

(No Model.)

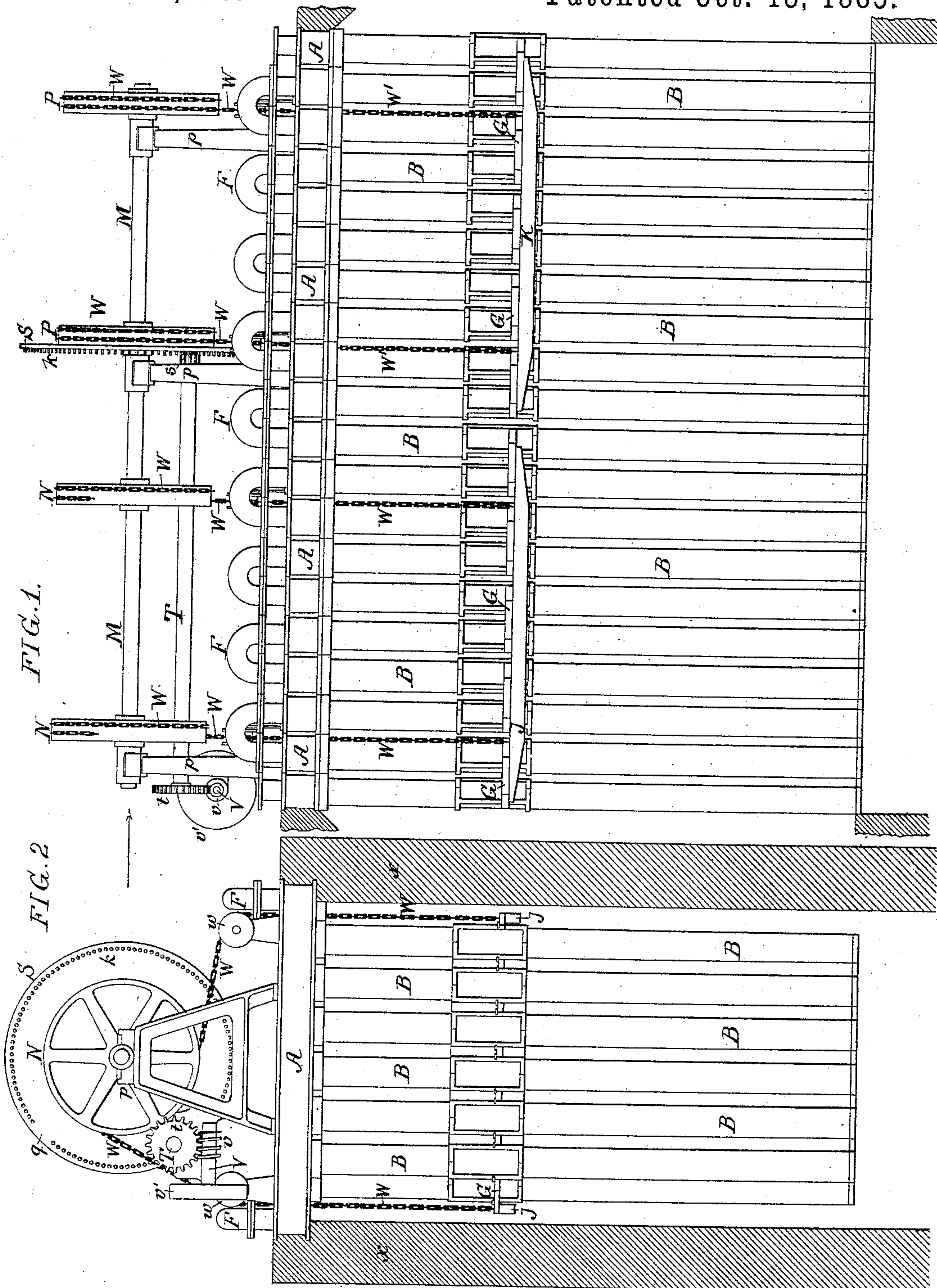
3 Sheets—Sheet 1.

C. H. HOLT.

TUBE CLEANER FOR FUEL ECONOMIZERS OR FEED WATER HEATERS.

No. 328,220.

Patented Oct. 13, 1885.



Witnesses { John M. Clayton.  
James F. Johns

Inventor { Charles H. Holt  
by his attys  
Hobson & Co.

(No Model.)

