking upon the bottom. My invention differs from this in this particular point, that I provide holes in the steam-pipe opening directly against the bottom or parts subjected to heat, whereby the steam is caused to impinge directly against the bottom instead of turning up and rising through the light oils which are subjected to treatment. The result of this is that the bottom is kept clear or washed by the forcible discharge of steam against it, no part of the oil remaining upon the bottom to be discolored by the heat and thereby injuring the product. The pipes containing these discharge-orifices are, as shown, close to the inner surface of the bottom of the still, and the steam is directly and forcibly discharged against said surface in jets which are closely and uniformly set. These jets, as they strike, spread out on said surface and constantly

keep the oil therefrom—an effect which they would not produce if turned aside, as the force of the steam would be broken and it would be turned upward by reason of the liquid nature and lack of viscosity of the oils for which the apparatus is designed.

I claim as my invention—

In combination with the still for treating hydrocarbon oils, a steam-pipe within said still arranged to substantially cover the surface exposed to the heat, the said pipe being placed close to said surface and being provided with discharge-orifices opening directly against the said surface, whereby the jets of steam are caused to impinge directly on the surface to be protected, as and for the purpose set forth.

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

ROSS J. HOFFMAN.

Witnesses:

G. W. BALLOCH,  
CHAS. L. STURTEVANT.