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PATENTED JUN 27 1871

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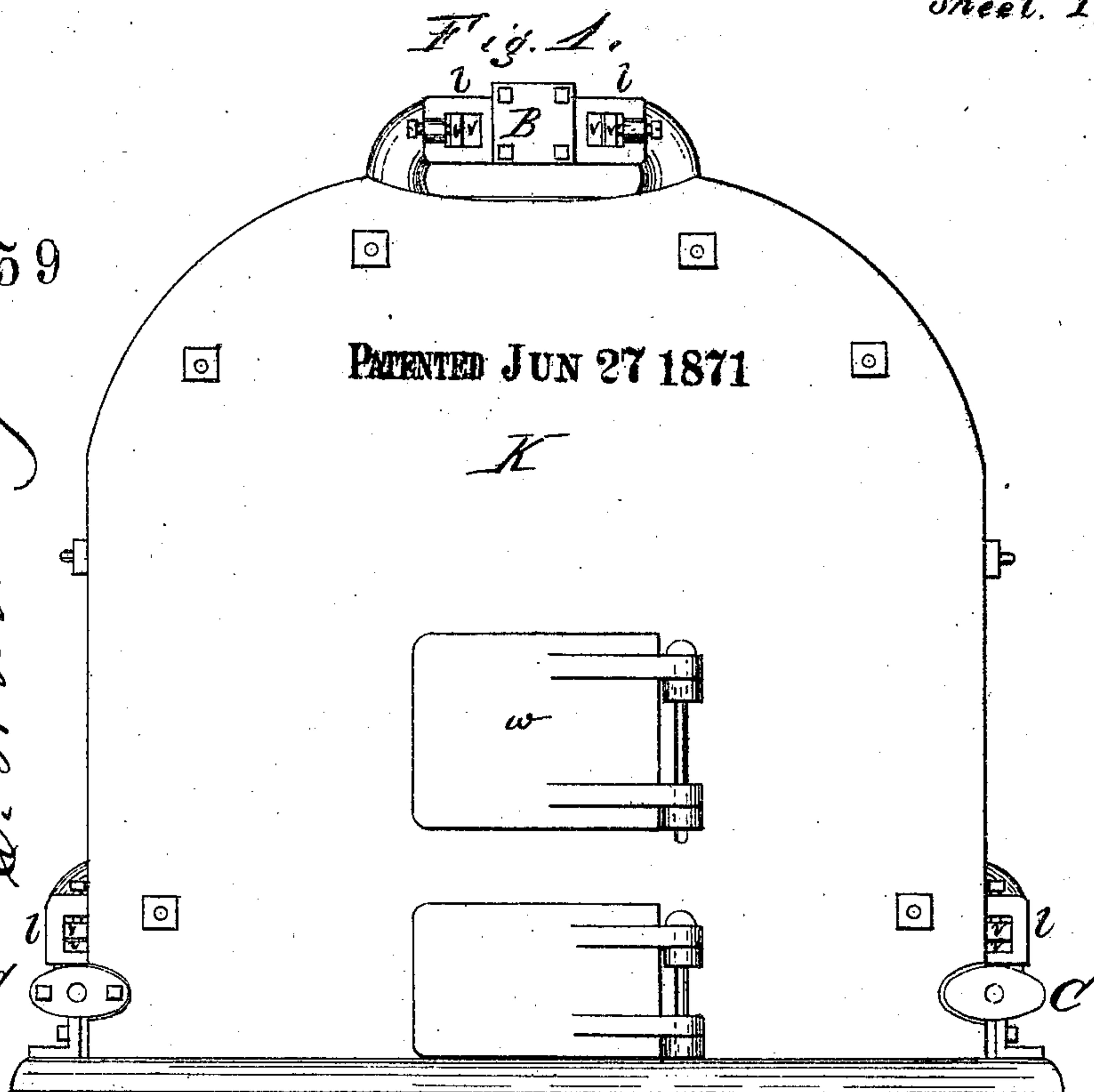