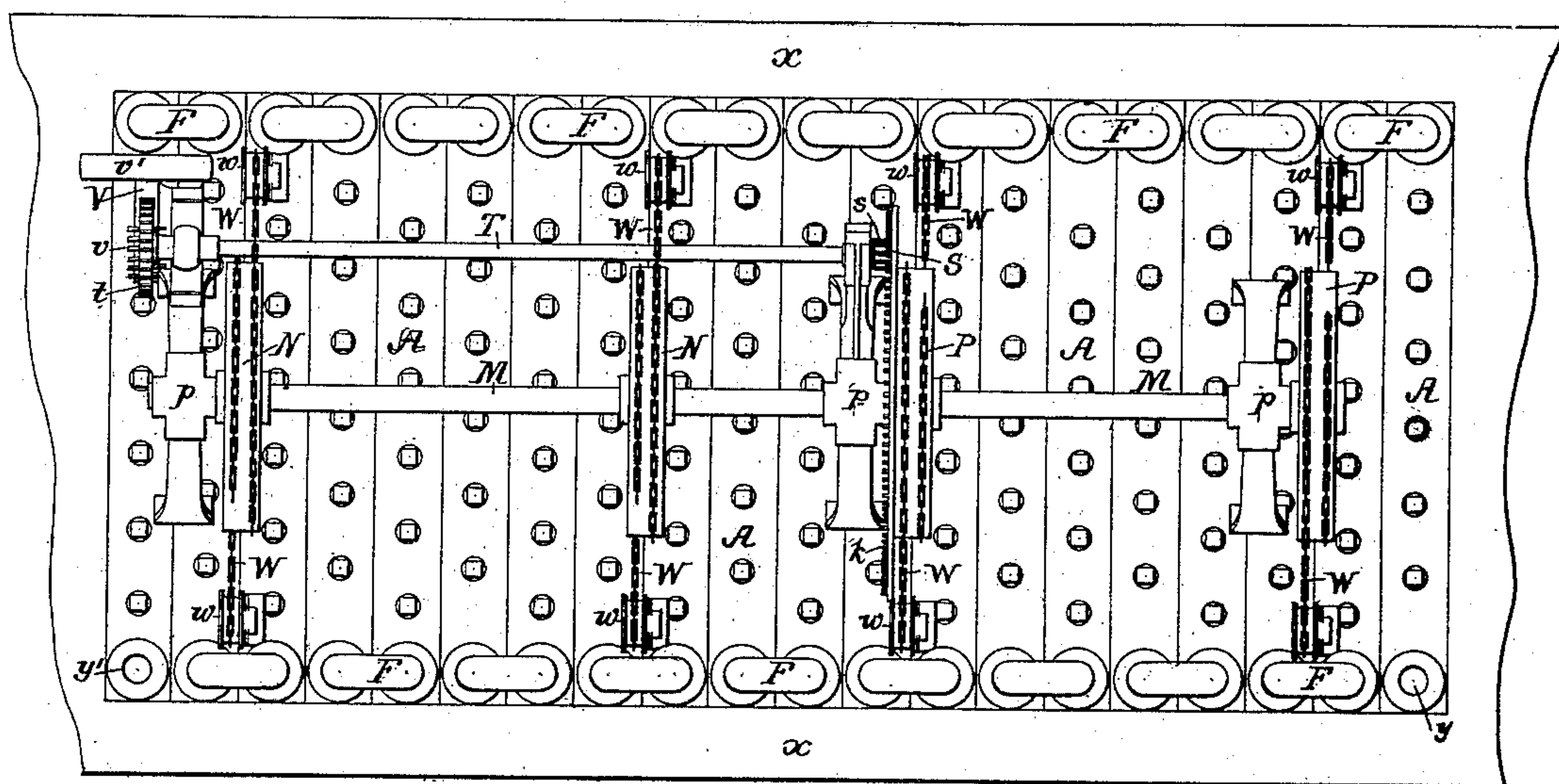
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FIG. 3.



