

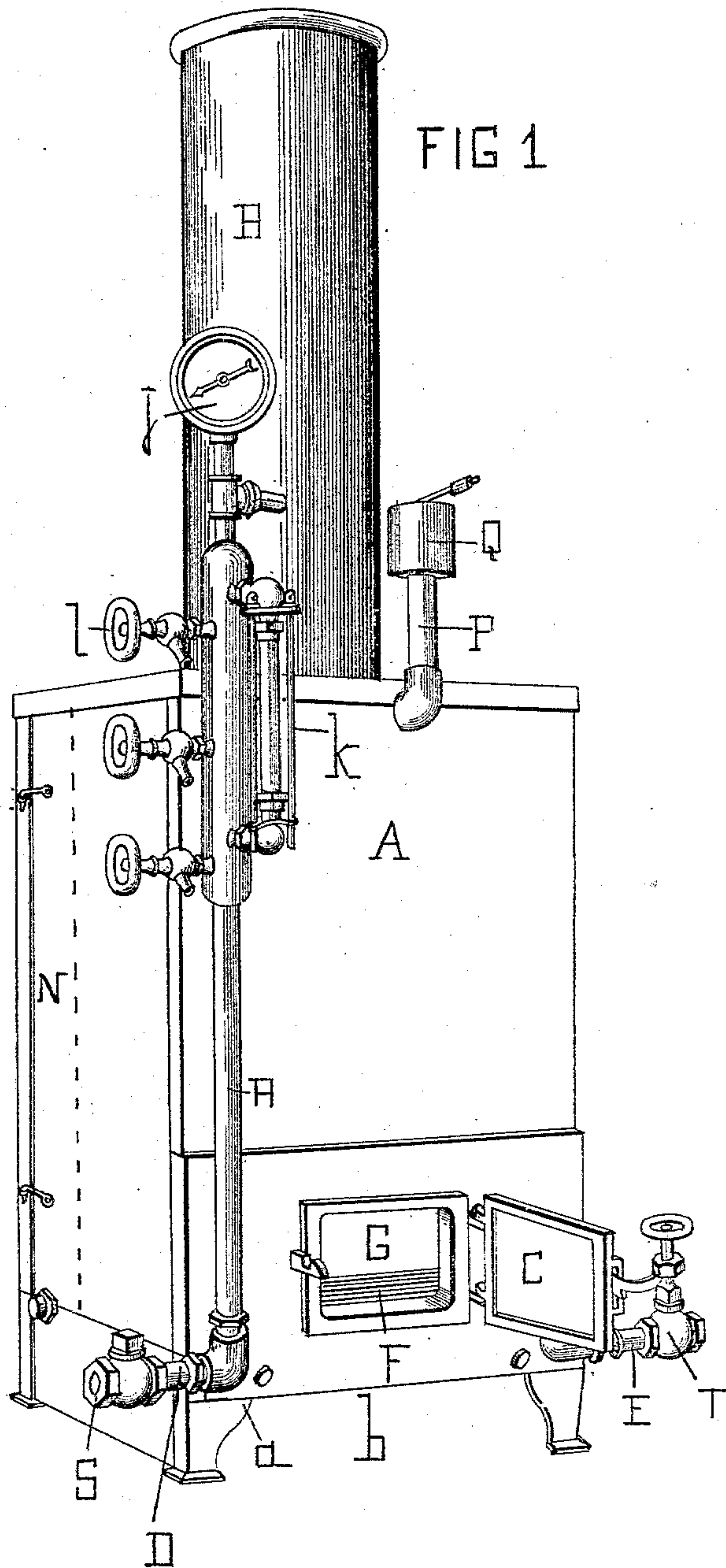
(No Model.)

5 Sheets—Sheet 1.

C. W. WAGNER.  
STEAM BOILER.

No. 551,419.

Patented Dec. 17, 1895.



Witnesses  
*Chas. H. Shuster*  
*John Gamm*

Inventor  
*Charles W. Wagner*  
by *Francis D. Pastorius*  
Attorney

(No Model.)

