(No Model.) 2 Sheets—Sheet 1.

D. KELLY & W. H. HOFFMAN.

STEAM GENERATOR.

No. 257,134. Patented Apr. 25, 1882.

Fig 2.

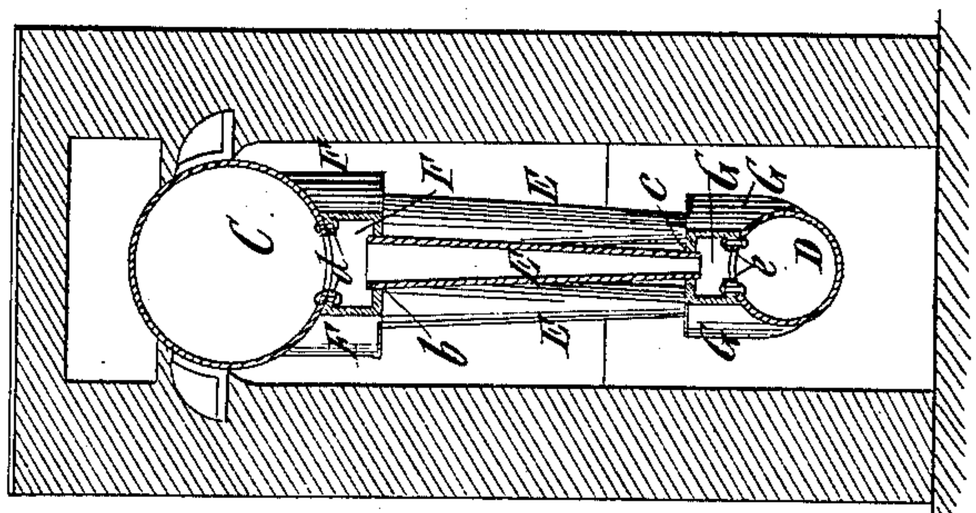
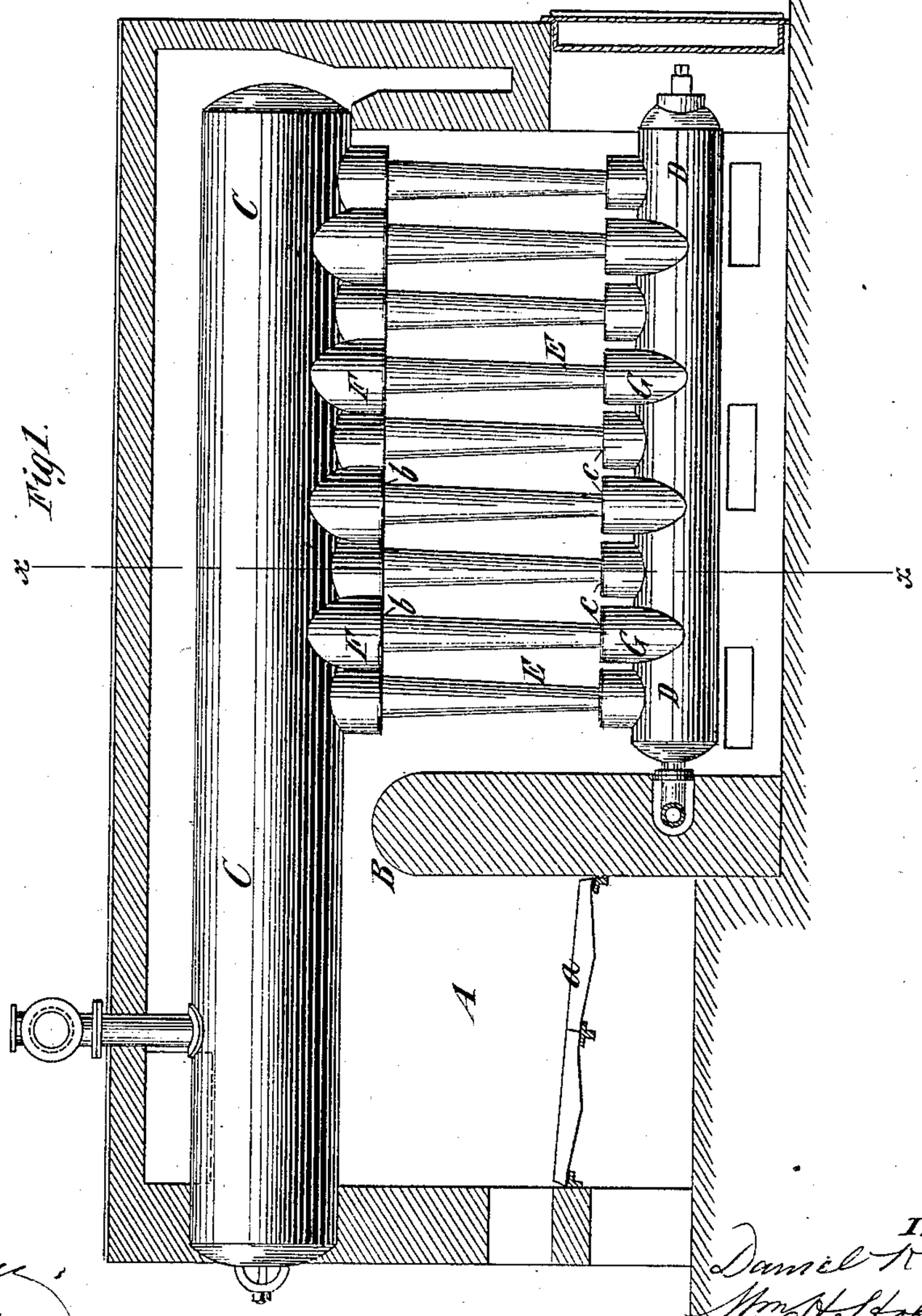