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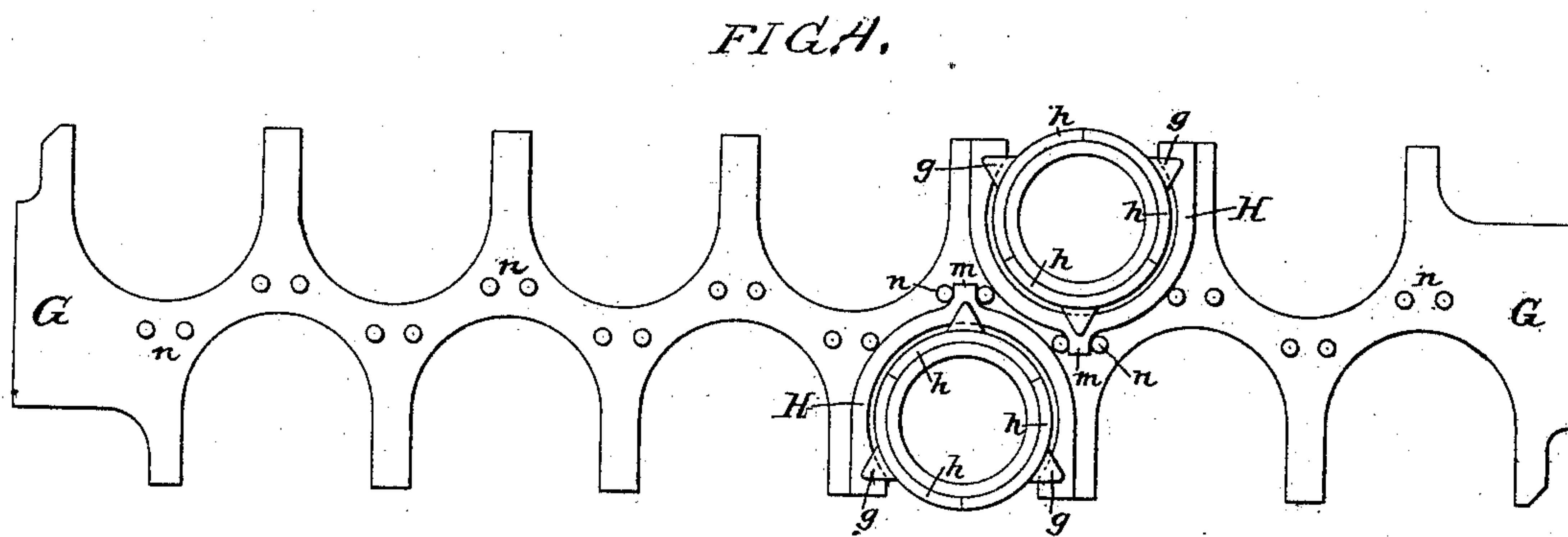