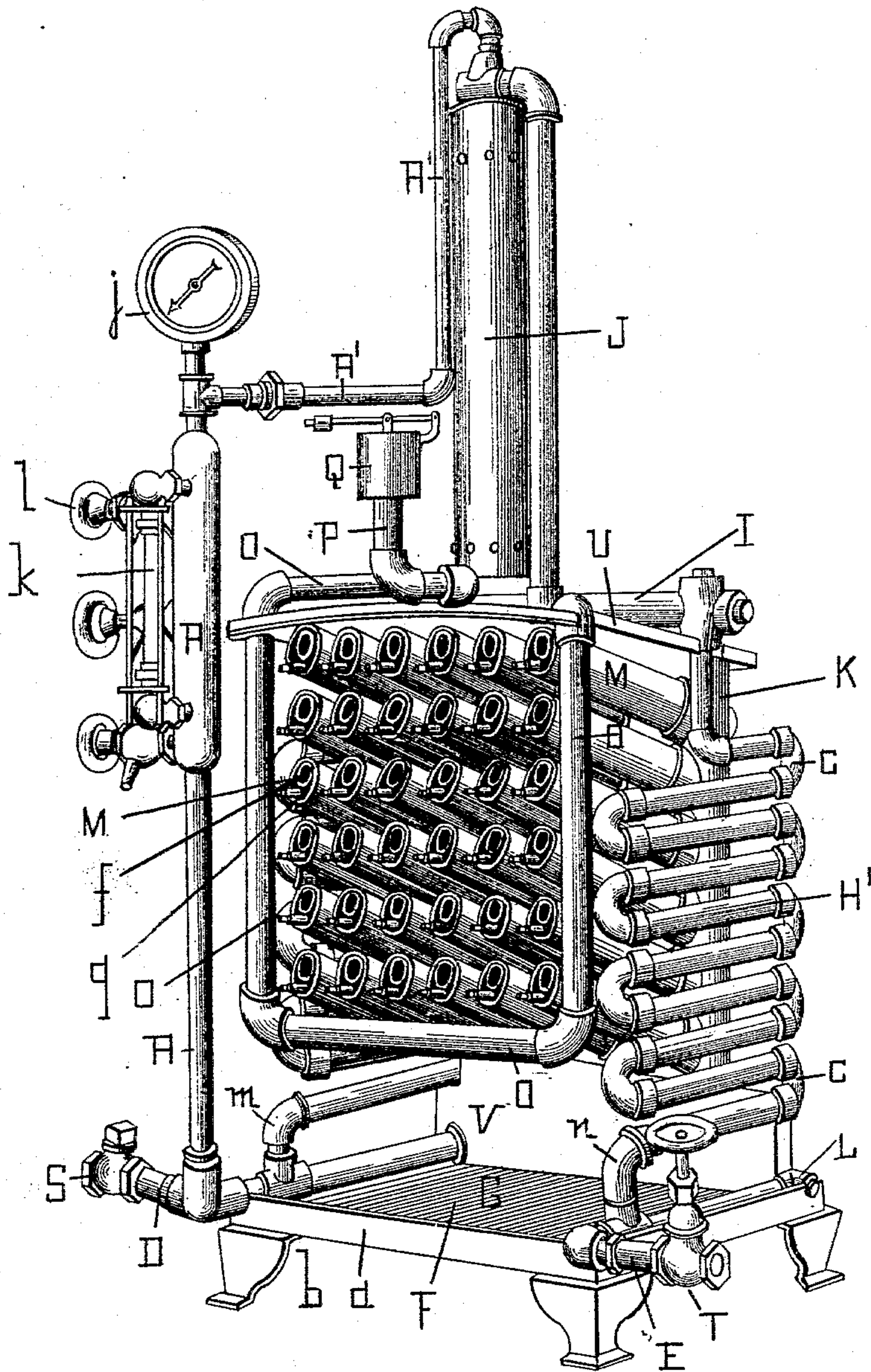
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FIG 2