Fig 1.



Witnesses
Fred Haynes
Ed Moran

Inventor
Daniel Kelly
Wm H Hoffman
by their Attorneys
Brown & Brown

(No Model.) 2 Sheets—Sheet 2.

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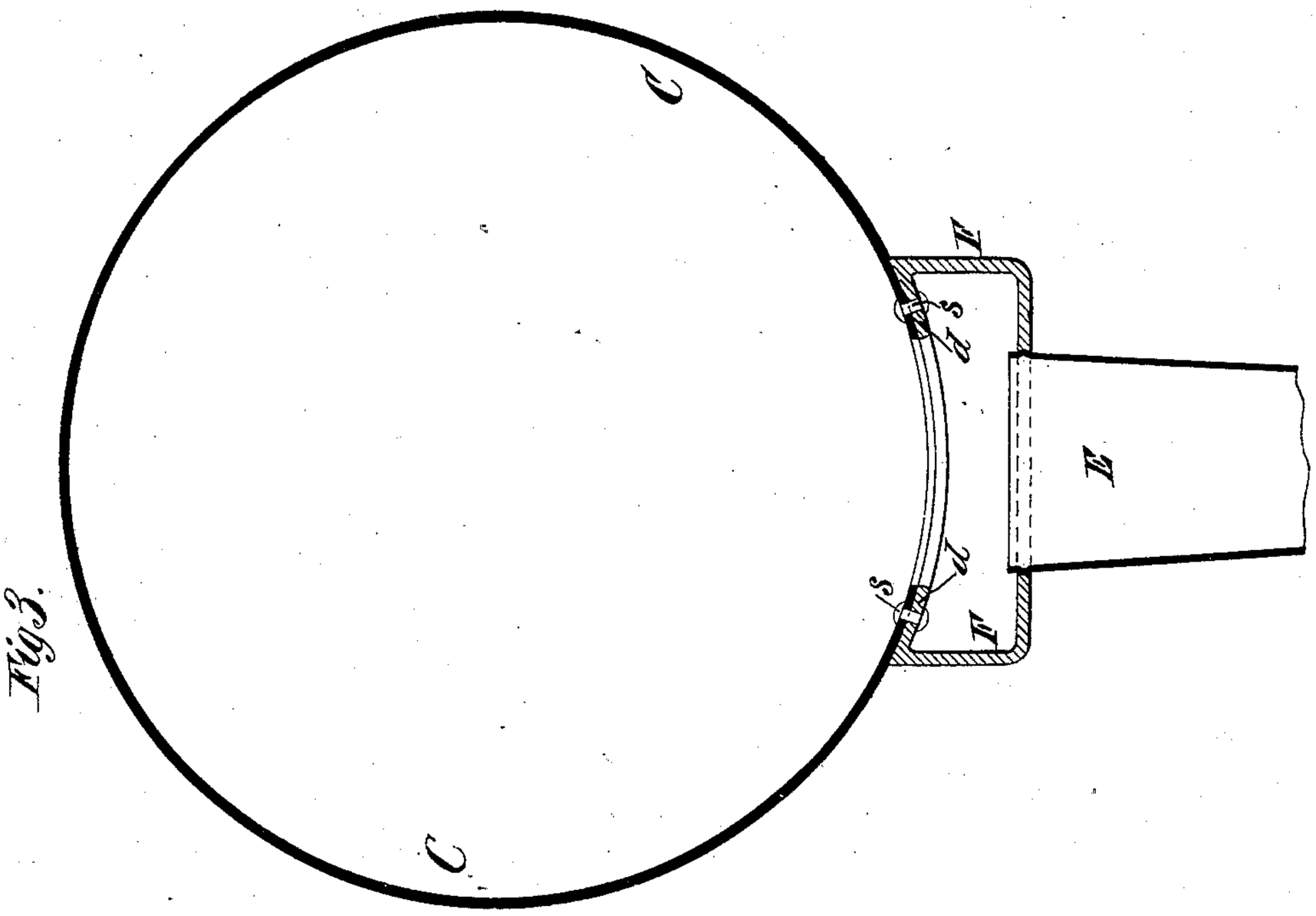

Fig 3.

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UNITED STATES PATENT OFFICE.

DANIEL KELLY, OF PHILADELPHIA, PENNSYLVANIA, AND WILLIAM H. HOFFMAN, OF PASSAIC, NEW JERSEY, ASSIGNORS OF ONE-THIRD TO WALTER K. LUDWIG, OF PHILADELPHIA, PENNSYLVANIA.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 257,134, dated April 25, 1882.

Application filed November 4, 1881. (No model.)

To all whom it may concern:

Be it known that we, DANIEL KELLY, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, and WILLIAM H. HOFFMAN, of Passaic, in the county of Passaic and State of New Jersey, have invented certain new and useful Improvements in Steam-Generators, of which the following is a specification.

Our invention relates to that class of steam-generators in which a number of upright water-tubes are arranged below a water and steam drum, with which they communicate, and more particularly to those generators in which the said tubes communicate at their lower ends with a water and sediment drum. In such generators the upright tubes are frequently formed or provided with outwardly-projecting flanges at their ends, through which rivets or bolts are passed to secure them to the water and steam drum and the water and sediment drum, and the external joints thus formed are liable to be destroyed or impaired by the great heat to which they are exposed.

The object of our invention is to obviate this difficulty and to make a more permanent connection between the tubes and drum or drums; and to this end the invention consists in the combination, in a steam-generator, of a water and steam drum, a number of upright tubes, preferably tapering downward, and hollow saddles or head-pieces, into which the upper ends of said tubes are expanded, and which have inwardly-projecting flanges, through which are inserted rivets or bolts for securing the said saddles or head-pieces to the said drum. The flanges of the saddles or head-pieces are not exposed to the fire, but are always covered by water, and are therefore more durable.