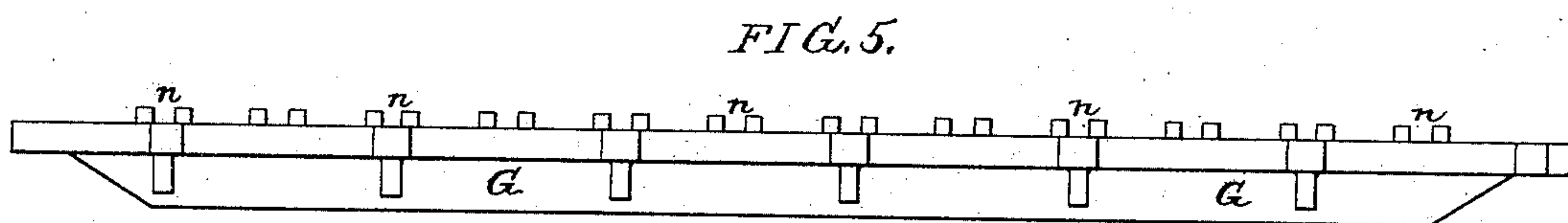
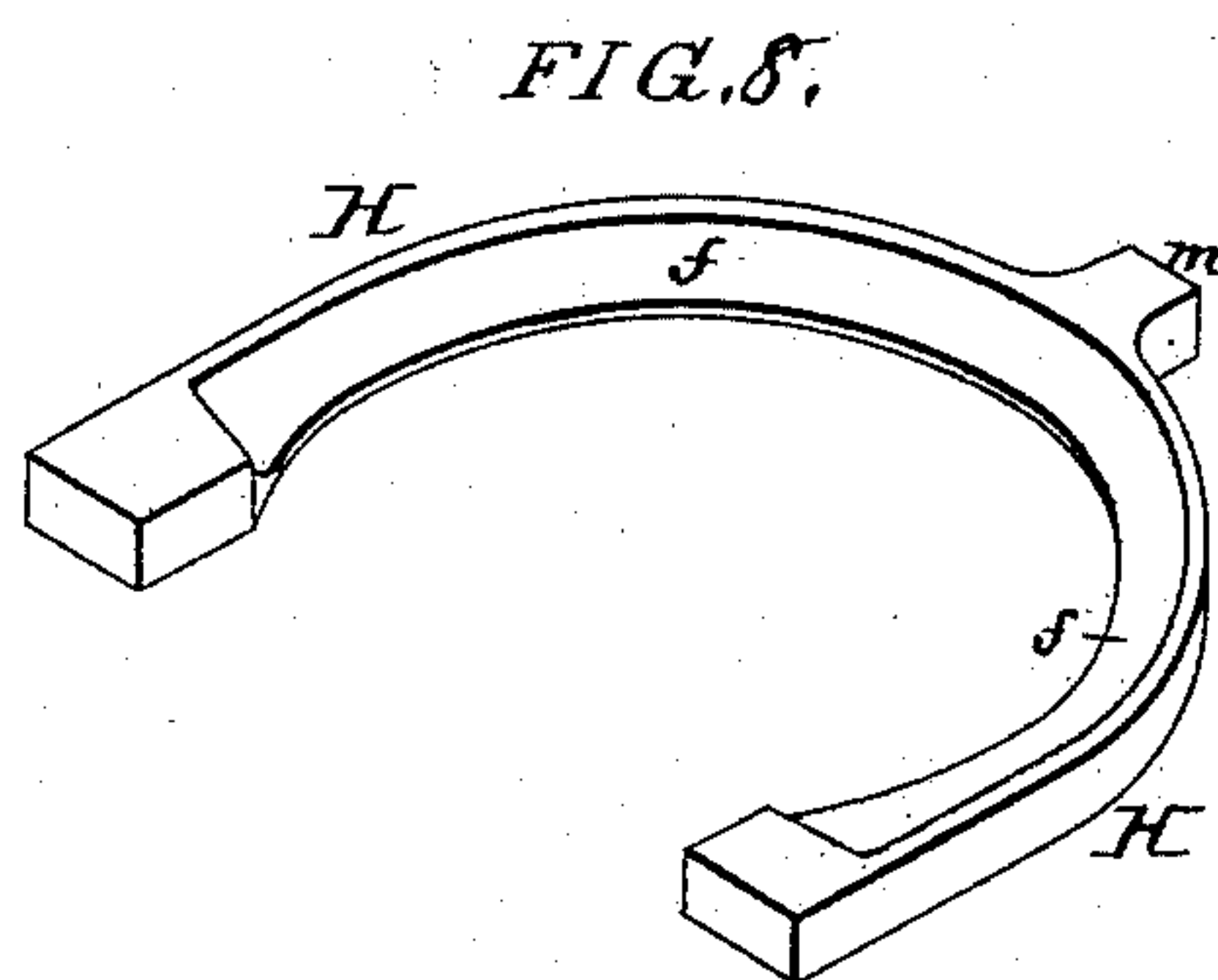
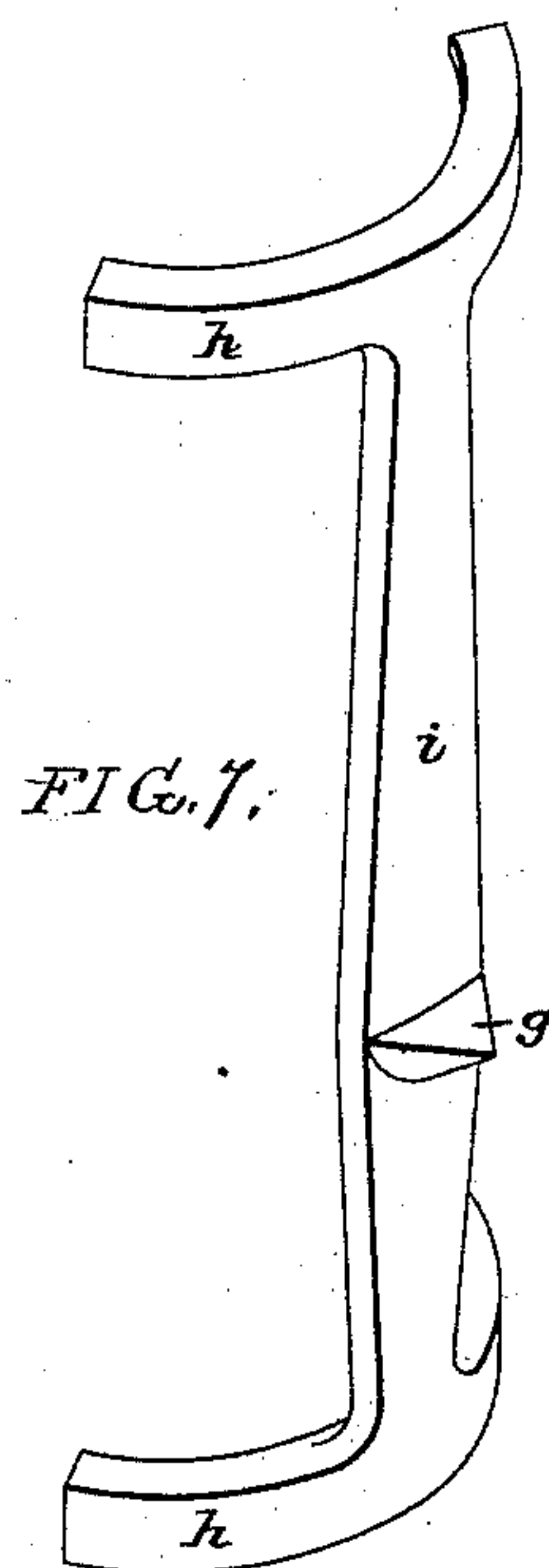
