No. 671,013. Patented Apr. 2, 1901.

E. S. CLARK.

STEAM BOILER COUPLING.

(Application filed July 30, 1900.)

(No Model.) 3 Sheets—Sheet 1.

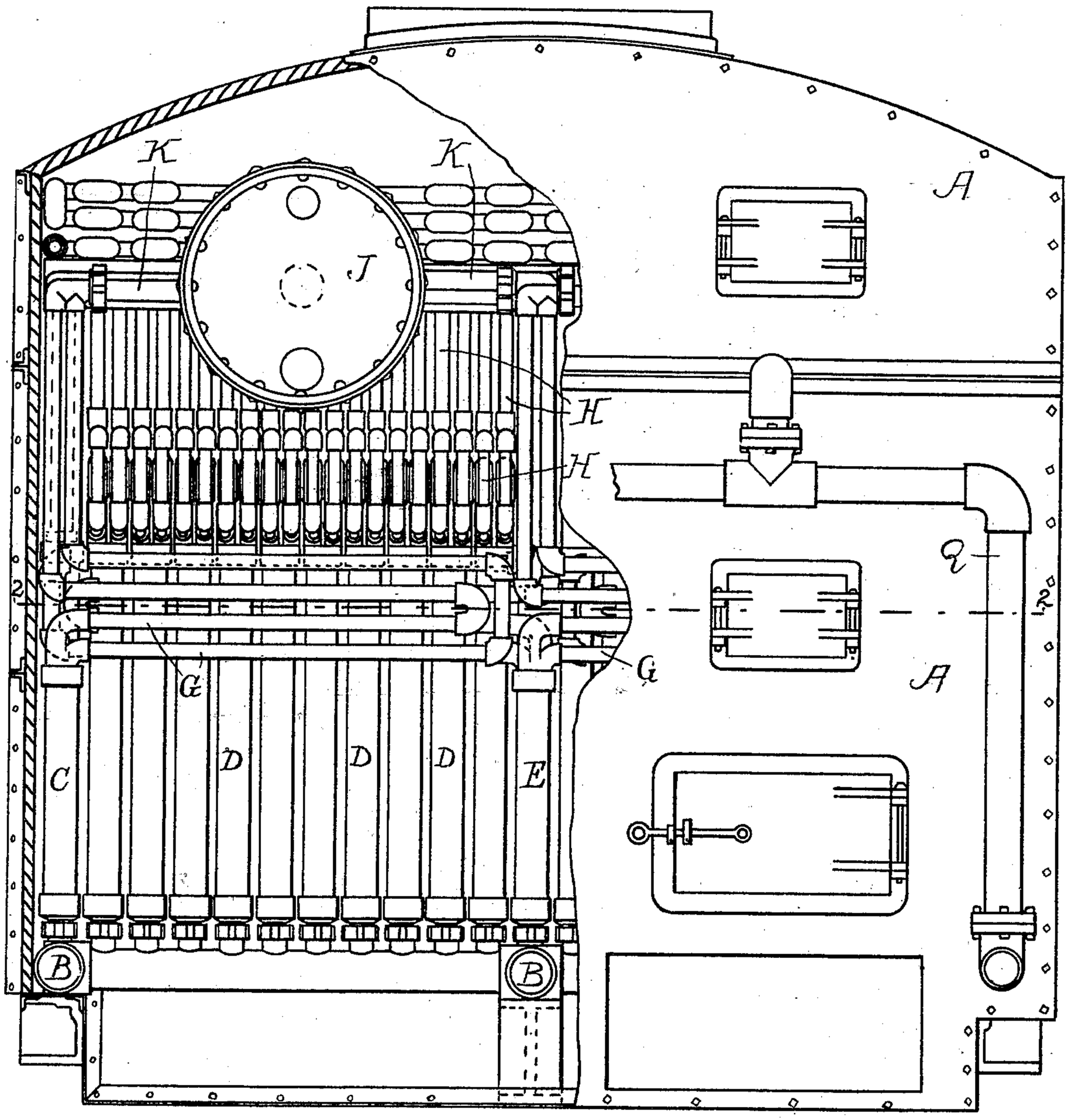

Fig. 1.

