

(No Model.)

2 Sheets—Sheet 1.

E. E. ROBERTS.
STEAM GENERATOR.

No. 601,004.

Patented Mar. 22, 1898.

Fig-2.

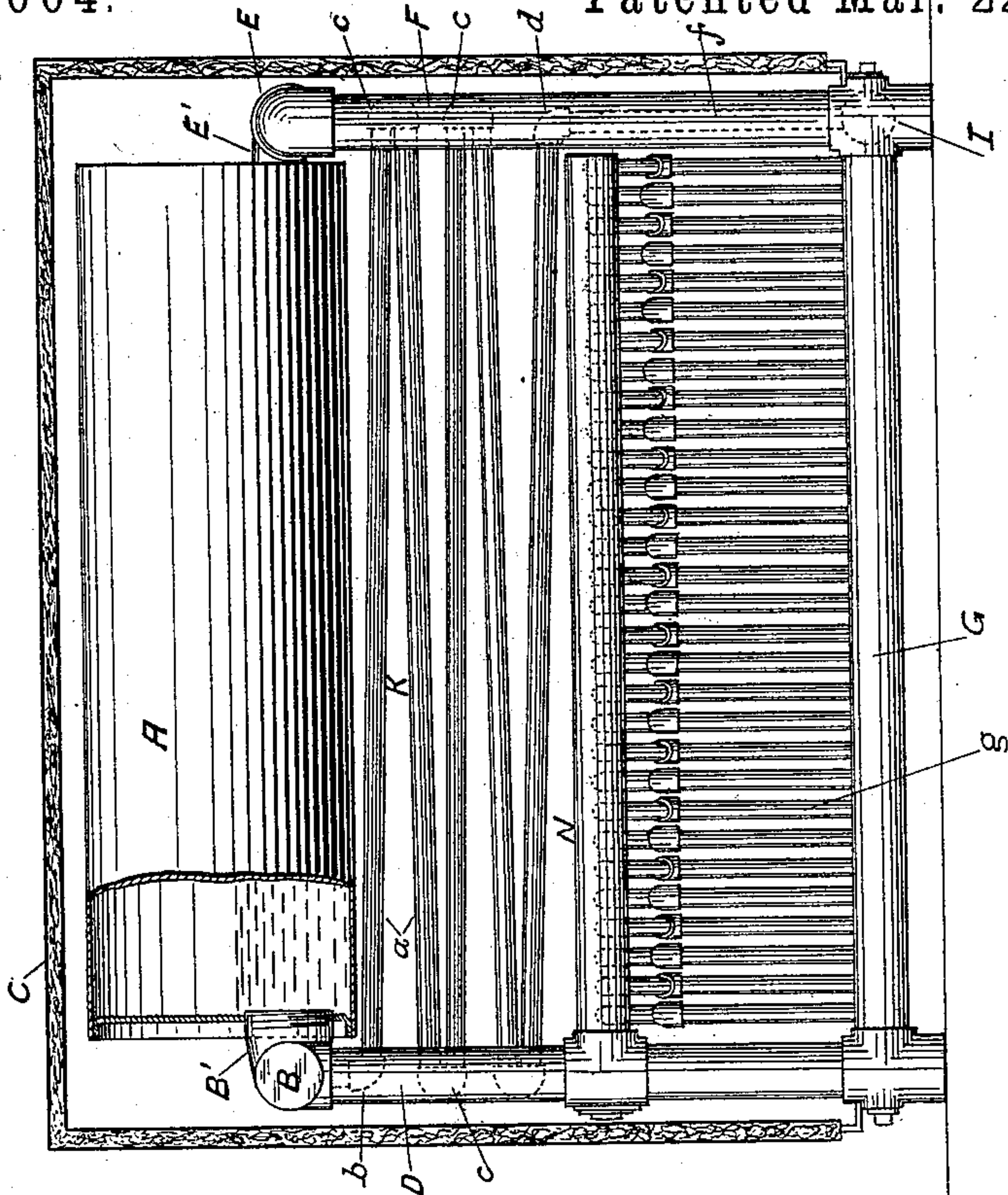
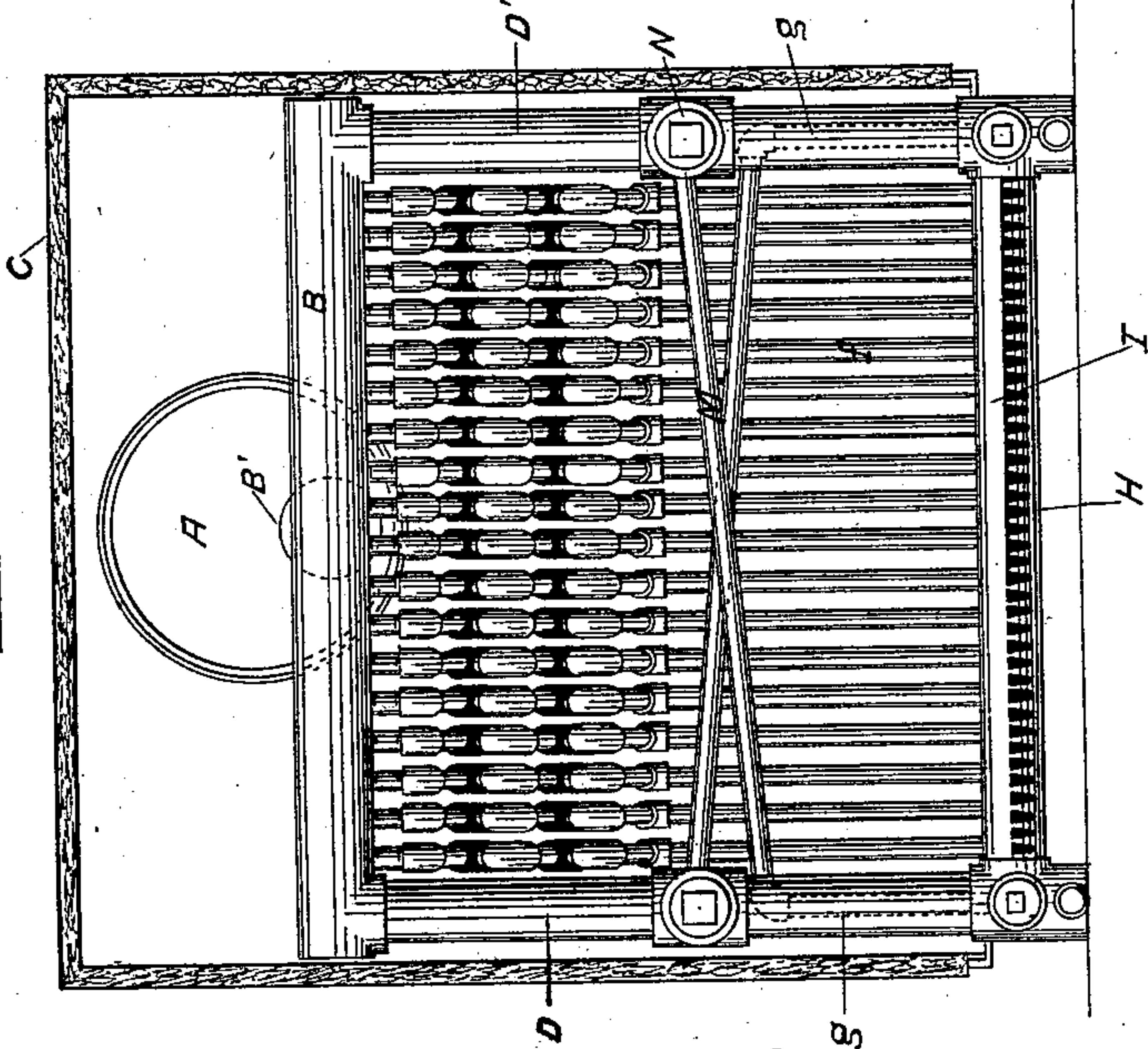