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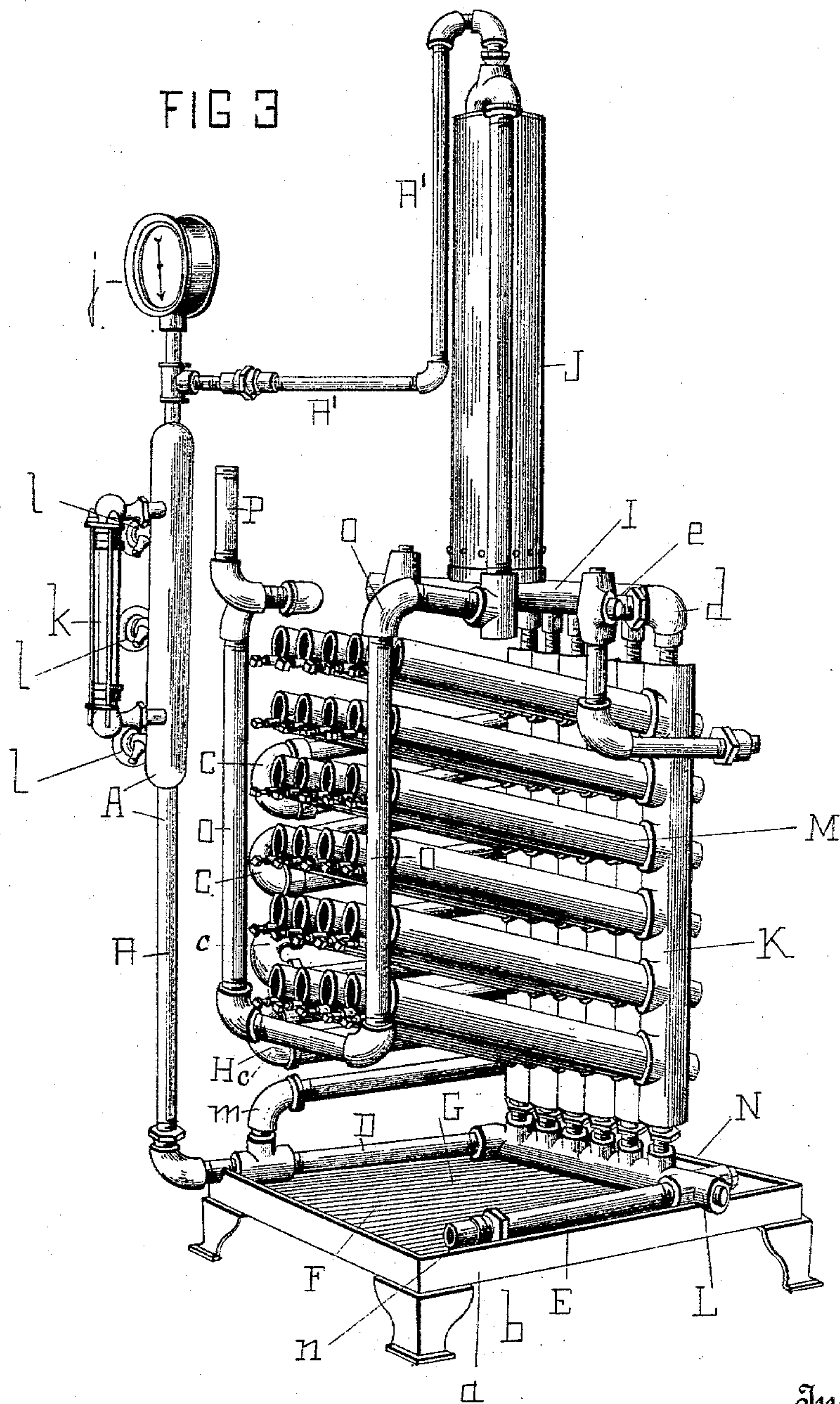