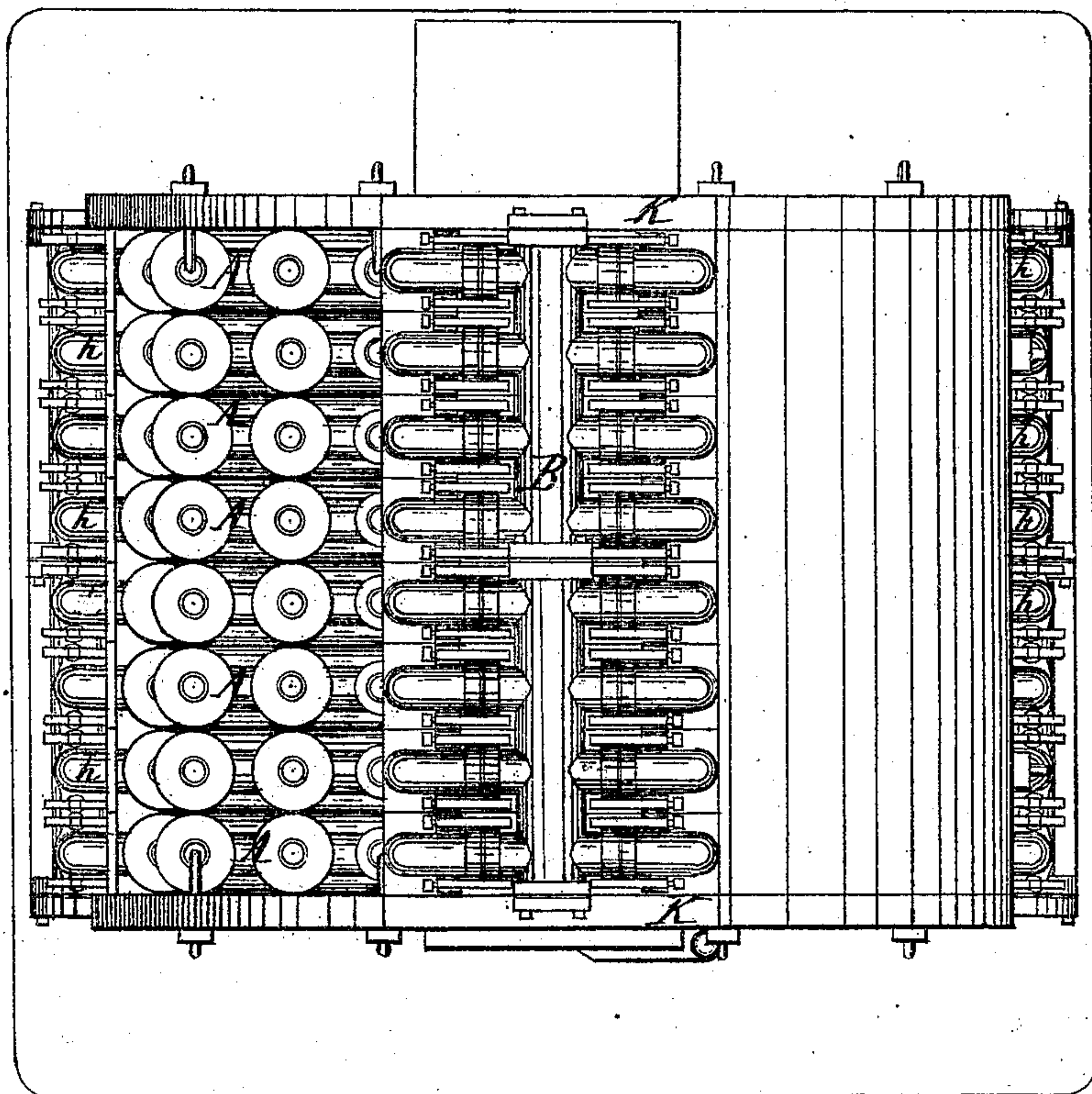
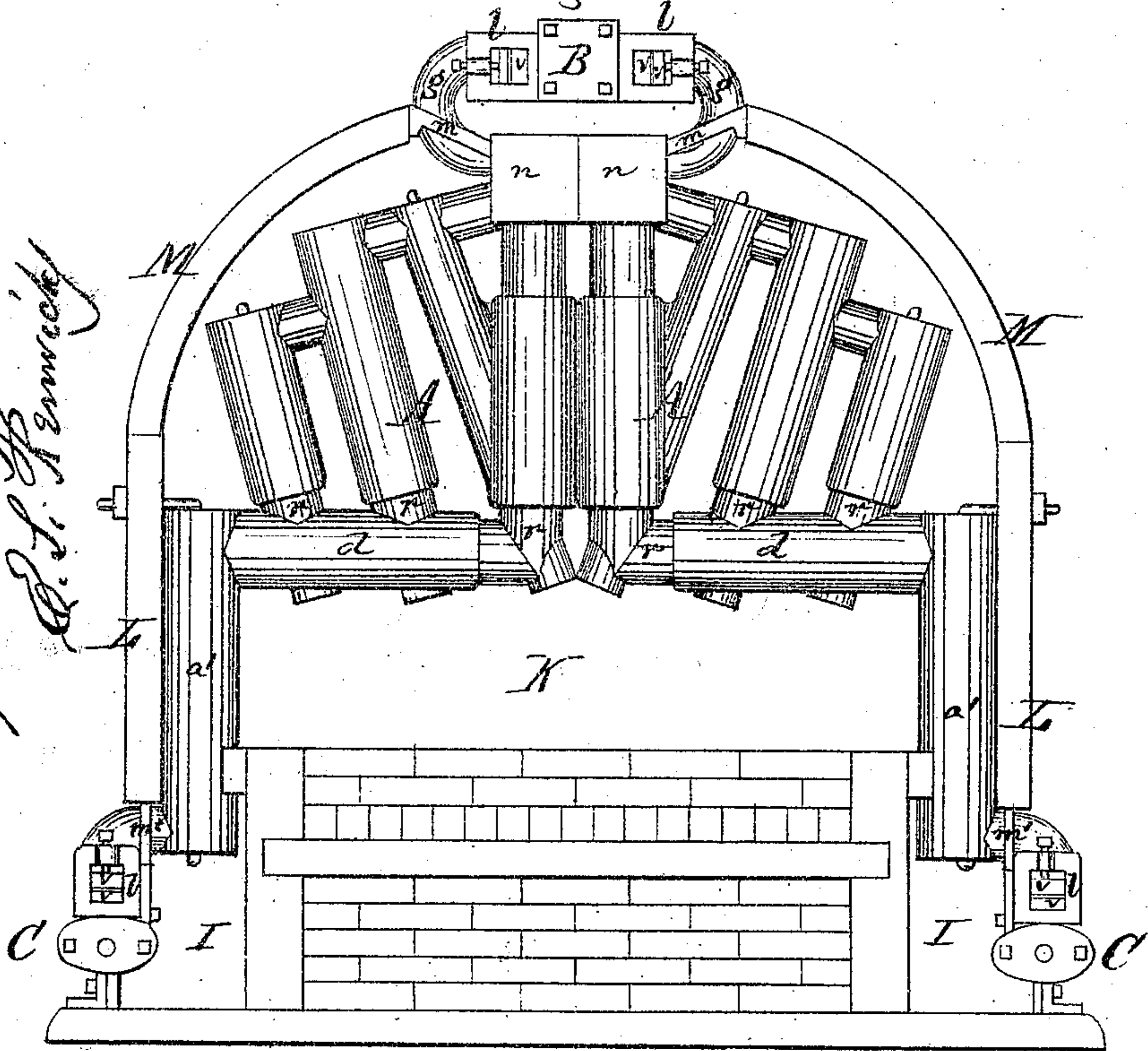