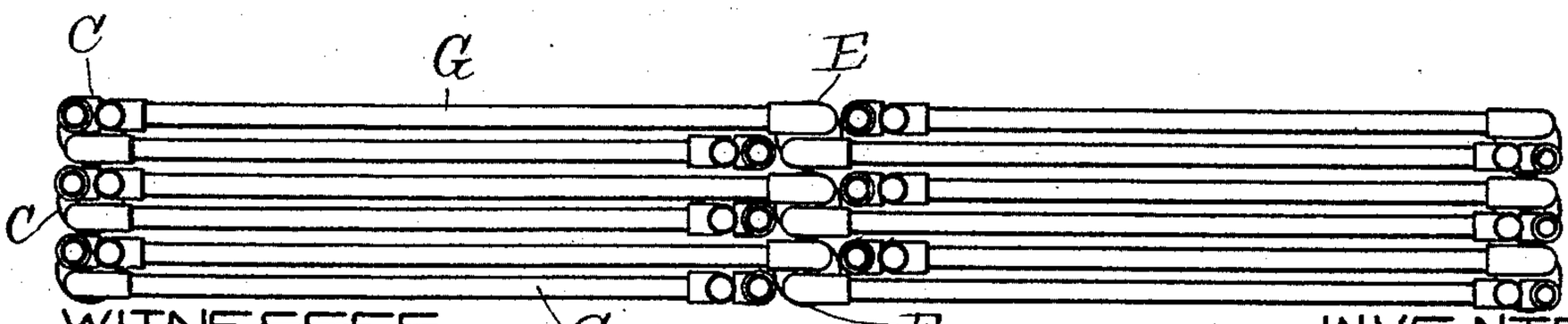

Fig. 2.

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(No Model.) 3 Sheets—Sheet 2.

