

(No Model.)

2 Sheets—Sheet 1.

G. ENGEL.
SECTIONAL STEAM BOILER.

No. 490,741.

Patented Jan. 31, 1893.

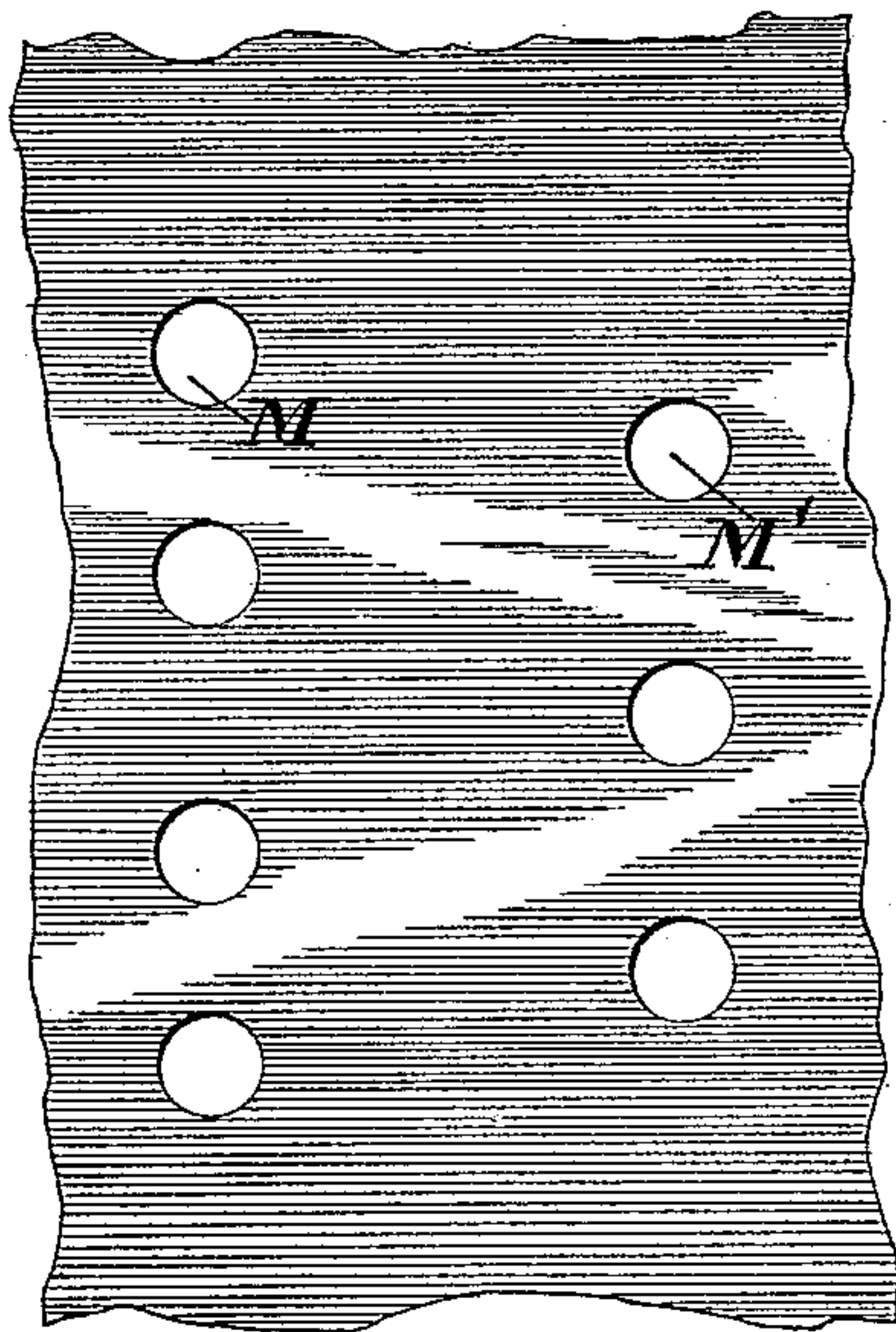
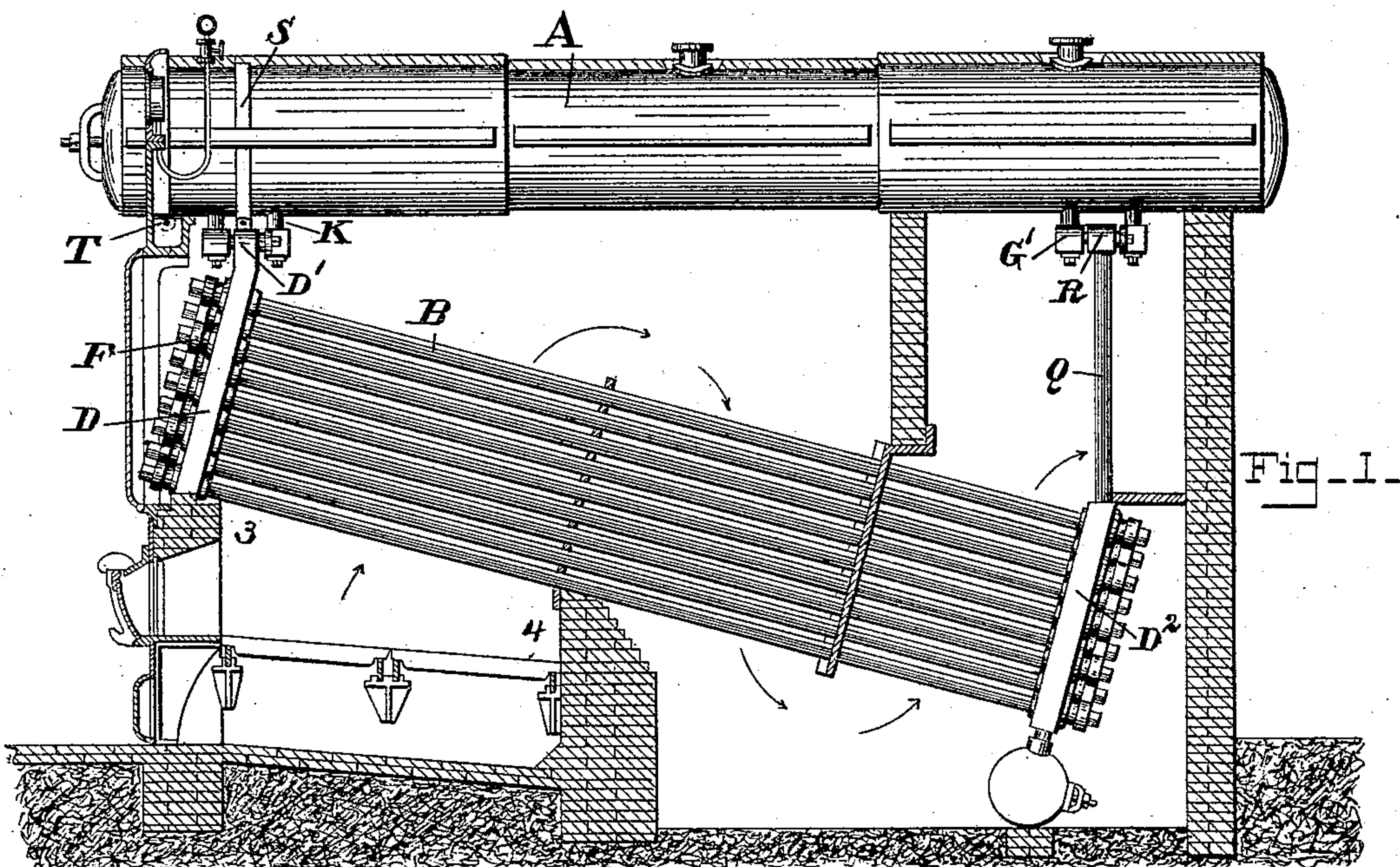