Fig-1



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By His Attorney Chas. N. Corbin

(No Model.)

2 Sheets—Sheet 2.

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Fig. 4

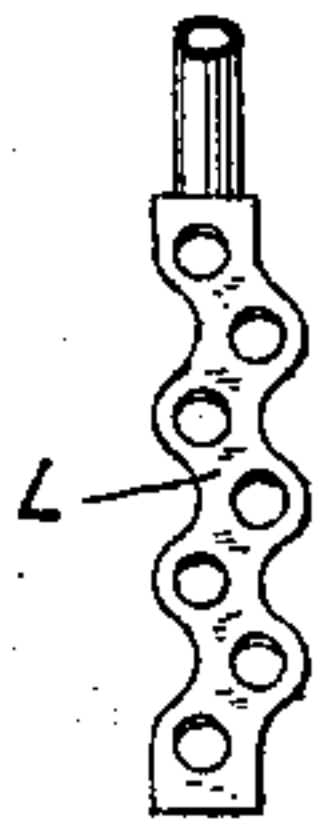


Fig. 3

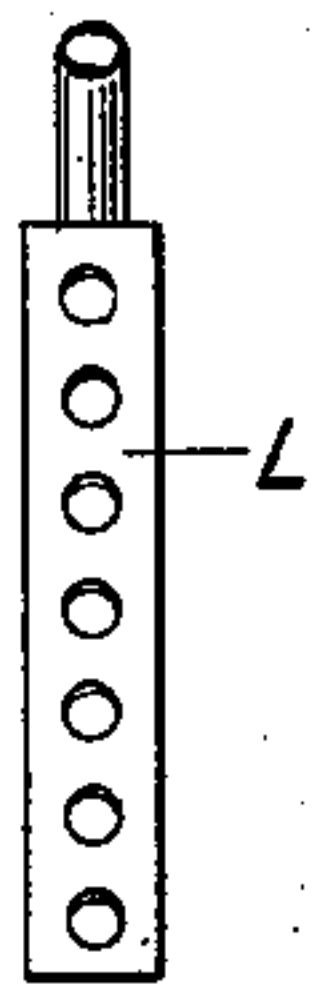
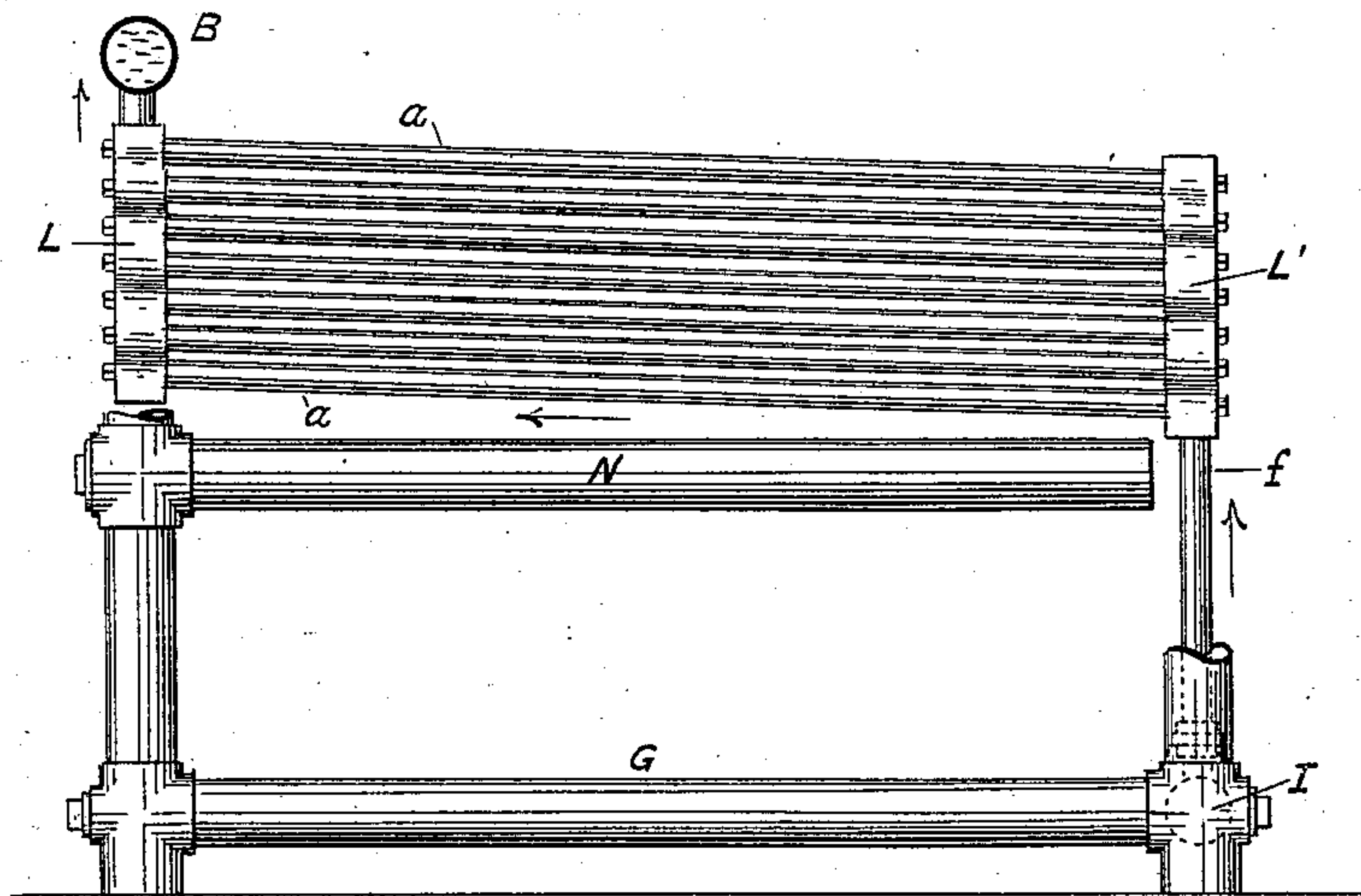