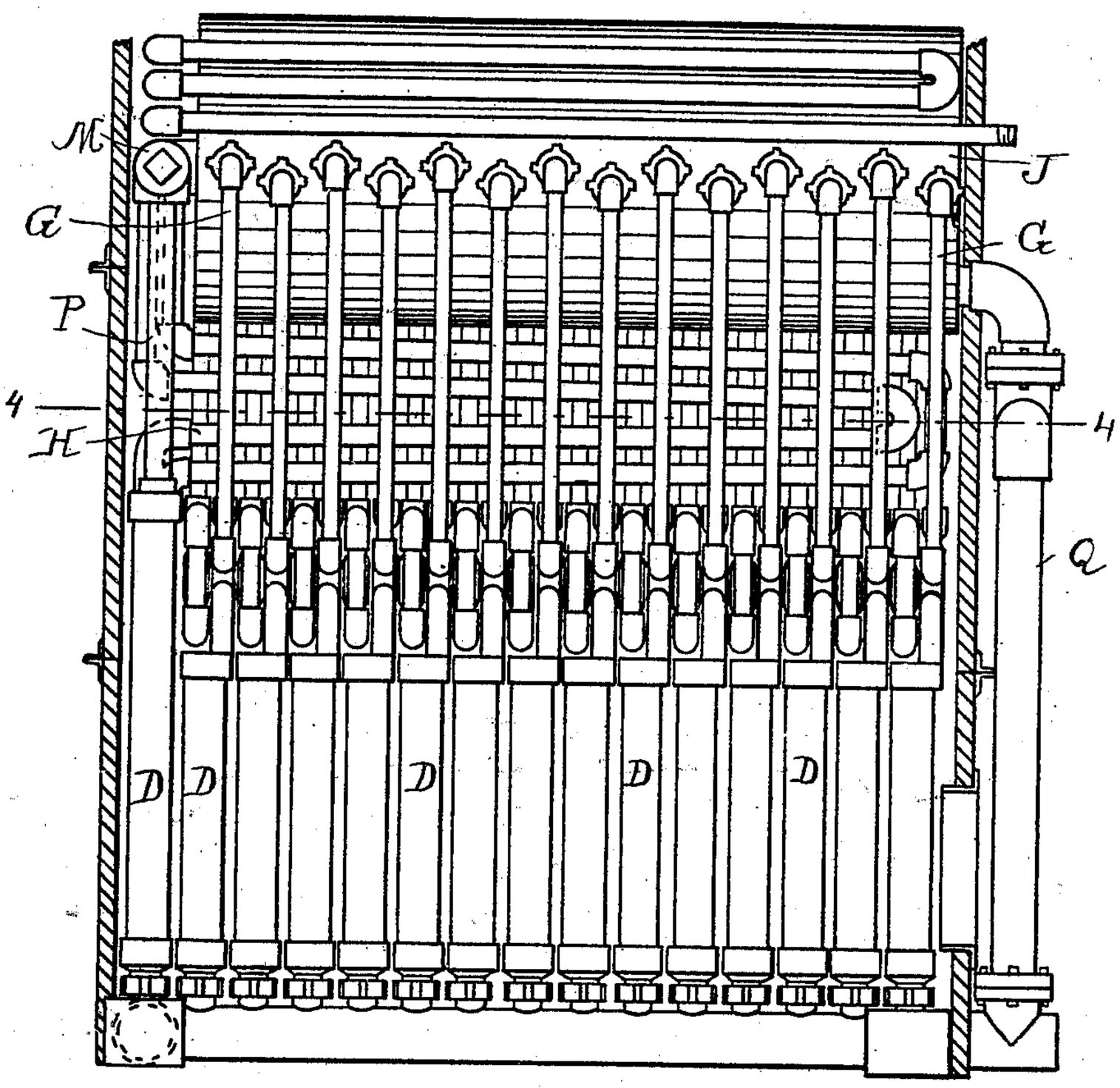

Fig. 3

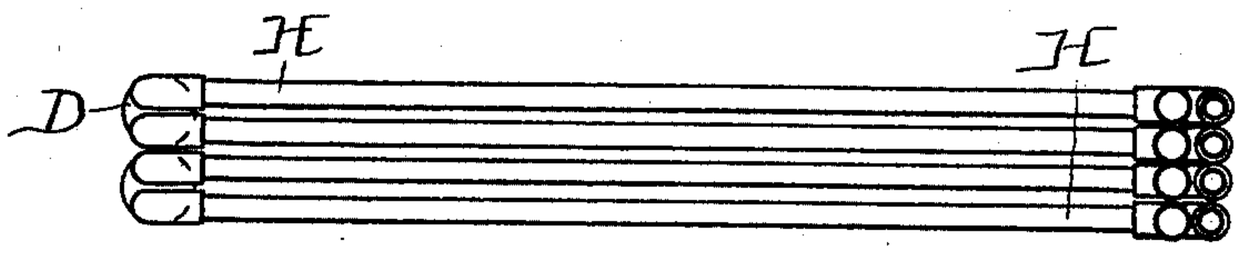

Fig. 4.

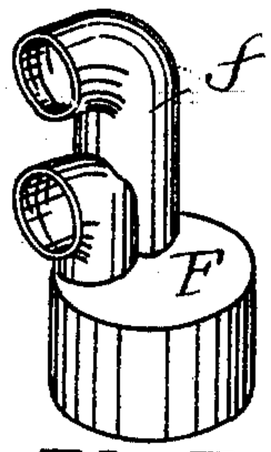

Fig. 5.

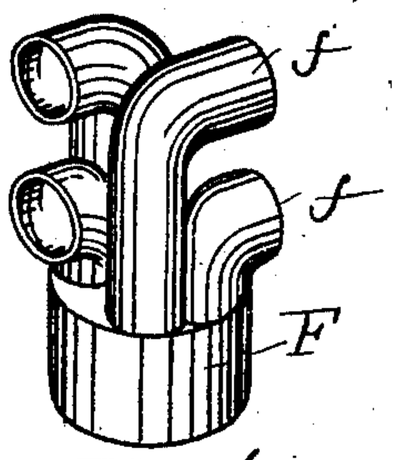

Fig. 6.

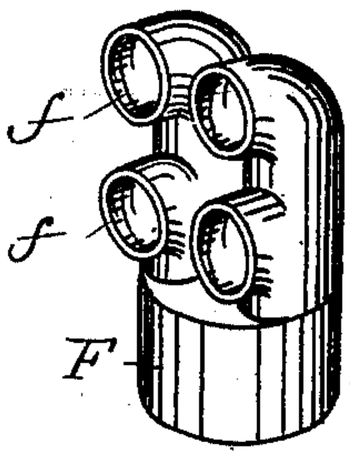

Fig. 7.

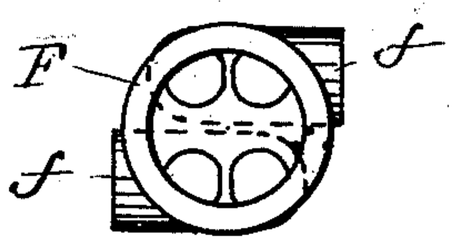

Fig. 8.