Fig. 4.

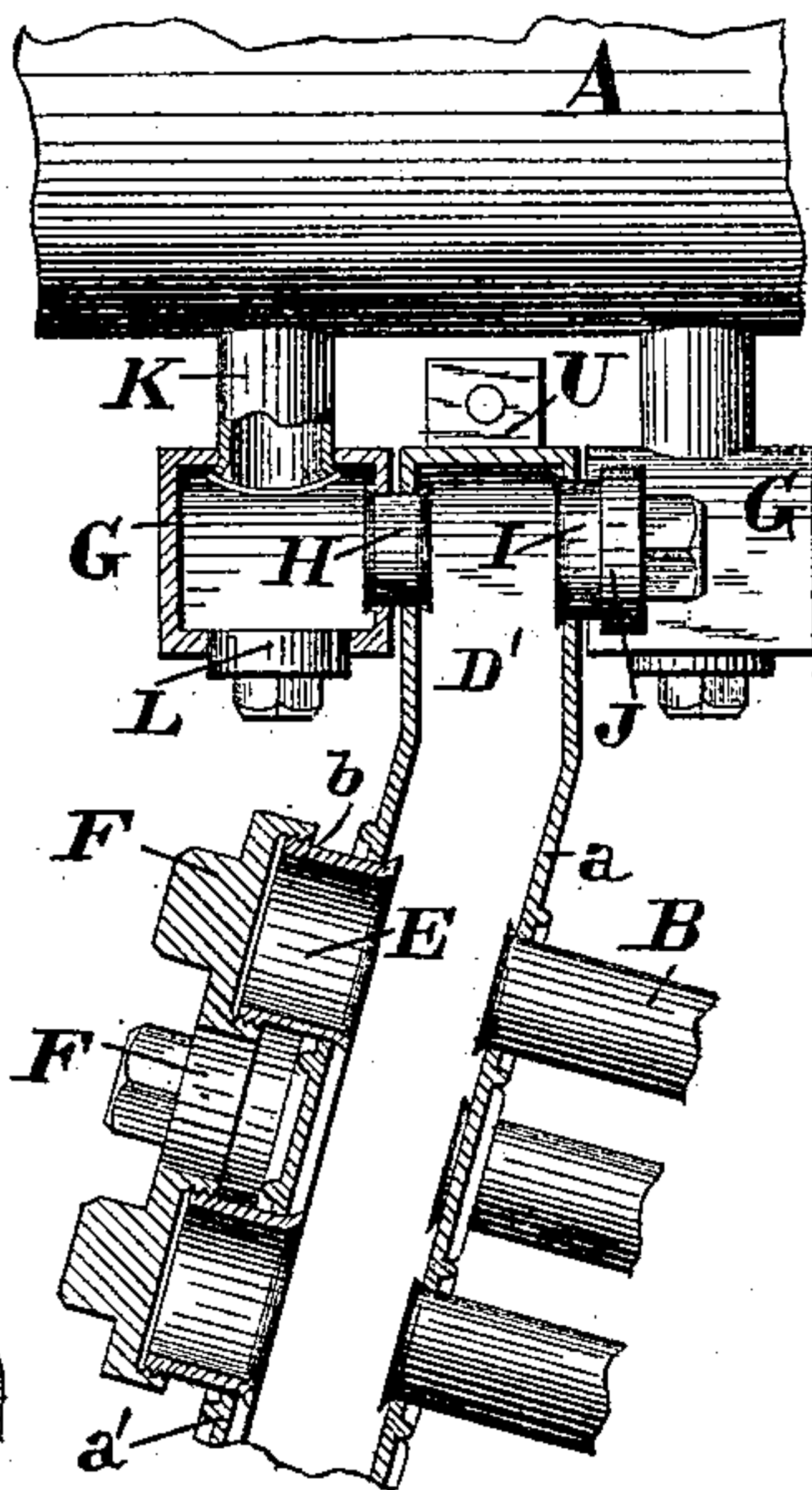


Fig. 5.

