

(No Model.)

G. H. WATSON.

VARIABLE EXHAUST NOZZLE FOR LOCOMOTIVES.

No. 502,796.

Patented Aug. 8, 1893.

Fig. 1

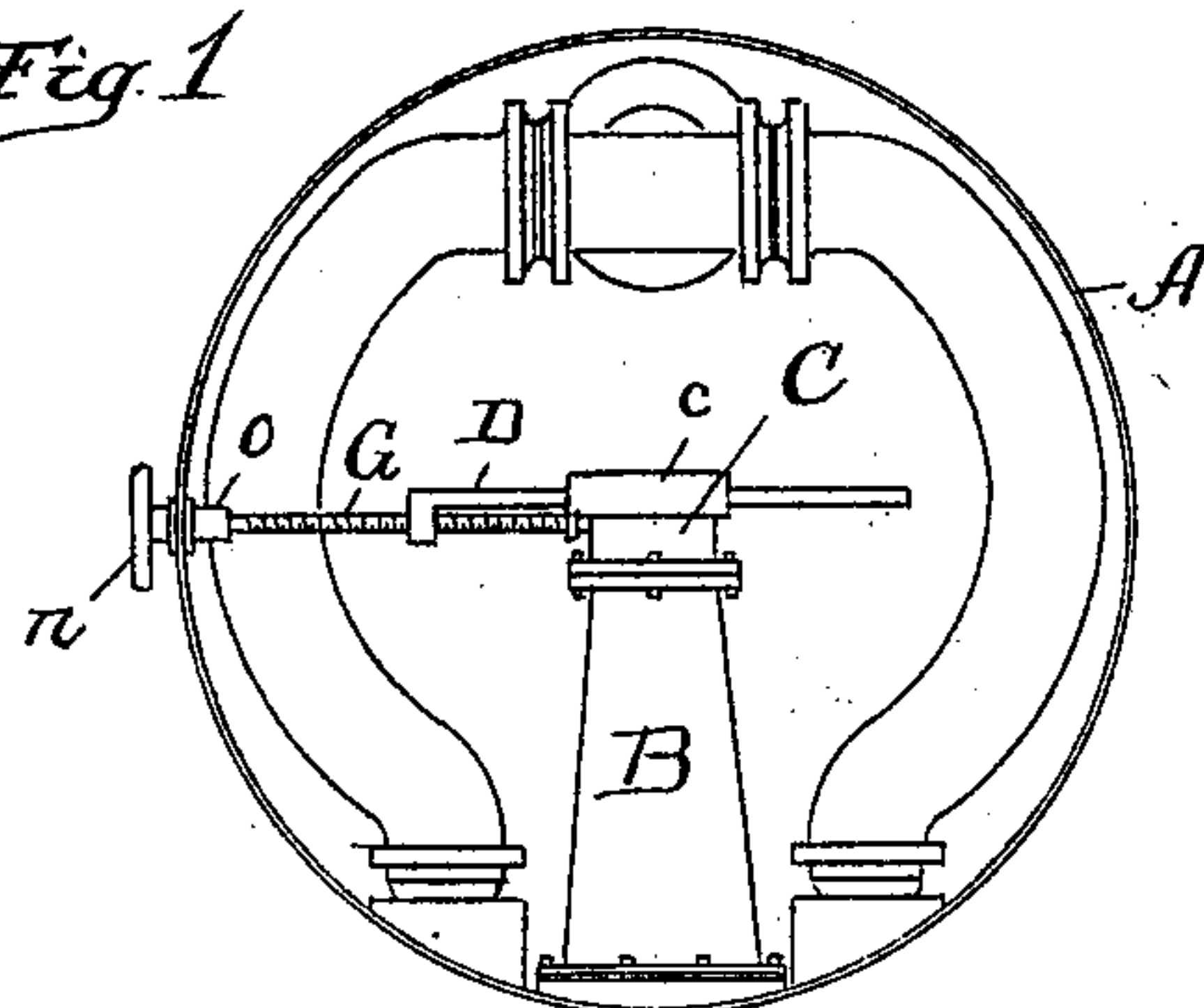


Fig. 5.