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STEAM BOILER COUPLING.

(Application filed July 30, 1900.)

(No Model.) 3 Sheets—Sheet 3.

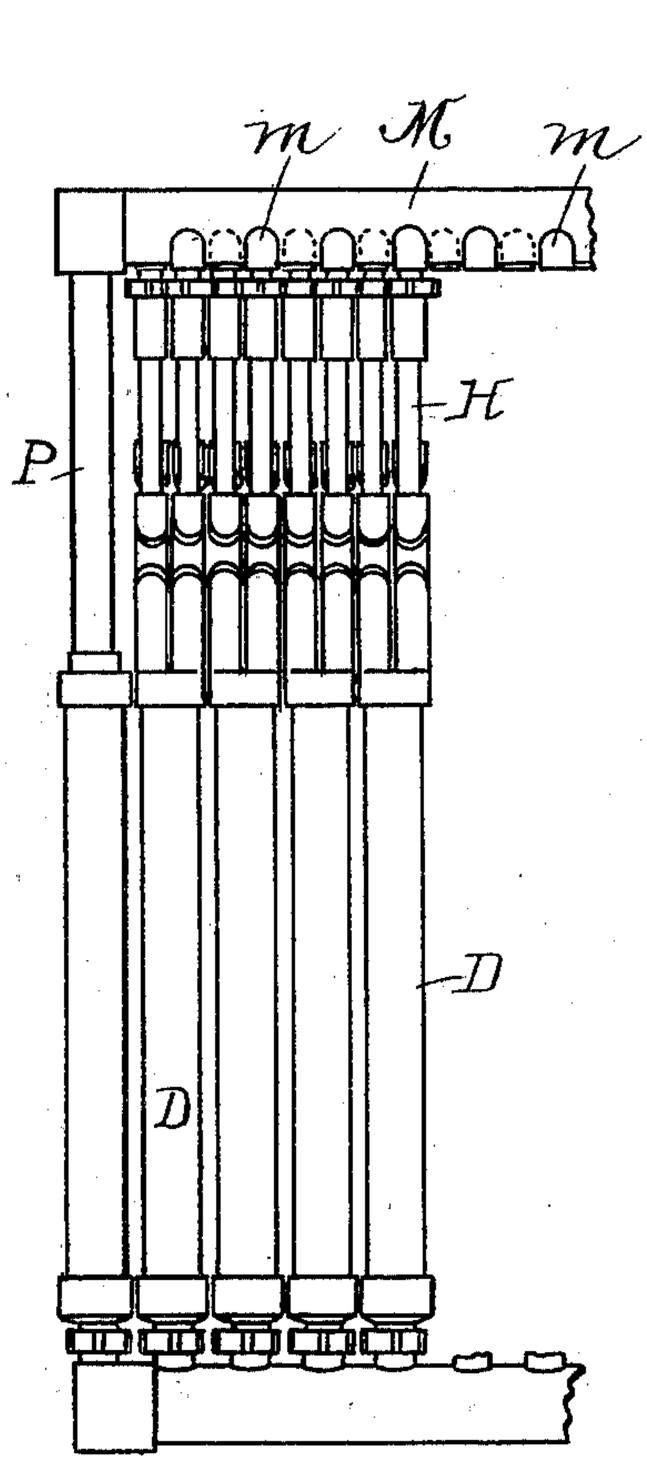

Fig. 9.