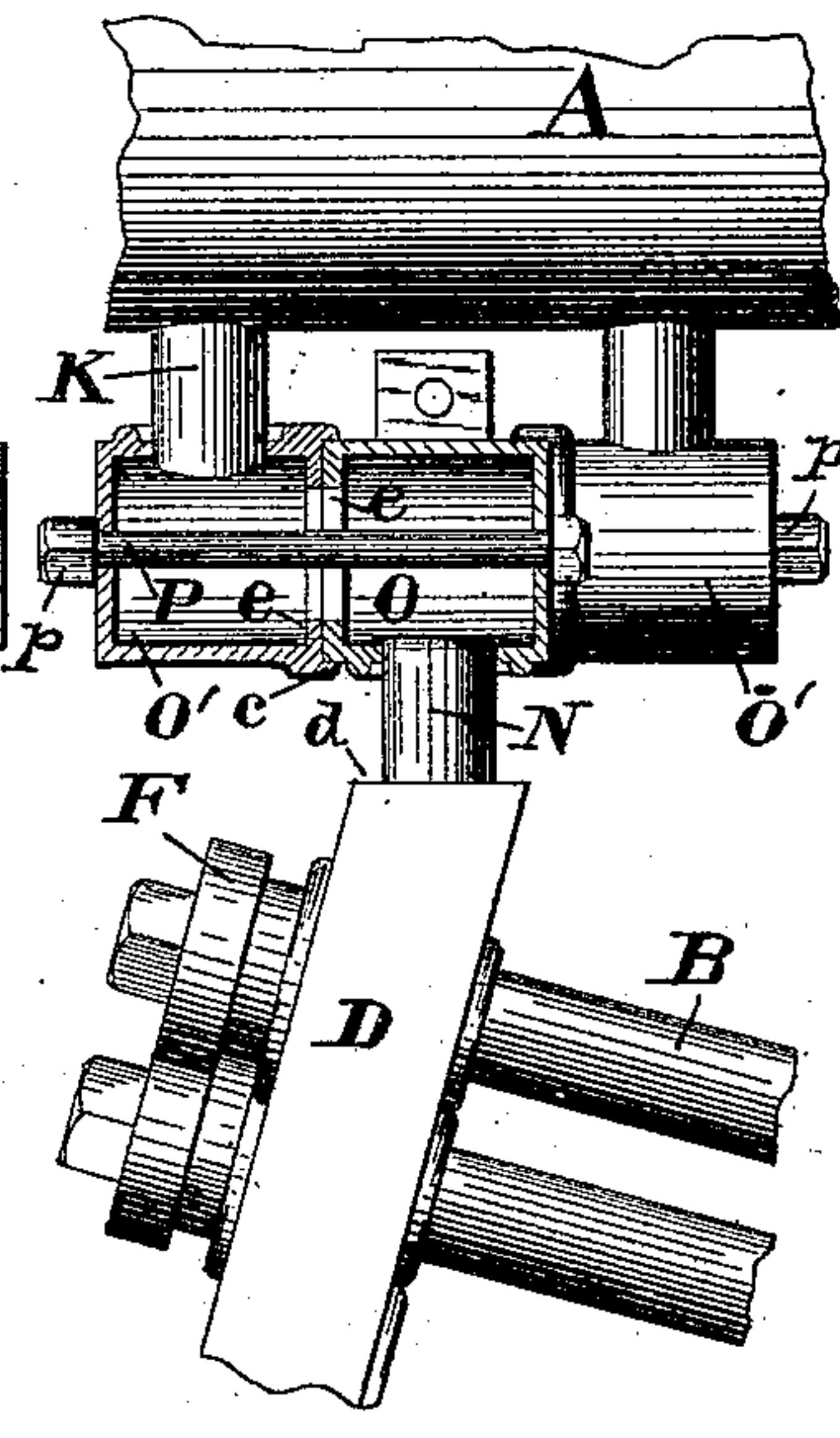


Fig. 6.