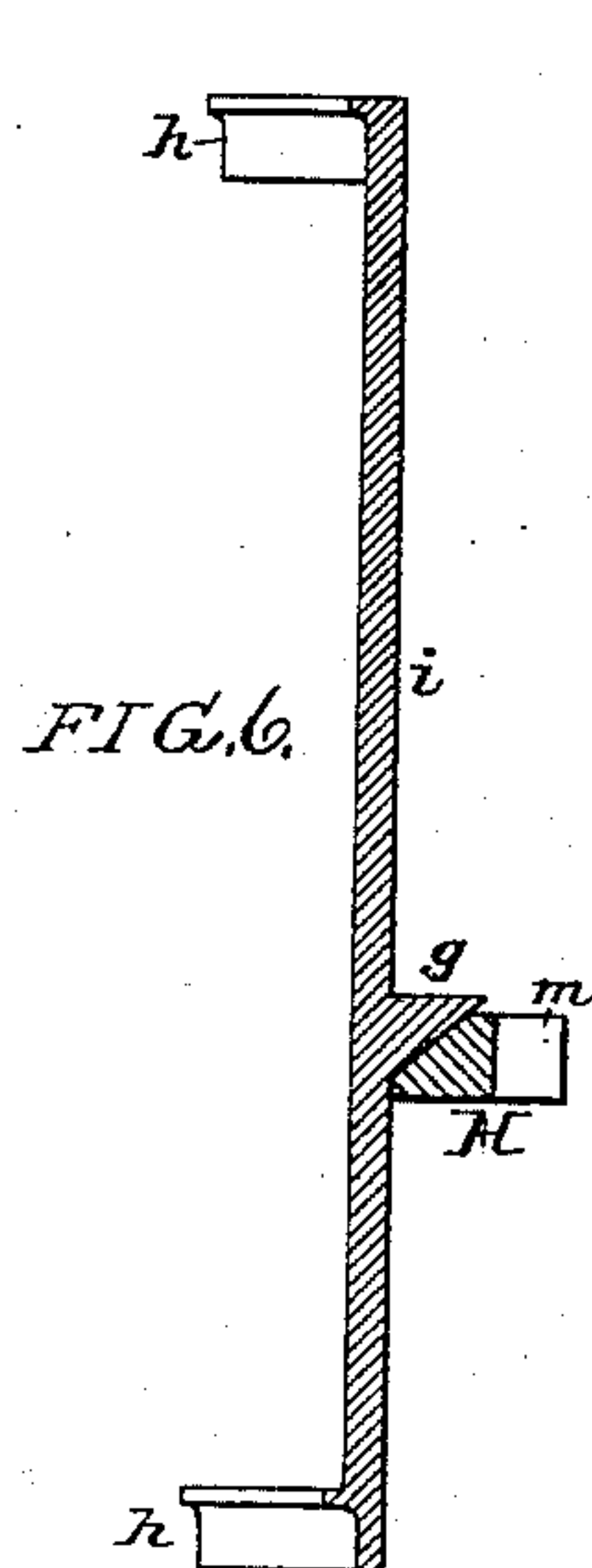
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3 Sheets—Sheet 3.