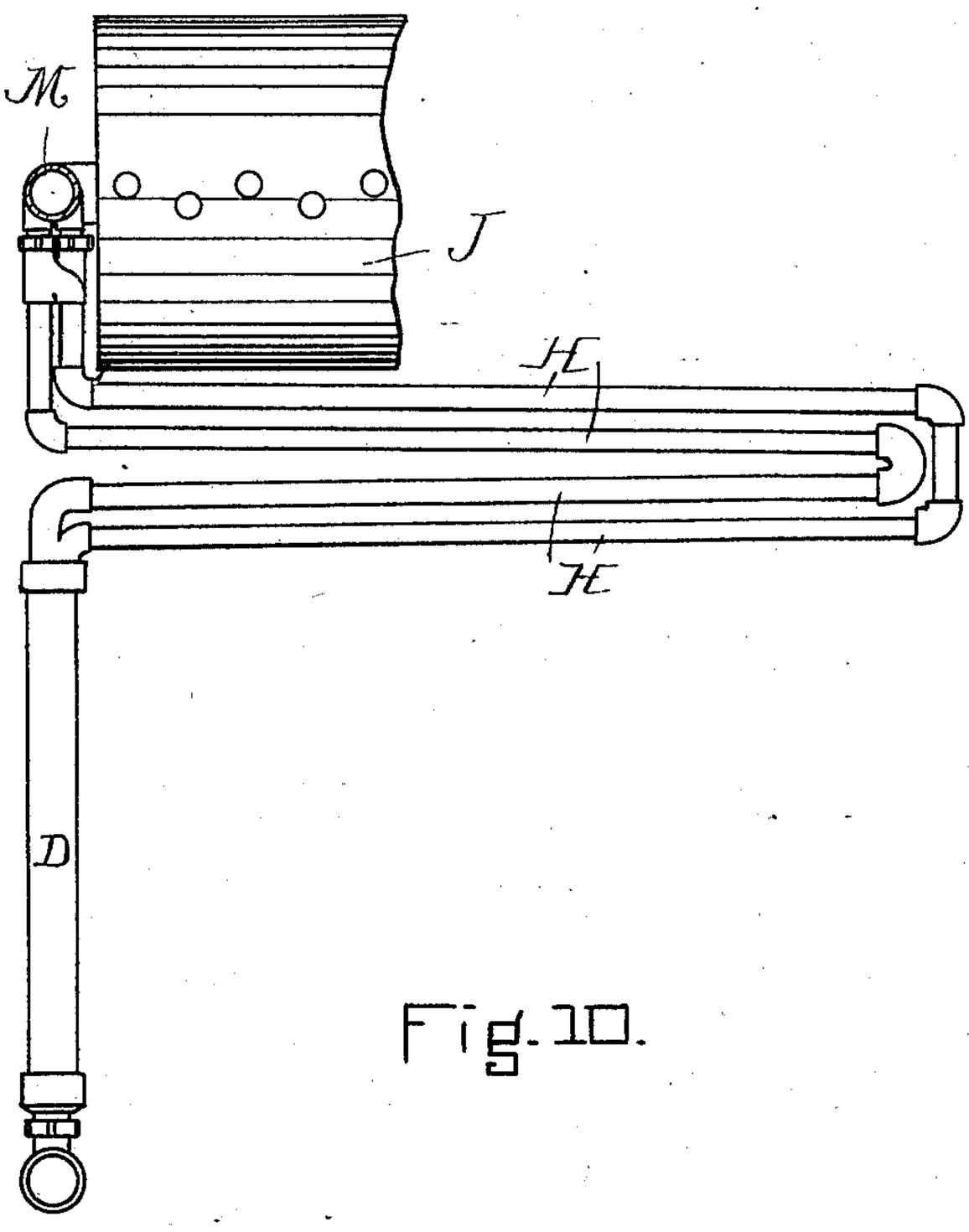

Fig. 10.

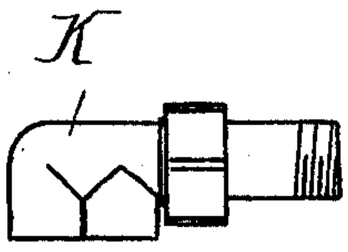

Fig. 11

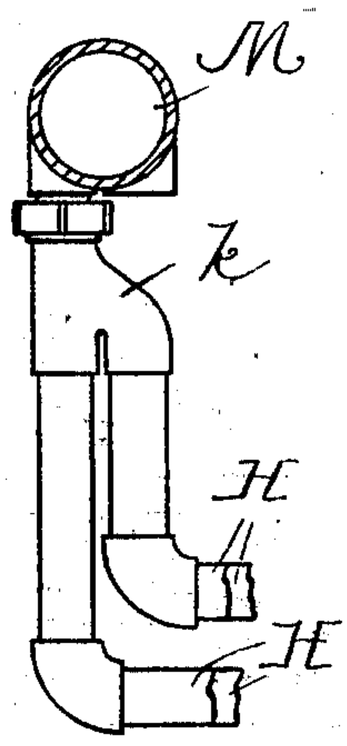

Fig. 12.