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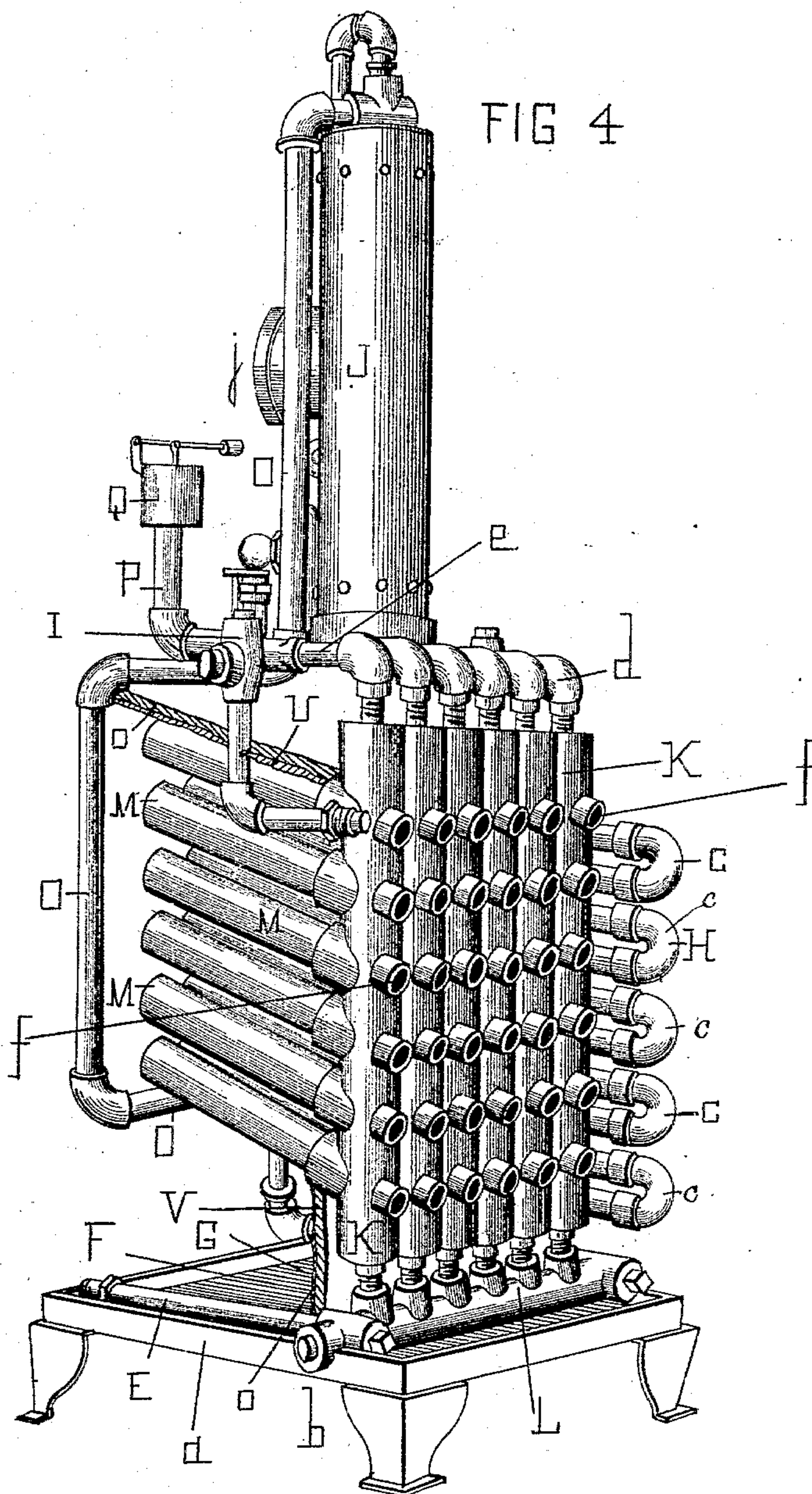