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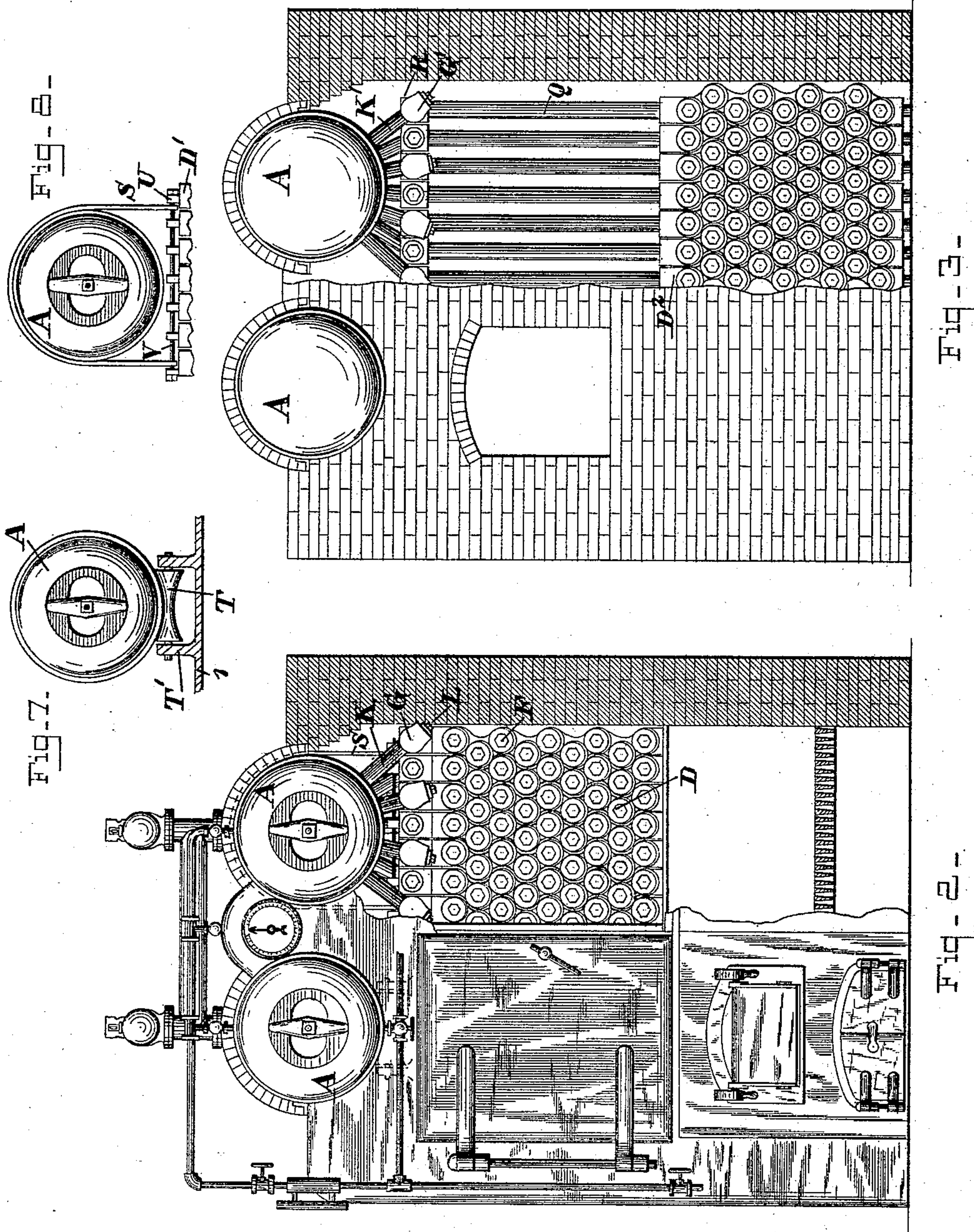
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Attorney.

UNITED STATES PATENT OFFICE.

GODFREY ENGEL, OF SOUTH BALTIMORE, MARYLAND.

SECTIONAL STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 490,741, dated January 31, 1893.

Application filed January 30, 1892. Serial No. 419,751. (No model.)

To all whom it may concern:

Be it known that I, GODFREY ENGEL, a citizen of the United States, residing at South Baltimore, in the county of Anne Arundel and State of Maryland, have invented certain new and useful Improvements in Sectional Steam-Boilers, of which the following is a specification.

This invention relates to improvements in sectional steam boilers of the class which employ inclined water-tubes arranged in vertical series below a horizontal steam and water drum and connected at their ends by vertical headers.

The objects of my invention are:—first, to provide means for connecting each of the headers of the boiler with the steam and water drum by a straight pipe inserted radially in the drum, by which construction the connections with the drum are simplified and made more durable and less expensive. Second, to provide means for permitting the free expansion of the parts of the boiler, so that there may be no straining due to sudden changes of temperature.

With these ends in view the invention may be said to consist in the novel features of construction and combinations of parts hereinafter described and claimed.

The invention is illustrated in the accompanying drawings, in which,—

Figure 1 shows a side elevation of a boiler embodying my improvements with sectional view of settings; Fig. 2 is a front end view of a double drum boiler, the iron front of the right hand side of the boiler being removed in order to show the brick setting of the boiler and the zig-zag headers which connect the ends of the inclined water tubes. Fig. 3 is a rear end view of a similar boiler, the right half of the rear wall of the brick setting being removed in order to show the rear headers and the vertical circulation tubes Q. Fig. 4 is a detail view of the shell of the steam and water drum at the point where it is drilled to receive the radial pipes connecting the drum with the headers, the shell of the boiler being shown as if developed or flattened out, so that the relative positions of the holes in the shell may be apparent. Fig. 5 is an enlarged sectional detail illustrating the construction of the headers and their connection

with the steam and water drum; Fig. 6 is a similar showing of a modified construction for the same parts; Fig. 7 is a detached front-end view of the steam and water drum showing the manner of mounting it on a roller; Fig. 8 is a similar view illustrating the manner of suspending the front headers and inclined tubes below the steam and water drum.