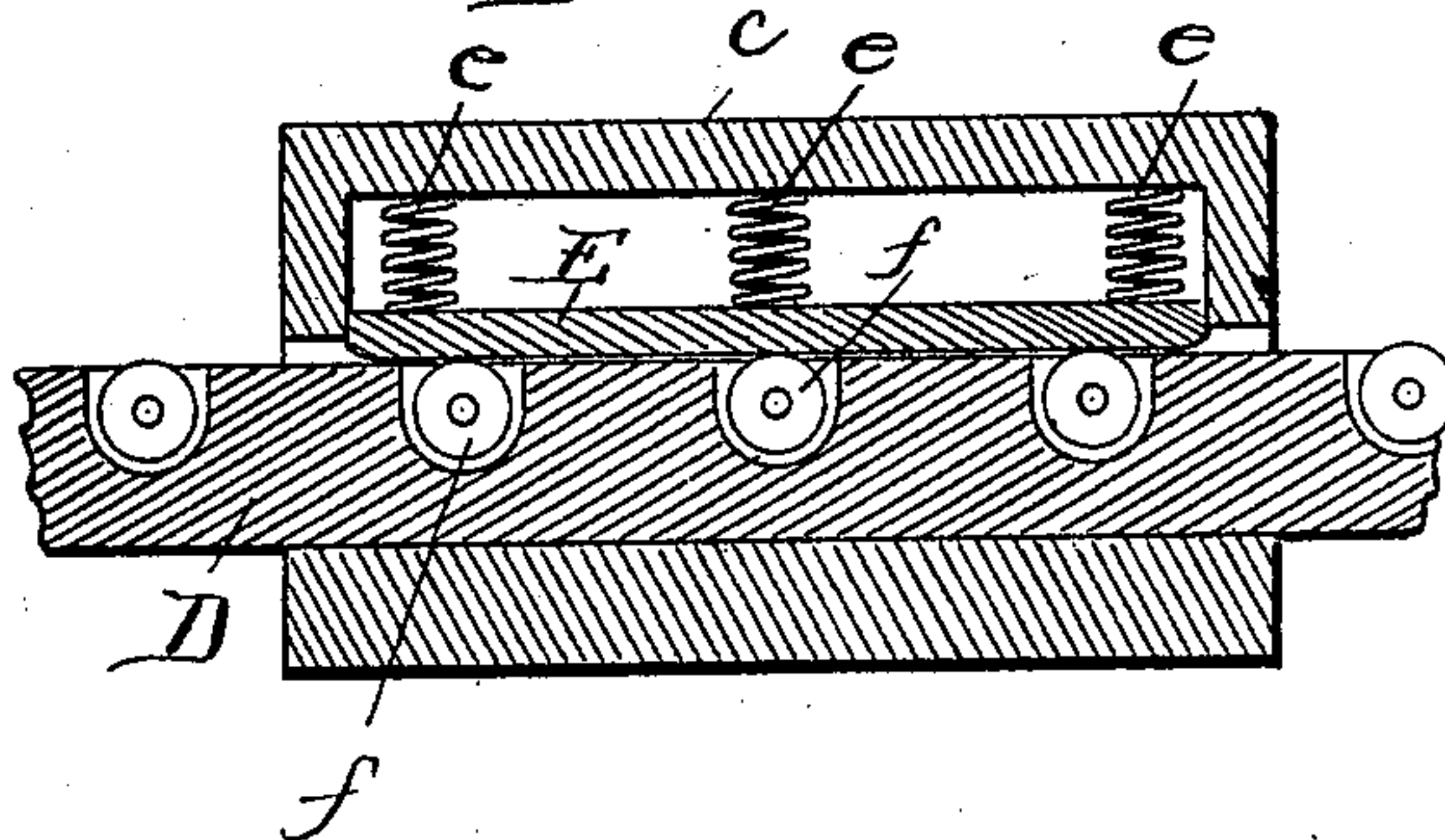


Fig. 2

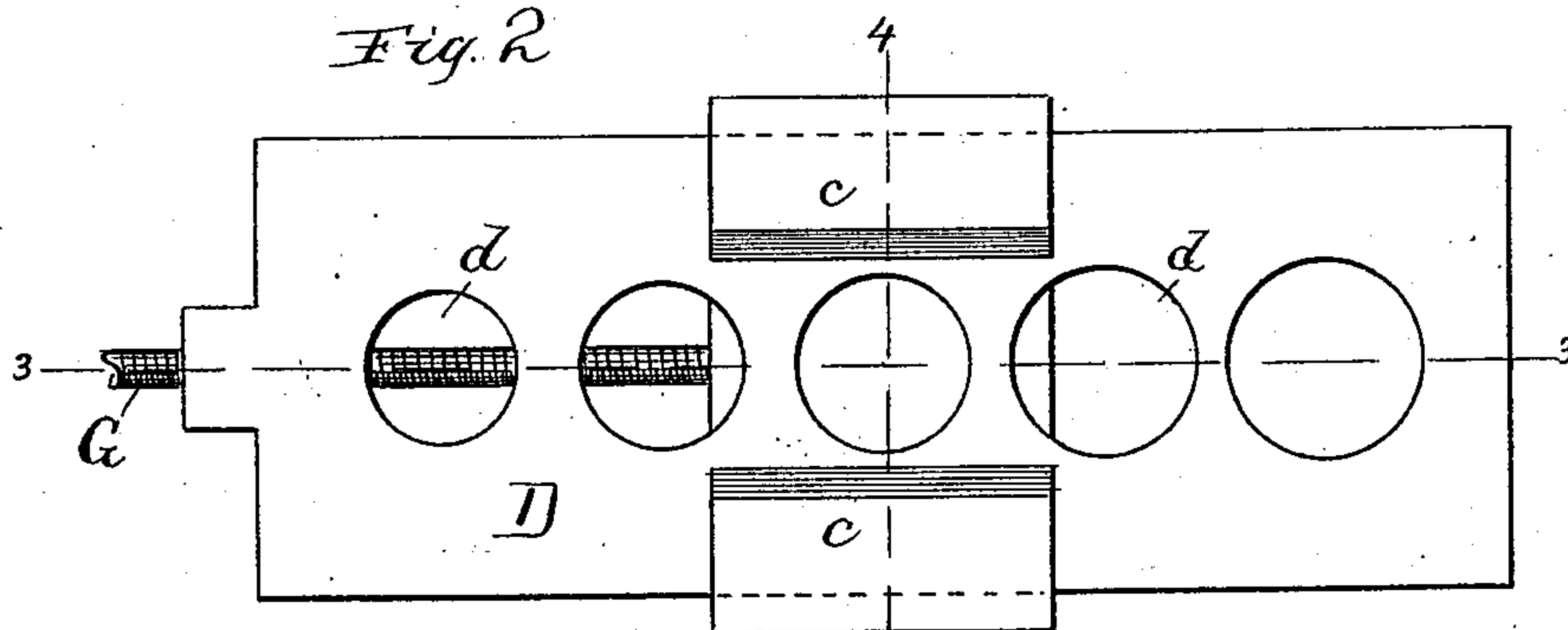