Fig. 5

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UNITED STATES PATENT OFFICE.

EDWARD E. ROBERTS, OF RED BANK, NEW JERSEY, ASSIGNOR TO THE
ROBERTS SAFETY WATER TUBE BOILER COMPANY, OF SAME PLACE.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 601,004, dated March 22, 1898.

Application filed December 11, 1897. Serial No. 661,499. (No model.)

To all whom it may concern:

Be it known that I, EDWARD E. ROBERTS, of Red Bank, county of Monmouth, and State of New Jersey, have invented certain new and
5 useful Improvements in Steam-Generators, of which the following is a specification.

The present improvements relate to steam-generators, particularly to the class known as the "water-tube," and have for their ob-
10 ject to so simplify and improve the construction as to afford ready access to its parts and the convenient removal of such parts as may from time to time need replacing without disturbing the condition of the generator as a
15 whole.

With these objects in view the improvements consist in the novel constructions and arrangements of parts hereinafter fully set forth with reference to the accompanying
20 drawings, in which—

Figure 1 is an elevation thereof, the covering being in section. Fig. 2 is a side elevation. Fig. 3 is a side elevation of a slight modification, certain parts being omitted.
25 Fig. 4 is an end view of one of the headers of the longitudinal tubes. Fig. 5 is a similar view of a changed form of the header.

Referring to said drawings, particularly to Figs. 1 and 2, the improved generator consists of a steam and water drum A, the front end of which communicates with a horizontal cross box or pipe B through a connection B', the outer ends of which cross-pipe communicate with side pipes D D'. The rear end of
35 the drum A likewise communicates by a connection E' with a rear horizontal cross box or pipe E, the outer ends of which are connected with side pipes F, similar to the pipes D D'. These front and rear pipes of each side are
40 connected by lower longitudinal distributing-pipes G, extending on opposite sides of the furnace. The two rear side pipes F are in turn connected by a lower cross-pipe I. With this system of piping is combined a longitudinal arrangement of tubes K, overlying the
45 fire-space and communicating at the rear with the lower cross-pipe I and at the front with the front cross-box B. In the embodiment of the invention shown in Figs. 1 and
50 2 these tubes are made up of a number of