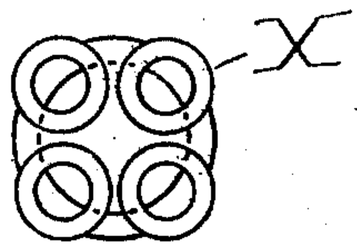

Fig. 13.

WITNESSES.

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UNITED STATES PATENT OFFICE.

EDWARD S. CLARK, OF BOSTON, MASSACHUSETTS.

STEAM-BOILER COUPLING.

SPECIFICATION forming part of Letters Patent No. 671,013, dated April 2, 1901.

Application filed July 30, 1900. Serial No. 25,211. (No model.)

To all whom it may concern:

Be it known that I, EDWARD S. CLARK, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Steam-Boilers and Couplings, of which the following is a specification.

This invention is in the nature of an improvement upon the steam-boiler and coupling for which Letters Patent of the United States No. 546,809 were granted to me September 24, 1895. In my former invention the coupling was peculiar in that it comprised a threaded cap for an enlarged pipe, with nipples or coupling-sockets on the closed end of said cap and offset or located on either side of the center thereof to receive pipes of reduced diameter, so that two series of such smaller pipes could be placed side by side in the same vertical plane as the enlarged pipe to which the cap was secured. The walls of the furnace were of closely-set vertical tubes to which the reduced transverse pipes above the fire were connected by said couplings. My present improvement retains this offset feature of the coupling and adds to it the peculiarity that the nipple or socket so offset is duplicated or partitioned and formed with a terminal and an intermediate outlet, both in the plane of one half of the end cap and curved to right or left, so as to receive at right angles to the axis of said cap two distinct pipes one above the other, which may thus extend parallel across the boiler, and by return-bends of unequal length return to the plane of the coupling, thus presenting four nearly-horizontal pipes in the vertical plane of one half of the cap or enlarged portion of the coupling. For the sides of my boilers the connecting-nipples are formed on one half only of the end of the cap, the other half being left vacant (as in my former patent) for the return-bend of the pipes extending from the opposite wall of the boiler. The central line of the couplings when the furnace is made double will have the curved offset nipples with the terminal and intermediate outlets, as stated, formed on each half of said cap, so that pipes connected thereto would extend one above the other both to right and left from such central line. At the back of the boiler the coupling has four offset nipples or outlets, all turning toward the front. I employ also improved forms of couplings at the upper ends of the small circulation-pipes in order to reduce the number of perforations in the steam-drum and the steam-manifold to which they lead. For the sides of the boiler these upper couplings receive the ends of the two parallel pipes running from the terminal and intermediate outlets of the offset couplings described, and by means of a pipe-section of proper length with right and left terminal threads or a union-joint connect each pair of said pipes to the drum. I now omit the front manifold shown over the doors of the furnace in my former patent and I connect the set of four circulation-pipes which run forward from each rear vertical tube and back to the steam-manifold at the rear of the boiler by couplings, each receiving two of said pipes and delivering the steam through one aperture to the manifold, these couplings having one central and one offset nipple or socket and being reversible edgewise so as to enter the manifold along a zigzag line, thus separating the perforations and leaving the manifold stronger. The manifold is supported at its ends by pipes extending directly upward from the vertical wall-tubes at the rear corners of the furnace.

In the drawings, Figure 1 is a front elevation of one of my double-furnace boilers, the outside casing being largely broken away to show the compact internal construction. Fig. 2 is a partial horizontal section at 2 2, Fig. 1. Fig. 3 is a side elevation, the casing in vertical section. Fig. 4 is a partial horizontal section at 4 4, Fig. 3. Figs. 5, 6, and 7 are enlarged perspective views of my improved offset double-outlet couplings, and Fig. 8 a bottom view of Figs 6 and 7. Fig. 9 is a partial rear elevation of the boiler, and Fig. 10 is a detail of the piping and connections. Figs. 11 and 12 are enlarged details of the upper couplings, and Fig. 13 a plan of a modified form of fourfold coupling for independent pipe connections.

The casing A of the boiler is made of sheet-steel riveted to angle-iron frames and bolted together in sections with through-bolts having head and nut on the outside. It is lined throughout with suitable non-conducting material properly secured in place. The fur-

nace is rectangular and has a suitable bottom grate above the ash-pit, water manifold-pipes B forming the base of the side and rear walls and of the central partition when a double furnace is provided, as in Fig. 1. These manifold-pipes have a series of suitably-spaced perforations to receive the nipples of the union-joints connecting the vertical tubes thereto.