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TUBE CLEANER FOR FUEL ECONOMIZERS OR FEED WATER HEATERS.  
No. 328,220.

Patented Oct. 13, 1885.



Witnesses  
John M. Clayton  
James J. Tobin

Inventor  
Charles H. Holt  
by his Attorneys  
Houson & Sons



# UNITED STATES PATENT OFFICE.

CHARLES H. HOLT, OF PHILADELPHIA, PENNSYLVANIA.

TUBE-CLEANER FOR FUEL-ECONOMIZERS OR FEED-WATER HEATERS.

SPECIFICATION forming part of Letters Patent No. 328,220, dated October 13, 1885.

Application filed November 24, 1884. Serial No. 148,662. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES H. HOLT, a subject of the Queen of Great Britain and Ireland, and residing in Philadelphia, Pennsylvania, have invented certain Improvements in Tube-Cleaners for Fuel-Economizers or Feed-Water Heaters, of which the following is a specification.

My invention relates to that class of feed-water heaters or fuel-economizers in which the feed-water, before being allowed to enter the boiler, is caused to pass through a system of pipes located in the discharge-flue of the furnace, the collection of soot upon the pipes being prevented by means of reciprocated scrapers.

My improvements relate to the construction of the scrapers and to mechanism employed for reciprocating said scrapers, these improvements being too fully described and claimed hereinafter to need preliminary explanation.

In the accompanying drawings, Figure 1, Sheet 1, is a side view of my improved tube-cleaner for fuel-economizers or feed-water heaters, part of the walls of the discharge-flue of the furnace being shown in section; Fig. 2, an end view looking in the direction of the arrow, Fig. 1, with the side walls in section; Fig. 3, Sheet 2, a plan view; Fig. 4, Sheet 3, a plan view of one of the scraper-frames, with two of the scrapers in position thereon, and also on an enlarged scale; Fig. 5, a side view of the frame without the scrapers; Figs. 6 and 7, views of the scraper on a still larger scale, and Fig. 8 a perspective view of one of the scraper-carriers.

The pipe structure of the heater is not shown in detail, as I propose to make it the subject of a separate application for a patent; hence it will be only necessary to say here that it consists of a number of boxes or sections, A, supported by the side walls, *x*, of the flue-chamber, and having rows of pendent tubes B, these boxes and tubes being, preferably, so partitioned and the boxes so connected as to cause a circulation of water from one end of the heater to the other.

To prevent the accumulation of soot upon the tubes of the heater, I use a scraper, as usual, the construction of this scraper being illustrated in Figs. 1 and 2, and Figs. 4 to 8.

Between adjacent rows of tubes is a trans-

verse bar, G, having opposite recesses for the reception of the tubes, and on this bar are supported a series of segmental plates, H, one for each tube, each plate having a beveled inner edge, *f*, on which rest conical lugs *g* on the scrapers, each of the latter consisting of two segmental ribs, *h*, connected by a vertical bar, *i*. As the bars G are raised, the scraping-ribs *h* are, owing to the conical bearings of the lugs *g*, caused to press firmly upon the tube and scrape from the same any soot which may have accumulated thereon, the ribs sliding freely on the tube when the bar G is permitted to descend.

Under ordinary circumstances the segmental plate H is prevented from turning on the bar by the engagement of a lug, *m*, on said plate with pins *n* on the bar; but by elevating the plate until its lug *m* is free from the control of the pins *n* said plate can be turned so as to permit its withdrawal from the bar, the opening at the front of the plate being large enough to permit said plate to be drawn past the tube D. This opening is also large enough to permit the withdrawal of either of the scrapers from the plate, so that ample provision is afforded for removing or replacing any portion of the apparatus which has become defective.

The scrapers are divided into two sets, the bars G of one set being supported upon opposite bars, J, and the bars G of the other set upon similar bars, K, the action of one set of scrapers alternating with that of the other set—that is to say, as the bars J are raised the bars K are permitted to descend, and vice versa.