In the drawings the letter, A, designates the horizontal steam and water drum which rests at the front end on a roller, T, mounted in standards or webs, T', formed on a girder, 1, and at the rear end the drum rests upon the brick setting. The girder, 1, in the front rests upon suitable iron columns forming a portion of the boiler front (see Figs. 1 and 2). The front headers and front ends of the inclined tubes are partly supported on the fire-box walls, 3, and partly by a suspension strap, S, passed over the drum. This construction for supporting the drum and tubes permits free expansion and contraction of said parts. The drum is otherwise provided with the usual appurtenances and the letter, B, designates the inclined water tubes beneath the drum with their highest part over the fire-box, C, and above the front and rear walls, 3, 4, of the latter, and with their lowest and rear end resting on a mud-drum, Z. The inclined tubes connect at their front and rear ends in vertical series or section with the zig-zag headers, D, which fit close together side by side. Openings are made in the inner sheets *a*, of the headers to snugly receive the inclined tubes, B, the ends of which project slightly into the headers and are expanded to produce a tight fit. Openings of larger size are made in the outer sheets, *a'*, of the headers opposite the tube-openings and each of these receives a short straight pipe-nipple, E, of a bore such that an inclined tube B may be inserted there-through, and these nipples are likewise secured by expansion, as illustrated in Fig. 5. The outer ends of the nipples have external screw-threads, *b*, and are closed by screw-caps, F, screwing over them. When access to an inclined tube is desired for the purpose of cleaning or removing the same, the screw-cap, F, closing the nipple opposite the end of such tube is taken off and the tube may then be cleaned or may be removed through the nipple and a new tube inserted, and the cap then re-

placed. Free access may be had through the nipple for an expanding tool. It will be seen that this is a very simple and efficient arrangement for closing the tubes. It does away with the complicated and expensive yoke-and-clamp construction commonly used, and at the same time does not require that threads be cut in the header as when a plug is used, which latter arrangement is objectionable for the reason that when the threads wear out the entire header has to be thrown aside. The construction and arrangement shown are inexpensive because no regrinding of the surfaces is necessary to form the joints and no packing is used and no finishing is required on the castings like other boilers, and it only requires two parts,—the nipple and screw-cap, both being finished by machine,—no handwork required; these parts are easily applied without skilled labor and serve as a very convenient means for giving access to the tubes; at the same time the construction is strong and durable.

The front headers, D, have an inclined position, but each has at its upper end a vertical extension, D'; to one side of this extension a box, G, is connected by a short nipple, H, which is inserted through holes in the extension and box and expanded therein. At the opposite side the extension, D', is fitted with a pipe-nipple, I, which is closed by a screw-cap, J, constructed as previously explained in connection with the inclined tubes; this cap gives access for expanding the nipple, H. A straight pipe, K, connects the said box, G, and steam drum, A, and extends in a radial line from the center of the latter; this connecting pipe is expanded directly into the drum and box, and access is had to the box and the pipe, K, through an opening in the lower side of the box closed by a screw-plug, L. All the pipes connecting the headers and drum enter the latter radially and to avoid having the pipe-holes in the drum too close together the arrangement of the box, G, connected with the vertical extension, D', of every other header is reversed, i. e., the box of one header is secured to the front side and the nipple and screw-cap fitted to the rear side, while the next adjoining header has the box at the rear side and the nipple and screw-cap at the front. It will be seen that this arrangement throws one row of connecting pipes, K, in the rear of the other and also in a staggered position. The position the pipe-holes have on the drum is illustrated in Fig. 4,—the letters, M, M', designating the openings in the drum which receive the pipes. The radial adjustment of the pipes may be easily obtained by turning or tilting the boxes, G, to the proper positions before expanding the nipples, H.