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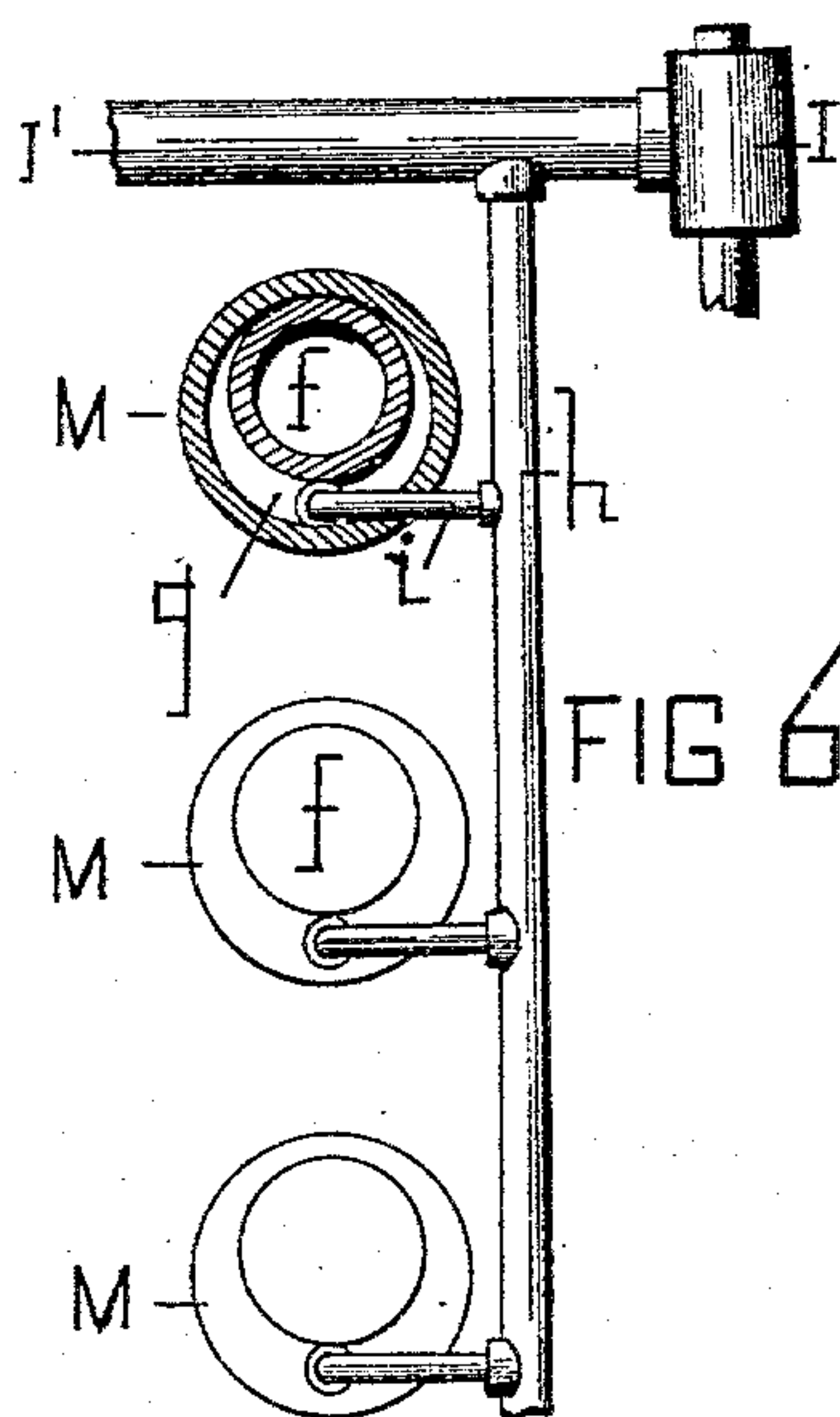