The invention also consists in the combination, in a steam-generator, with the water or steam drum, the tubes, and their saddles or head-pieces, of a water and sediment drum, and a number of hollow saddles or foot-pieces, into which the lower ends of the tubes are expanded, and which have inwardly-projecting flanges, whereby they are secured to the water and sediment drum in the same manner as are the upper saddles or head-pieces.

In the accompanying drawings, Figure 1 represents a vertical longitudinal section of a steam-generator embodying our invention. Fig. 2 represents a transverse vertical section thereof on the dotted line *x x*, Fig. 1; and Fig. 3 represents a section of the steam and water drum, a saddle or head-piece, and the upper portion of one of the tubes, upon a larger scale than in Fig. 2.

Similar letters of reference designate corresponding parts in all the figures.

A designates the furnace, *a* the grate, and B the bridge-wall of the generator.

C designates a water and steam drum, extending over the furnace and forward as far as is necessary to give the necessary capacity of the generator.

D designates a water and sediment drum, arranged immediately below the drum C.

E designates a number of upright tubes, which extend from the drum D to the drum C, and which communicate at their lower ends with the drum D and at their upper ends with the drum C. The tubes are intended to afford a free circulation of water from the water and steam drum C downward, and of steam upward from the interior surfaces of the tubes to the drum C; and in order to increase their effectiveness the tubes E are tapered from their upper ends downward, so that the steam formed upon their interior surfaces may have opportunity to escape upward without interference from the water in the tubes. The tubes E are not connected directly to the drums C and D, as is usual in generators of this class, but they are connected at their upper ends to hollow saddles or head-pieces F and at their lower ends to similar hollow saddles or foot-pieces, G. The upper saddles or head-pieces, F, have tube-holes *b* in their under sides, and into these holes the upper ends of the tubes are expanded, and the lower ends of the tubes are expanded into the holes *c* in the lower saddles or foot-pieces, G.

Both the saddles or head and foot pieces F G are provided with flanges *d e*, which project inward, and are curved to correspond to the external surfaces of the drums C D, and they are secured to said drums by rivets or bolts inserted through said flanges. The flanges are

not exposed to the fire, and hence there is no liability of the heads of the rivets or bolts being burned off and the joints leaking.

The manner of forming the joint between the upper saddles or head-pieces, F, and the steam and water drum C is shown most clearly in Fig. 3; and it will be understood that the joints between the lower saddles or foot-pieces and the water and sediment drum D are formed in precisely the same manner. From Fig. 3 it will be seen that the flange *d* on the head-piece F is always covered by water, as also are the rivets *s*, and hence the rivets cannot burn off and thereby impair the joint.

The head and foot pieces or saddles F G may consist of steel castings, as they may then be made of sufficient strength without undue thickness and weight.

In order to increase the effectiveness of the generator and afford the heated products of combustion free access to all the tubes, they are preferably arranged in staggered relation to each other—that is, in three rows, those in the center row being intermediate between those in the side rows.

We are aware that the water-tubes of steam-generators have been connected with water and steam drums and with water and sediment drums by flanging the tubes externally and riveting them thereto, and therefore do not claim any such construction. In our generator the tubes are secured in the head and foot pieces or saddles by expanded joints, which are not liable to be burned out, and the flanged joints between the head and foot pieces or saddles and the drums and the rivets securing them are absolutely protected by being always covered with water.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. In a steam-generator, the combination of a water and steam drum, C, the hollow saddles or head-pieces F, provided with internal flanges, *d*, riveted or bolted to said drum, and tubes E, expanded into said saddles or head-pieces, substantially as specified.

2. In a steam-generator, the combination of a water and steam drum, C, a water and sediment drum, D, hollow saddles or head and foot pieces F G, provided with internal flanges, *d e*, riveted or bolted to said drums, and tubes E, expanded into said saddles or head and foot pieces, substantially as specified.

DANIEL KELLY.
WILLIAM H. HOFFMAN.

Witnesses:
FREDK. HAYNES,
CHANDLER HALL.