Fig. 2.



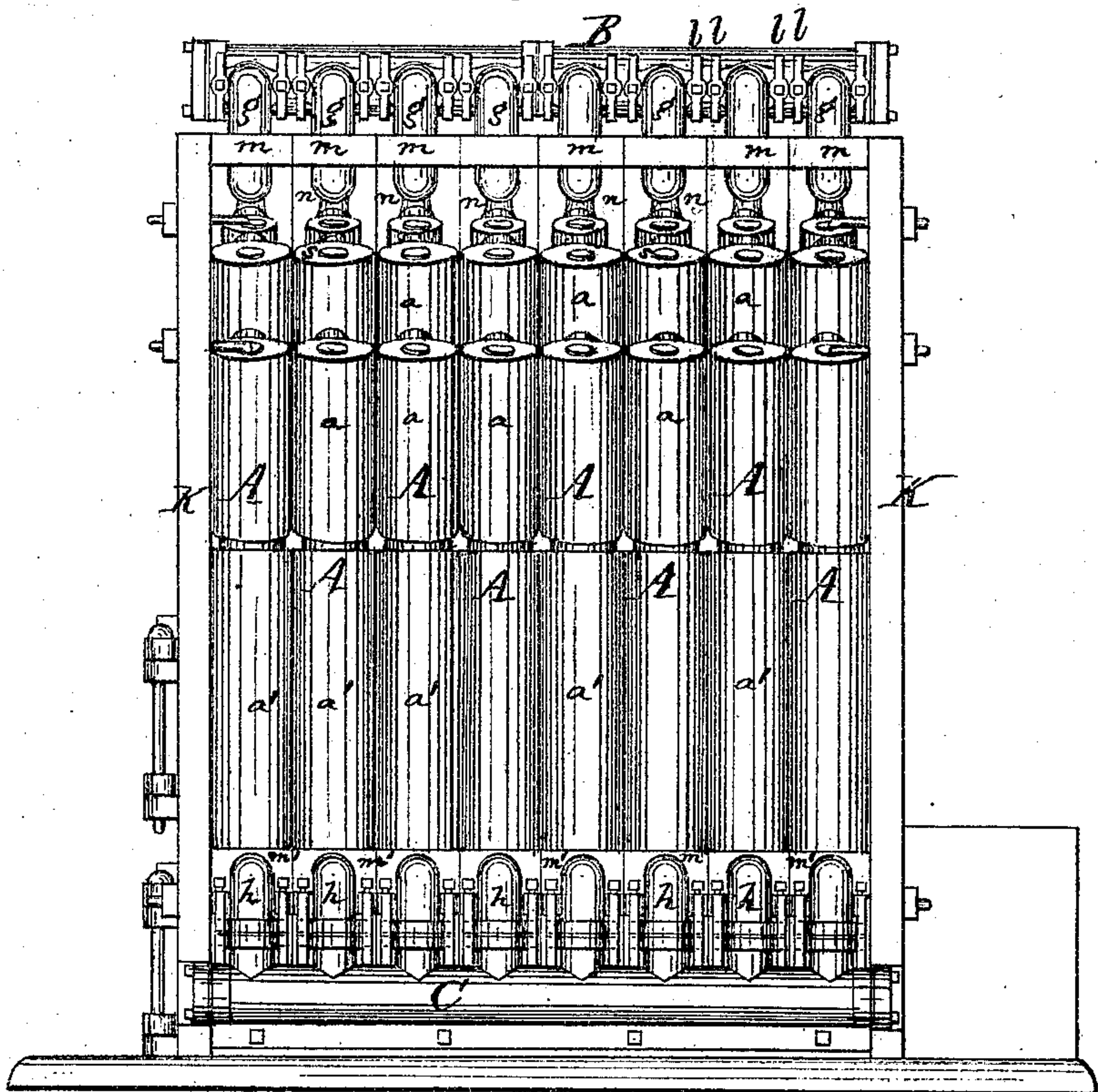
Witnesses
M. L. Penner
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Fig. 3.



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Fig. 4.



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Fig. 5.