C represents the enlarged vertical tubes of the side walls closely set in the manifold B, D the like tubes of the rear wall, and E those forming the central partition, Fig. 1, similarly set. These tubes are preferably secured in position by union-joints, as indicated in Figs. 1, 3, and 9.

Figs. 5 to 8 represent my improved couplings F^f by which the vertical wall-tubes are connected at top to the smaller circulation-pipes G and H, traversing the space directly above the furnace. These new couplings differ somewhat in form, but are characterized by a plurality of offset outlets through either or each half of the end of the threaded cap screwed upon the vertical tube. Fig. 5 shows the form I use for the side walls, the two outlet-sockets *f* being formed on one half only of the cap to receive the two transverse circulation-pipes G, which run parallel to each other across the furnace and return, bringing the four pipes in the vertical plane of one half of the end cap. The other half of the end cap being vacant gives space over it for the elbow or the return-bends of the two pipes coming to that point from a similar coupling on the opposite side of the furnace and returning thereto or extending directly upward. It will be seen that with these double-outlet offset couplings and piping arranged as shown eight of the transverse circulation-pipes will be found in the vertical plane of each of the side-wall tubes—that is, two of the small pipes forward and back from and in the plane of each half of said tube and connected to the outlets of said couplings.

The coupling shown in Fig. 6 and bottom plan, Fig. 8, is the form employed in my double boilers, where a central range of the vertical tubes E forms a partition between the furnaces. In such cases the twin outlets *f* are formed on both halves of the end cap and lead in opposite directions to receive the pipes G, which extend in duplicate to the side walls at right and left of said partition. These pipes returning to the center four high or in the same vertical plane in which they depart from it extend thence upwardly and are connected to the steam-drums in the top of the boiler. Pipes from the side walls extend in to the center and return to the sides four high in the vertical plane of the same tubes E, as shown in Fig. 2. The other fourfold coupling (shown in Fig. 7) has its four outlets turned in the same direction. This is the form I employ to connect the longer vertical tubes D of the rear wall to the horizontal circulating-pipes H, two pairs of which run forward side by side and return in the same vertical plane to the rear of the boiler, as shown in Figs. 3 and 10. Here, again, immediately above the transverse pipes G there are in the vertical plane of each rear-wall tube D eight of these longitudinal circulation-pipes H—that is, the four pipes from the coupling, Fig. 7, extending forward and back in said plane. This construction, due to the double outlets in the plane of each half of the couplings, results in the greatest possible compactness and gives wonderful effectiveness in utilizing the fuel and in speedy production of steam without making the circulation-pipes too long.

The bottom plan, Fig. 8, shows the double outlets *f* separated by a partition in each half of the end cap, all being offset for the purposes stated. In the modification, Fig. 13, instead of the integral nipples *f* four threaded bosses are formed on the end of the cap X to receive independent tubes connected by elbows to the horizontal pipes H. I use this coupling to avoid casting long integral nipples on the caps in cases where the rear vertical tubes D are no higher than the side tubes C, and hence where extension is required to connect the rear tubes with the longitudinal pipes H in a plane above the transverse pipes G.

In Figs. 1, 3, and 10, J represents one of the steam-drums at top of the boiler, into which steam is delivered from the central and side walls and the pipes G. The upper couplings K, connecting the twin pipes G to the drum, are shown in Figs. 1, 3, and 11. The outer end or head of the coupling has two threaded lateral sockets properly spaced to receive the upper section of said pipes, reversely threaded at its end to engage the pipe-elbow below and said socket. This double-socketed head is connected to the drum in a straight or staggered line of openings by short pipe-nipples and union-joints or by an integral tubular stem. After the coupling is inserted in the drum the twin pipes G may be successively connected thereto by rotating their upper sections, the horizontal portions springing sufficiently for the purpose.