A modified construction for this swivel arrangement of box is illustrated in Fig. 6, where the upper end of the header is shown with a horizontal surface, d, into which is expanded a short vertical pipe-nipple, N, ex-

tending to a cylindrical shell or box, O, to one side of which is fitted a similar shell or box, O', having an annular rim-collar, c, which takes over the box, O. The two boxes have inward-extending flanges, e, to form joint, and said boxes are connected together by a bolt, P, extending centrally through them. The connecting pipe, K, is expanded into the box, O', and the desired radial adjustment of the pipe secured by turning said box to the proper position and then tightening the bolt by means of a cap-nut, p, on its end, and thus locking the two boxes.

The arrangement at the rear end of the boiler is somewhat similar to this modified construction. The rear headers, D², are made with horizontal top-surfaces and vertical pipes, Q, extend therefrom and at their upper ends carry boxes, R, to which are connected the swivel-boxes, G', in the same manner as at the front end, and in the same horizontal plane as the front boxes. This construction permits the radial adjustment of the rear connecting pipes K' without crowding.

It will be observed that by my construction the inclined headers are connected directly with the steam drum by straight pipes which enter the latter radially and the use of curved pipes is avoided, and expensive castings or forgings to form the heads in the drum of such shape as to receive the connections of the headers which when made of cast-iron endanger life, are also dispensed with.

To relieve the fire-box walls of the weight of the tubes, I employ the following construction (see Figs. 1, 5 and 8): A lug, U, is cast on the top of each header-extension, D' (or box, O) at the front end of the boiler; this lug has a hole through it and a metal strap, S, passes over the drum, A, and its ends fit against the lugs, U, of the outside headers. A bolt or rod, V, passes horizontally through the ends of this strap, S, and through all of the lugs, U, and connects them; thus the front ends of the inclined tubes are suspended and supported by the drum which itself rests on the girder, 1.

It is evident changes may be made in the construction herein described without departing from my invention, and that one or more of my described improvements may be used without necessarily using all.

Having thus described my invention what I claim as new and desire to secure by Letters-Patent is:—

1. In a sectional steam boiler, the combination, with a steam and water drum, water tubes arranged in vertical section or series and extending in the direction of the drum, and headers connecting the ends of said vertical sections or series of tubes, of straight pipes entering the drum and extending in radial lines from the center thereof, and swivel joints between said radial pipes and the headers, adjustable in a plane crosswise of the drum, substantially as described.

2. In a sectional steam boiler, the combina-

tion, with a steam and water drum, water tubes below the same arranged in vertical section or series and extending in the direction of the drum, and headers connecting the ends of said vertical series of tubes, of straight pipes entering the said drum in radial lines with the center thereof, and boxes swiveled to the headers and receiving the said radial pipes, and adapted to be adjusted in a plane cross-wise of the drum, substantially as described.

3. In a sectional steam boiler, the combination, with a steam and water drum, water tubes below the same, and headers connecting the ends of said tubes, of swiveled boxes each connecting with one side of each header, pipes connecting the said drum and swiveled boxes, a nipple in the side of each header opposite that to which its box is connected, and screw-caps for closing said nipples, substantially as described.

4. In a sectional steam boiler, the combination, with a steam and water drum, water tubes below the same and headers connecting the ends of said tubes, of swiveled boxes connecting each with one of said headers, pipes K connecting said boxes with the steam and water drum, and nipples in said boxes opposite the ends of said tubes K and closed by screw-caps, substantially as described.

5. In a sectional steam boiler, the combination, with a steam and water drum, water tubes below the same arranged in vertical section or series, and headers connecting the ends of said tubes, of pipes entering the drum in radial lines with the center thereof, and boxes swiveled to the headers and receiving the said pipes, alternate boxes being secured to opposite sides of the headers, substantially as described.

6. In a sectional steam boiler, the combination, with a steam and water drum, and water tubes below the same, of headers connecting the ends of said tubes and having lugs on top, straps passing over said drum and means for attaching the said lugs to the ends of said strap, substantially as described.

7. In a sectional steam boiler, the combination, with a steam and water drum, and a roller mounted in bearings and supporting the end of the drum, of water tubes below the drum, and a strap passing over said drum and supporting the ends of the water tubes, all arranged substantially as described.

In testimony whereof I affix my signature in the presence of two witnesses.

GODFREY ENGEL.

Witnesses:

CHAS. B. MANN,
JNO. T. MADDOX.