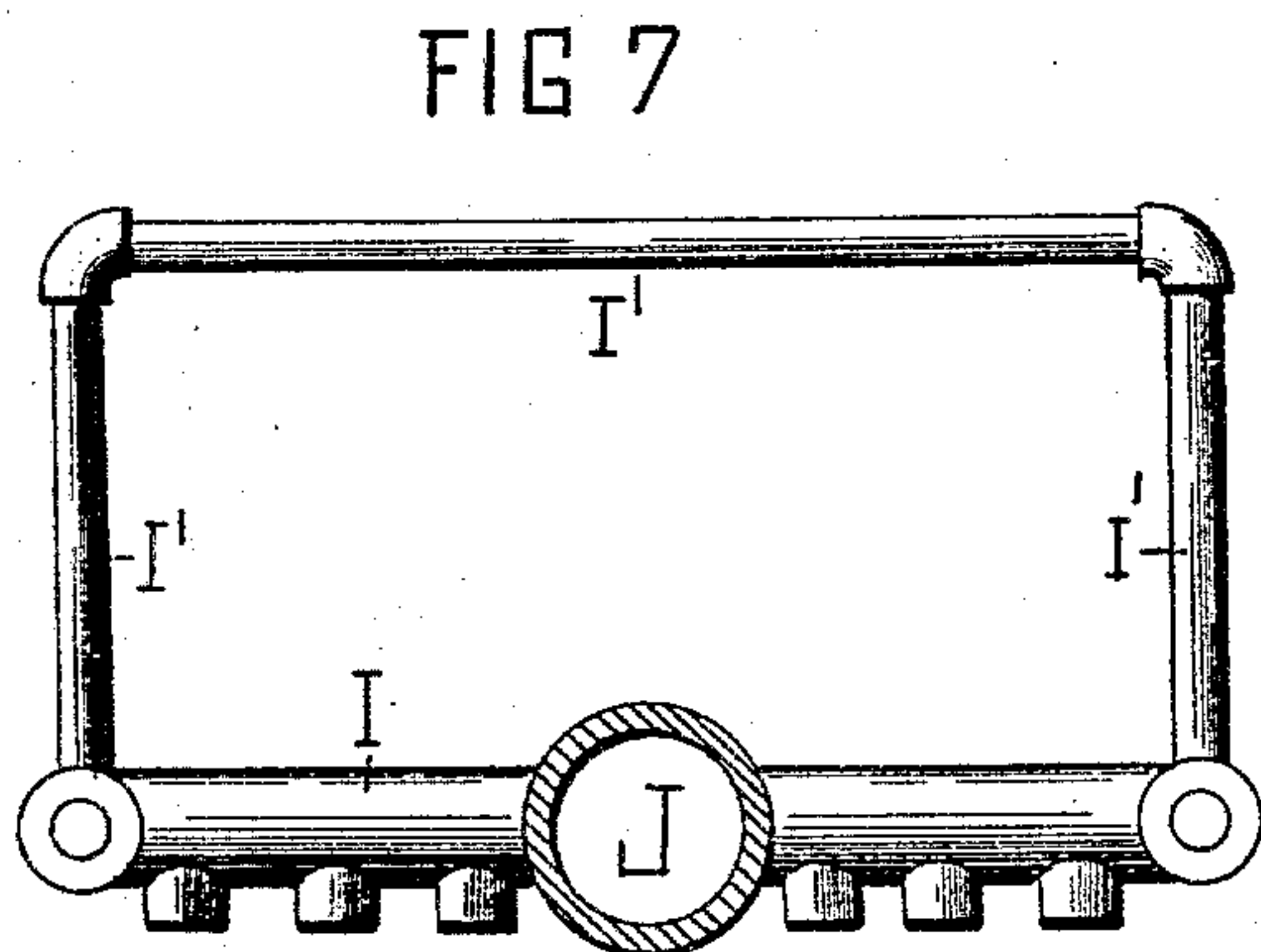
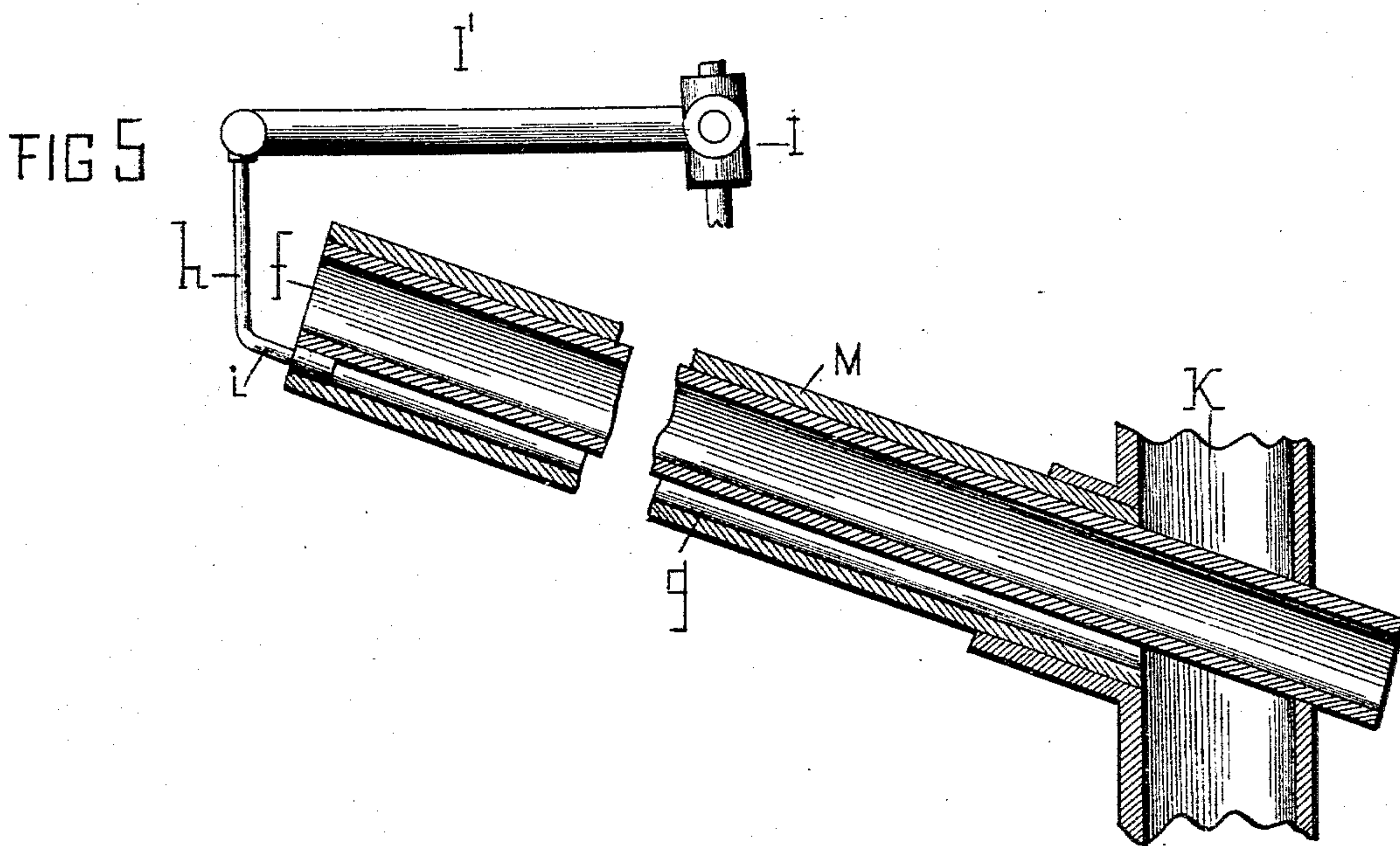
(No Model.)