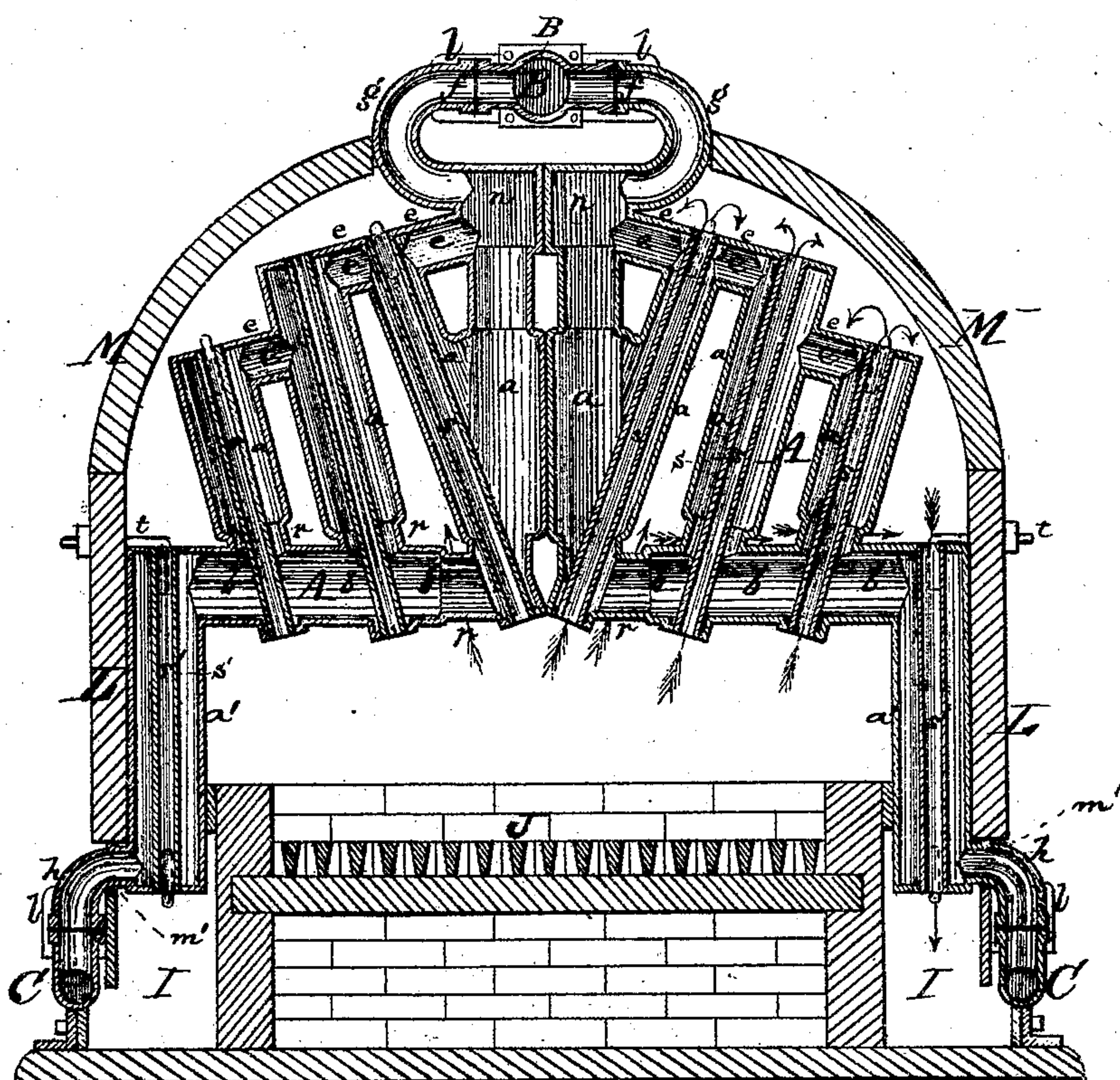


Fig. 6.



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UNITED STATES PATENT OFFICE.

BENJAMIN F. BEE, OF HARWICH, MASSACHUSETTS.

IMPROVEMENT IN SECTIONAL BOILERS.

Specification forming part of Letters Patent No. 116,259, dated June 27, 1871.