The upper pipes H do not discharge directly into the drums J, but into the steam-manifold M, extending across the rear of the boiler and communicating with the drums. This manifold has along its under side a succession of bosses *m*, staggered or arranged in a zigzag line to each engage the one nipple or stem of the coupling *k*, which receives the two pipes H coming in the same vertical plane from the rear lower coupling F^f, Fig. 7. The form and application of this coupling *k* are shown in Figs. 9, 10, and 12, where the twin pipes enter the two threaded sockets, the axis of one of them being offset with relation to the stem which enters the boss *m*. Reversing these couplings edgewise alternately brings the coupling-stem to the bosses *m* successively, as shown. It will be seen that the couplings K and *k* are similar in the respect that each takes the two circulation-pipes com-

ing to it from the two outlets *f* on one half of one of the couplings F and delivers the steam through one orifice into the drum or manifold at top of the boiler.

In Figs. 3 and 9 the manifold M is shown supported by the tubular posts P, extending up to it from the corner vertical tubes D. In lieu of the single post at each corner four parallel pipes may be interposed between the top and bottom couplings, such as are indicated in Fig. 13. Suitable doors in the casing are shown in Fig. 1, while Figs. 1 and 3 show the downflow-pipe Q outside the casing and the feed-water-heating pipes beside the steam-drums.

I claim as my invention—

1. The described offset coupling for water and steam pipes, consisting of an enlarged end cap having a plurality of outlets leading through its end portion from one side of the axial center thereof and adapted to receive, in the vertical plane of one half of such end portion, two distinct pipes, of reduced diameter the ends of which engage said outlets in the same vertical plane, substantially as set forth.

2. The described offset coupling for water and steam pipes, consisting of an enlarged threaded end cap having, integral with its end portion and at one side of the axial center thereof, a partitioned tubular passage formed with a terminal and an intermediate threaded outlet adapted to engage the ends of two parallel pipes lying in the plane of one half of said end cap and serving to receive the threaded ends of two distinct circulation-pipes, substantially as set forth.

3. The described offset coupling for water and steam pipes, consisting of an enlarged threaded end cap formed with a plurality of threaded pipe-sockets opening through its end portion in each half thereof, that is at each side of its axial center, and adapted to receive in the vertical plane of each half of its end portion two distinct pipes of reduced diameter, substantially as set forth.

4. The described offset coupling for water and steam pipes, consisting of an enlarged, threaded end cap having a plurality of quarter-turn pipe-sockets formed in pairs on and integral with each half of its end portion, that is at each side of the axial center, and adapted to receive in the vertical plane of each half of its end portion, two distinct pipes extending in said plane at right angles to the axis of said cap, substantially as set forth.

5. In a steam-boiler, a furnace having vertical side walls formed of closely-set vertical water-tubes, supplied from horizontal manifold base-pipes and suitably-arranged feed-water pipes, in combination with transverse circulation-pipes of less diameter than said vertical tubes, arranged in pairs one above another, crossing and recrossing the boiler above the furnace, and with offset couplings therefor having an enlarged cap for the vertical tube and two threaded sockets located one above the other at one side of the axial center of said cap, each pair of such circulation-pipes being connected to said sockets and located in the vertical plane of one half of said cap and its tube, substantially as set forth.

6. In a steam-boiler, a furnace having a vertical wall formed of closely-set vertical water-tubes connected at foot to horizontal water-supply pipes, and provided with offset couplings consisting of a threaded end cap for each vertical tube and a plurality of outlets through the end of said cap at each side of its axial center in combination with smaller circulation-pipes connected in pairs one above another to the several outlets of said cap, whereby two pairs of said pipes extend from each cap and traverse the space above the furnace in the vertical plane of each half of said wall-tubes and may recross in the same plane, substantially as set forth.

7. In a steam-boiler, a furnace having side and rear walls formed of vertical water-tubes suitably connected with a water-supply, each side-wall tube, being provided with a threaded end cap having a plurality of quarter-turn threaded coupling-sockets at one side of its axial center and in the same vertical plane, and each rear-wall tube having an end cap with a plurality of such sockets at each side of its center, in combination with circulation-pipes connected to said sockets, the pipes G from the end caps of the side-wall tubes extending in pairs from one side of each cap toward the opposite wall, there rising and returning in the same vertical plane, and the pipes H from the four sockets of the end caps of the rear-wall tubes extending about horizontally, above the pipes G to the front of the boiler and returning to the rear thereof, each pair of tubes H in its own vertical plane and all the circulation-pipes communicating at top with the steam-receptacle, substantially as set forth.

In testimony whereof I have affixed my signature in presence of two witnesses.

EDWARD S. CLARK.

Witnesses:
A. H. SPENCER,
H. W. LADD.