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C. W. WAGNER.  
STEAM BOILER.

No. 551,419.

Patented Dec. 17, 1895.



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# UNITED STATES PATENT OFFICE.

CHARLES W. WAGNER, OF CAMDEN, NEW JERSEY.

## STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 551,419, dated December 17, 1895.

Application filed July 16, 1895. Serial No. 556,152. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES W. WAGNER, a citizen of the United States, residing at Camden, in the county of Camden and State of New Jersey, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a specification.

The invention consists in a pipe or tubular boiler within a suitable casing. The fire-grate and combustion-chamber are surrounded by and composed of the pipes or tubes, so that every part is exposed to the heated products of combustion.

On reference to the accompanying sheets of drawings, making part of this specification, Figure 1 is a vertical and perspective view of the incased boiler. Fig. 2 is a front perspective view of the boiler, the casing being omitted. Fig. 3 is a front perspective view of the boiler, the casing, flat coil side pipes, and roof or deflecting-plate being omitted. Fig. 4 is a rear perspective view of the boiler, the casing and one side of the flat coil side pipes being omitted. Fig. 5 is a sectioned view of an inclined double pipe, tap-pipe, and rear vertical pipe. Fig. 6 is a front view of the steam tap-pipes as applied to a vertical row of the inclined double pipes, and Fig. 7 is a plan view of the top manifold and tap-pipe.

Similar letters refer to similar parts in the several views.

A, Fig. 1, is the casing of the boiler which is provided with a smoke-stack B, fire-door C, water-supply and blow-off pipes D E, and means for ascertaining the height of water and steam-pressure.

F, Figs. 1, 2, 3, and 4, is a fire-grate set on a cast-iron base *a* over an ash-pit *b*. The sides of the combustion-chamber G are composed of flat coil-pipes H H' connected by return bends *c*. Both sides join at their lower ends with the horizontal water-supply and blow-off pipes D E, respectively, while their upper ends connect with a top transverse manifold I, which unites with and carries an upright steam-drum J located in the smoke-stack B.

At the rear of the combustion-chamber G, Figs. 3, 4, and 5, are vertical pipes K, which unite with and rise from a bottom transverse manifold L and join with the top manifold I

by means of bends *d* and spring-pipes *e*, by which a circulation is maintained with the vertical steam-drum J on said top manifold I. The water-supply and blow-off pipes D E communicate with the flat coil side pipes H H' at their front ends and with the transverse manifold L at the back. The coil H is filled with water by the supply-pipe D and the coil H' by the blow-off pipe E from that end of said manifold L.

Located above and between the side pipes or flat coils H H' and inclined downwardly from front to back and forming the top of the combustion-chamber G are tiers of double pipes M, one within the other, as shown at Figs. 2, 3, 4, 5, and 6, whereby there is provided in each an inner or hot-air flue *f* and an annular or intermediate water-space *g*. The hot-air flues *f* extend through the verticals K and form the draft between the fire-grate F at the front and the smoke-box or chamber N at the back, (dotted line, Fig. 1,) while each water-space *g* communicates with and receives its water from its respective vertical or rear pipe K. The inclination of said pipes M provides a means of dripping sediment into the verticals K, thence into the bottom manifold L, from which it can be flushed out by the blow-off pipe E.