To all whom it may concern:

Be it known that I, BENJAMIN F. BEE, of Harwich, in the county of Barnstable and State of Massachusetts, have made an invention of certain new and useful Improvements in Sectional Boilers; and that the following is a full, clear, and exact description and specification of my said invention:

The objects of my invention are to enable an economical boiler of great strength to be constructed of cast-iron sections; to enable the sections to be readily and securely connected, to protect the connections of the sections from the action of the flame; and to facilitate the cleansing of the fire surfaces of scurf and ashes. To these ends my invention consists, first, of a tubular boiler-section composed of a group of upright tubes, arranged side by side, and connected by transverse passages extending crosswise to the plane of the group, and fitted at the uppermost and lowermost parts with nozzles for the passage of steam and water. The tubular construction of this section combines a large amount of fire surface with great strength and facility of cleansing the exterior surfaces. This grouped tubular section extends half-way across the fire-box, so as to form a transverse rib of the roof thereof, while one of its tubes extends downward at the adjacent side of the fire-box and forms a portion of said side. My invention consists, further, of the combination of the said tubular boiler-section with internal tubular flues extending through the upright tubes, so as to permit the products of combustion to pass through the same and return around their exteriors. My invention consists, further, of the combination of a series of said grouped tubular boiler-sections in couples, each couple extending crosswise with the fire-box and connected with the adjacent couple of the series, so that the said connected couples form a roof of transverse ribs for the fire-box. My invention consists, further, of the construction of said grouped tubular boiler-section with a nozzle having flanges fitted to abut and form a wall with the flanges of adjacent sections. My invention consists, further, of the connection of the grouped tubular sections and the connecting-pipes by means of lugs and screw-clamps, the lugs projecting from the sections and pipes and the screw-clamps embracing the said lugs. My invention consists, further, of the combina-

tion of the boiler, composed of a series of said grouped tubular sections, with a removable casing, which can be removed for the purpose of cleansing the fire surfaces of scurf and ashes.

In order that my invention may be fully understood, I will proceed to describe a boiler which embodies every portion of it, and which is represented in the accompanying drawing.

Figure 1 represents a front elevation of the boiler. Fig. 2 represents a top view of it with a part of the casing removed. Fig. 3 represents a front elevation of it with the front of the casing removed. Fig. 4 represents a side view of it with the side casing removed. Fig. 5 represents a transverse section of the boiler. Fig. 6 represents a face view of one of the nozzles.

The boiler thus represented is composed of a series of tubular sections, A A A, connected by a steam-pipe, B, and by water-pipes C C. Each tubular section is composed of a number of upright tubes, *a a a'*, connected by transverse passages *b b*, formed by the horizontal pipe *d* for the circulation of water, and by other transverse passages, *e e*, for the passage of steam. Each section has a nozzle, *f*, at its uppermost part for the escape of steam, the said nozzle being formed by the elbow-pipe *g*, which is turned inward to communicate with the steam connecting-pipe B; and each section has a nozzle at its lowermost part for the entrance of water, the said nozzle being formed by the elbow-pipe *h*, which is turned downward to connect with the water connecting-pipe C. Each nozzle has a flange, *m* and *m'*, cast upon it, the edges of said flanges abutting so as to form a wall and prevent the passage of the products of combustion to the connecting-pipes B C and to the joints between them and the nozzles. The head *n* of the uppermost tube also is made square, so that the heads of the adjacent sections shall touch each other and prevent the passage of the heated gases. As will be perceived by reference to the drawing, the greater part of the tubes is above the level of the grate J, while one tube, *a'*, descends below that level to the water connecting-pipes. The greater portions of the tubes also are of such diameter that their bodies touch, when the sections are placed in juxtaposition, so as to prevent the passage of the heated gases between them, except at the parts *r r r*, where they are made of smaller diameter for the purpose of permitting the heated