of superposed longitudinal and slightly-inclined tubes *a*, the front end of the uppermost tube being connected by bend *b* and short tube length with the front cross-box B, 55 the rear end of the lowermost tube being connected by a bend *d* and tube *f* with the lower cross-tube I, while the intermediate ends of the tubes are connected by return-bends *c*, each tier of tubes forming a complete water com- 60 munication from the front cross-tube B longitudinally back and forward over the fire-space to the lower rear pipe I. This arrangement of longitudinal tubing is obviously susceptible of modification. Thus, as shown in Figs. 3 and 65 4, the tubes communicate with front and rear headers L L', the upper end of the front header communicating by a short tube with the front cross-box B and the lower end of the rear header communicating by a longer tube *f* 70 with the lower cross-pipe I. The headers L L' may also be varied in form. Thus in Figs. 3 and 4 the header is of serpentine form and the tubes staggered, while in Fig. 5 the header is straight with parallel sides, with the tubes ar- 75 ranged one directly over the other. The arrangement of tubing also embraces a series of cross-tubes M, extending over and across the fire-space from side to side beneath the longitudinal tubes K before described. These 80 tubes are arranged so that alternate tubes are inclined in a direction opposite to the other tubes of the series and communicate at their upper ends with an intermediate longitudinal pipe N, arranged one on each side of the gen- 85 erator, communicating at one end only with the front side tubes D D', the alternate cross-tubes being connected with the intermediate pipe at one side and the other tubes with the intermediate pipe at the other side of the 90 generator. The opposite lower ends of the alternate cross-tubes communicate by vertical side tubes *g* with the lower longitudinal distributing-pipe G at one side and the other cross-tubes by similar vertical tubes with the 95 lower pipe on the opposite side of the generator, the whole arrangement of cross-tubes and their connections forming a water connection between the two lower longitudinal distribut- 100 ing side pipes and the intermediate longitudinal side pipes N, that pass over the fire-space.

The circulation of the water through the various pipes and tubes to and from the steam and water drum A will be readily understood from what has been described, the water circulating downward through the pipes E', E, and F to the longitudinal distributing-pipes I G and upward through the vertical tubes *f* and longitudinal tiers of tubes K to the front cross-box B and from the longitudinal side pipes G through the cross-tubes M to the intermediate side pipes N, and thence by the front vertical side pipes D D' to the front cross-pipe B and connection B' to the drum A. The arrangement of the vertical rear tubes *f* and the vertical side tubes *g* surround three sides of the fire-space of the furnace, and the overlying longitudinal tubes K and cross-tubes M provide an exceedingly-extended heating-surface, insuring not only economy in the generation of steam, but efficient water circulation.

The cross-pipe E may be of larger diameter, if desired, which would provide a greater quantity of water near the water-level and thereby insure steadiness of the latter, and also the cross-pipe E and cross-box B may be located at the bottom of the drum A and connected therewith.

The arrangement of the longitudinal tubes K with the connecting-bends and return-bends or connecting-headers, as the case may be, located at the ends of the generator, enable any one or all of either tier of tubes or their connections easily accessible for removal and replacing. So, too, the cross-tubes with their vertical side connections may likewise be readily removed and replaced, all without disturbing other parts of the generator.

The generator, as usual, may be inclosed

by any suitable covering or shell C, as indicated in Figs. 1 and 2, and the front covered with large swinging doors, including the furnace doors, and parted at the center and permitting the removal of the whole interior of the generator, if desired.

What I claim is—

1. In a steam-generator, the combination of the elevated drum A, communicating cross-box B, cross-pipe I and one or more tiers of longitudinal return-tubes communicating directly with said cross-pipes, and forming a connection with the front and rear of the generator, as set forth.

2. In a steam-generator, the combination of the drum A, cross-box B, cross-pipe I and an intermediate group of longitudinal tubes *a* connected to headers L, L', as set forth.

3. In a steam-generator, the combination of the drum A, the lower longitudinal pipes G and N, the intermediate side pipes D connected with said drum, and a series of cross-tubes M, alternately connected with the opposite lower and intermediate pipes G and N, as set forth.

4. In a steam-generator, the combination of the drum, the cross boxes or pipes B and I, one or more tiers of longitudinal tubes K communicating therewith, longitudinal lower and intermediate side pipes G and N also communicating with the drum, and a series of cross-tubes M, alternately connected with the opposite lower and intermediate side pipes, as set forth.

EDWARD E. ROBERTS.

Witnesses:

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