The raising of the bars J and K is effected by mechanism on the top of the heater, this mechanism being shown in Figs. 1, 2, and 3.

To bearings *p*, suitably located on the boxes A, is adapted a shaft, M, carrying four drums, N N P P, and a disk, S, the latter having projecting pins *k*, forming a rack into which gears a pinion, *s*, on a shaft, T, a worm-wheel, *t*, at the end of which gears into a worm, *v*, on a shaft, V, which has a pulley, *v'*, for receiving a driving-belt from any suitable counter-shaft.

The bars J are suspended from the drums N by chains W, passing over pulleys *w*, hung to bearings on the top of the heater, the chains of one bar passing over the drums and the chains of the other bar under the same, so that as the drums are rotated in one direction both



chains will be wound up and both bars J elevated, and as the drums are rotated in the reverse direction both chains will be unwound and both bars J permitted to descend.

5 A similar arrangement of chains W' is used in connection with the bars K and drums P, the winding of the chains on the drums P, however, being the reverse of that of the chains W upon the drums N, so that the desired alternating movement of the bars J and K will be effected.

The pins *k* of the disk S are discontinued at one point, *q*, so that the rack formed by the said pins constitutes, in connection with the pinion *s*, the well-known mangle-wheel, the pinion gearing alternately with the inside and the outside of the rack, so as to partially rotate the disk S, first in one direction and then in the opposite direction, the inner end of the shaft being free to move laterally and the bearing at the outer end of the same being so pivoted that the pinion can pass freely through the opening *q* in shifting from the inside to the outside of the rack, so that the desired reverse vibration of the drums N and P is effected from the uniformly-rotating shaft V.

By supporting the transverse scraper-bars G upon the longitudinal lifting-bars, and connecting the lifting-chains W to the latter near each end, a direct vertical lift of each of the bars J and K and of the scraper-bars is insured, thus overcoming the tendency to tilt and become jammed, which is an objection to lifting-bars connected in the center to the lifting-chains.

It will be observed on reference to Fig. 3 that the tubes B are staggered—that is to say, the tubes of one row are in line with the spaces between the tubes of the adjoining rows, so that the products of combustion are compelled to take a circuitous course, and are brought in contact with the entire surface of each tube; moreover, this arrangement permits the employment of a great number of tubes in small space, as the tubes are arranged as closely together as is consistent with the proper passage of the products of combustion through the flue-chamber.

I do not claim in this application the mode of constructing and connecting the sections of the pipe structure so as to cause circulation of water through the same from one end to the other, but propose to make this the subject of a separate application for patent.

55 I claim as my invention—

1. The combination of a series of heating-tubes, scrapers adapted thereto, transverse bars carrying said scrapers, longitudinal bars supporting the scraper-bars, suspending-chains connected to the supporting-bars near each end, and winding-drums for said chains, as set forth.

2. The combination of the scraper-bars, the supporting-bars and their chains, the shaft M and its drums, the mangle-wheel S, and the shaft T, having a pinion, *s*, whereby movement of partial rotation in opposite directions is imparted to the said shaft M, as set forth.

3. The combination of the heating-tubes, the scraper-bars, the supporting-bars, the shaft M and its drums, and chains W, connected to the opposite supporting-bars, the chains of one bar passing over the drums, and the chains of the other bar passing under said drums, as set forth.

4. The combination of the heating-tubes, the scraper-bars, the shaft M and its drums, two pairs of supporting-bars, J K, and suspending-chains W, those of one pair of bars having a drum-connection the reverse of that of the chains of the other pair, whereby as one pair of bars descends the other pair rises, as set forth.

5. The combination of the heating-tubes, arranged in transverse rows and staggered, as described, with the bars G, extending transversely between adjoining rows and carrying scrapers adapted to the tubes of each row, as set forth.

6. The combination of the heating-tubes, arranged in transverse rows, the transverse bars G, having in their opposite edges recesses for the reception of the adjoining rows of tubes, and scrapers carried by said bars, as set forth.

7. The combination of the rows of tubes, the recessed bar G, the segmental plates H, and the scrapers carried by said plates, as set forth.

8. The combination of the rows of tubes, the recessed bar G, having pins *n*, the segmental plates H, having lugs *m*, and the scrapers carried by said plates, as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHAS. H. HOLT.

Witnesses:

JOHN M. CLAYTON,  
HARRY SMITH.