In front of and communicating with the vertical rows of inclined pipes M at their raised ends, Figs. 5, 6, and 7, are vertical steam and air-tap pipes *h*, each of which joins with transverse pipes *i*, and with the top manifold I at the ends, through the medium of a horizontal bent pipe I', to permit the steam and air, which would otherwise accumulate in the raised ends, to draw off into said manifold I, and thus be prevented from choking and interfering with the circulation of water through the annular space *g* of each pipe. Said pipes can be placed immediately in front of the inclined pipes M or at one side, Fig. 6, and not interfere with the draft through the flues *f*.

A superheating-pipe O, Figs. 2, 3, and 4, taps the steam-drum J conveniently near its top and drops down one side of the front of the inclined pipes M, bends and crosses over the fire-grate F, and then return bends and forms connection with any pipe P leading to an engine or other place where the steam is to be applied. A safety-valve Q can be applied



to the pipe P to relieve the boiler of pressure above its ordinary working capacity.

R, Figs. 1, 2, and 3, is a vertical pipe on the outside of the casing A. Its upper end communicates with the steam-drum J by the pipe R' and its lower end with the water-pipe D controlled by a valve S. A steam-gage *j* on said pipe R indicates the steam-pressure within the boiler, and a glass sight-tube *k* is fixed to the same, by the aid of which the height of the water within the boiler is readily ascertained. In conjunction with said glass tube *k* are gage-cocks *l* at different elevations for indicating the height of water and steam. Water for generating steam is passed through the cock S and pipe D and enters the bottom manifold L thence into the rear verticals K and the annular space *g* of each inclined pipe M. The side flat coil H is filled by means of a connection *m* with the pipe D and the coil H' by means of a connection *n* with the blow-off pipe E, which connects with said bottom manifold L. When the head-pressure is not sufficient water can be supplied by a pump. The blowing off is effected through the pipe E and cock T, which if properly practiced will free the pipes from scale and deposit. The general level of the water of the boiler should be slightly below the bends *d*, by which the steam generated is drained before reaching the drum J, and subsequently superheated in the bent pipe O.

The flat coils H H' and inclined pipes M, Figs. 2 and 4, are covered with a metal roof or plate U, which is overlaid with asbestos *o*. Likewise the inner sides of the casing A and between the vertical pipes J are packed with the same material. The end of the fire-grate F is stopped off by a vertical deflecting-plate V, Fig. 2. As shown the heat is confined in and about the pipes composing the boiler and every part is exposed as heating-surface. The products of combustion after passing from the grate F circulate in the fire-box or combustion-chamber G between the flat coils H H', inclined tubes M and verticals K and then pass through the draft-flues *f* of said inclined double tubes M to the smoke-chamber N at the rear, after which they rise up the back of the boiler against and over the rear vertical tubes K in contact with the bends *d*, spring-pipes *e*, and top manifold I, and ascend the smoke-stack B, around the steam-drum J located in it, into the atmosphere.

The steam generated rises into the steam-drum J, and thence through the superheating-pipe O to the supply-pipe P for use.

I claim—

1. In a boiler of the character described, the combination of rear vertical-pipes, and inclined-pipes composed of an inner draft-flue and an annular water-space, the draft-flue of each inclined-pipe passing through its respective rear vertical-pipe, and the annular water-space communicating with the interior of said rear vertical-pipe, for the purpose shown and described.

2. In a boiler of the character described, the combination of double inclined-pipes composed of an inner draft-flue and an annular water-space, steam tap-pipes communicating with the raised-ends of the double inclined-pipes, top-manifold communicating with the steam tap-pipes, and a vertical steam-drum of the top-manifold, for the purpose shown and described.

3. In a boiler of the character described, the combination of a vertical steam-drum, inclined double-pipes, and a vertical, rectangular super-heating pipe, which taps the steam-drum conveniently near its top, and drops down one side of the front of the inclined double-pipes, bends and crosses over the fire-grate, and return bends and forms connection with an outlet-pipe, for the purpose shown and described.

4. In a boiler of the character described, the combination of flat-coil side-pipes, rear vertical-pipes, inclined double-pipes, a roof or deflecting-plate over the inclined double-pipes, and a bottom deflecting-plate at the rear of the furnace against the rear vertical pipes, for the purpose shown and described.

5. In a boiler of the character described, the combination of a casing, fire-grate, flat-coil side-pipes, rear-vertical-pipes, inclined double-pipes, top and bottom manifolds, steam drum, and water-supply and blow-off pipes, for the purpose shown and described.

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

CHARLES W. WAGNER.

Witnesses:

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WM. S. HOFFMAN.