gases to pass, as required. The boiler is made up by setting two sections to the right and left of the central line and by setting as many sections in couples behind the first two as are required to furnish the requisite steam-generating power. In the boiler thus set up the lowermost upright tubes a' , by touching each other, form the sides of the fire-box, while the pipes d d , forming the transverse water-passages b b , by touching each other form the roof of the fire-box. The grate J is set within this fire-box, and the ends K of the fire-box may be built of permanent masonry or may be made removable, as deemed expedient. The upright tubes of each section are traversed by internal tubular flues s s' , which are of wrought-iron, and are secured at their ends in holes in the heads of the tubes in the ordinary way. The tubular flues s s , which are above the fire-box, permit the heated gases to pass to the ends of the tubes furthest from the fire, whence they return around the upright tubes, and finally pass through the tubular flues s' in the side tubes, and through the spaces between said tubes outside of the plane of their central lines, at which they touch each other, to side flues I I below the level of the grate. The products of combustion are thus forced to travel as indicated by the arrows in Fig. 5. The sides and top of the boiler are inclosed by a removable casing composed of sections L L M M , the side sections L L being held in place by hook-bolts t engaged in the tubular flues, and the arch-formed upper sections M M being held in place simply by their weight. These sections of casing are constructed, by preference, hollow, with sheet-iron sides, which are tied together at intervals by through-rivets, and the cavities of these sections are filled in with some non-conducting material, such as ashes or clay. Each nozzle of each section has two lugs, v v , Figs. 3 and 6, projecting laterally from its exterior, and each connecting-pipe, for both steam and water, is constructed with corresponding nozzles and lugs. In order to secure the connecting-pipes and boiler-sections to each other a pair of screw-clamps, l , is used for each nozzle, the clamps being applied to the adjacent lugs and the screws being screwed up. As the joints are all outside of the casing of the boiler, and protected by the flanges m m' of the nozzles from the action of the heated gases, the joints may be packed with India-rubber gaskets, thus rendering nice fitting unnecessary, and permitting a slight amount of movement to compensate for any unequal expansion of the boiler-sections that may occur.

In order to facilitate the construction of boilers of different capacities out of sections of the same size, and without change of the patterns for the castings, the connecting-pipes B C C are made up of sections having nozzles enough to connect four pairs of sections; hence the boilers can be furnished of any multiple of four pairs of sections from the same patterns, and, by having additional patterns of connecting-pipes with five and six nozzles, boilers of any desired numbers of couples of tubular sections can be supplied.

When the length of grate required does not exceed six feet it may be fired at one end only of the boiler, through a door, w , provided for the purpose; but when the length exceeds six feet it is expedient to fire the grate from both ends of the boiler-casing. The construction of each section of a set of connected tubes enables it to be readily constructed by casting, gives it great strength to resist internal pressure, enables the steam to escape in an upward direction as fast as formed, and forms tubular passages, which can be readily cleaned, between the touching tubes of adjacent sections, for the passage of the heated gases.

The combination of the tubular sections with internal tubular flues combines the advantages of a cast-iron sectional boiler with those having tubular flues. The construction of the sections so as to extend over only half of the fire-grate permits the sections to be made of a size and weight that can be readily handled. The mode of connection by screw-clamps and lugs greatly facilitates the setting up of the boiler, and the construction of the casing in removable sections permits the exteriors of the sections, as well as the interiors of the tubular flues, to be readily cleansed of scurf.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The grouped tubular boiler-section, consisting of upright tubes arranged side by side crosswise with the fire-box, united by transverse passages, the said section being fitted with nozzles for the passage of steam and water, and adapted to form a transverse rib of the roof of the fire-box, substantially as before set forth.

2. The combination of the said tubular boiler-section with tubular flues extending through the upright tubes, substantially as hereinbefore set forth.

3. The combination of a series of grouped tubular boiler-sections in couples, each couple arranged crosswise with the fire-box and connected with the adjacent couple, the said couples constituting transverse ribs of the roof of the fire-box, substantially as before set forth.

4. The said grouped tubular boiler-section, constructed with a nozzle having flanges at its sides, which flanges are fitted to abut and form a wall to prevent the passage of flame, substantially as before set forth.

5. The combination of the series of grouped boiler-sections with the connecting-pipes by means of lugs and screw-clamps, substantially as before set forth.

6. The combination of the boiler, composed of said grouped tubular sections arranged in couples crosswise with the fire-box, with a casing constructed of removable sections, substantially as before set forth.

In testimony whereof I have hereto set my hand this 9th day of December, A. D. 1870.

BENJAMIN F. BEE.

Witnesses:

OBED BROOKS,
H. W. HOLMES.