Fig. 3.

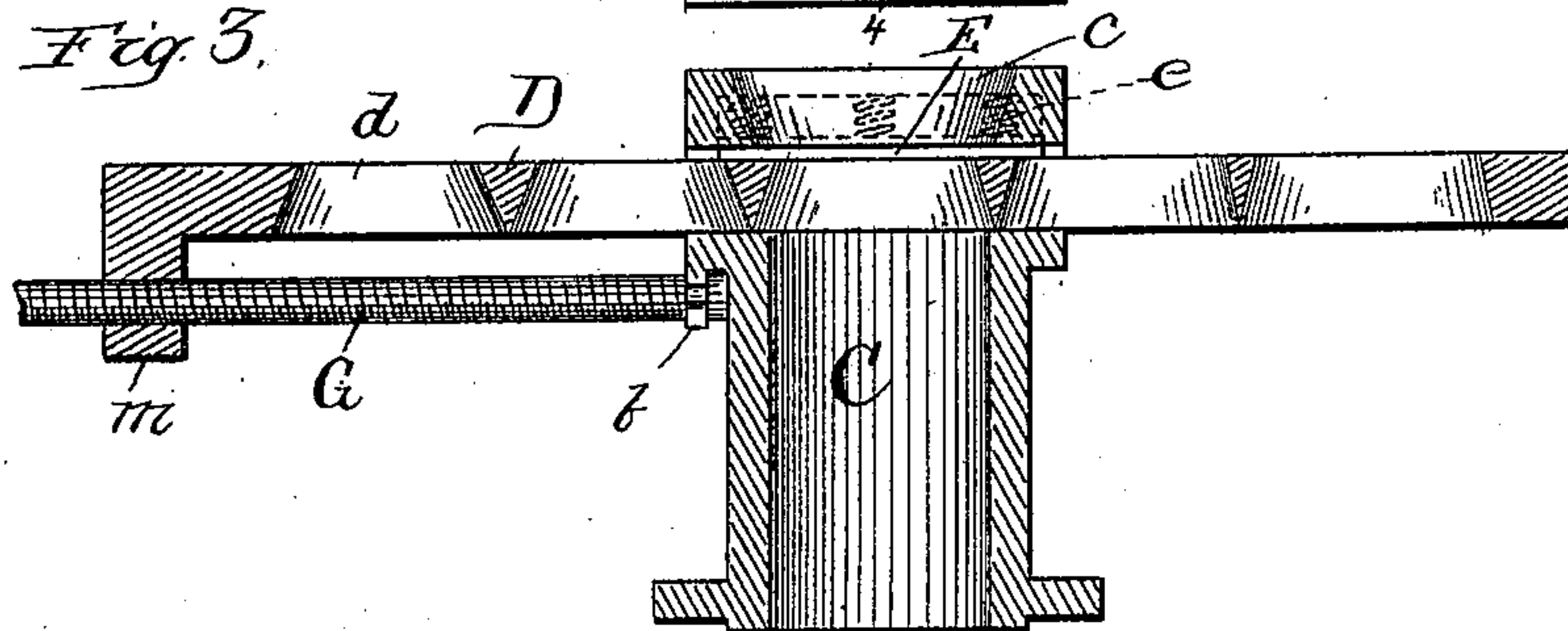
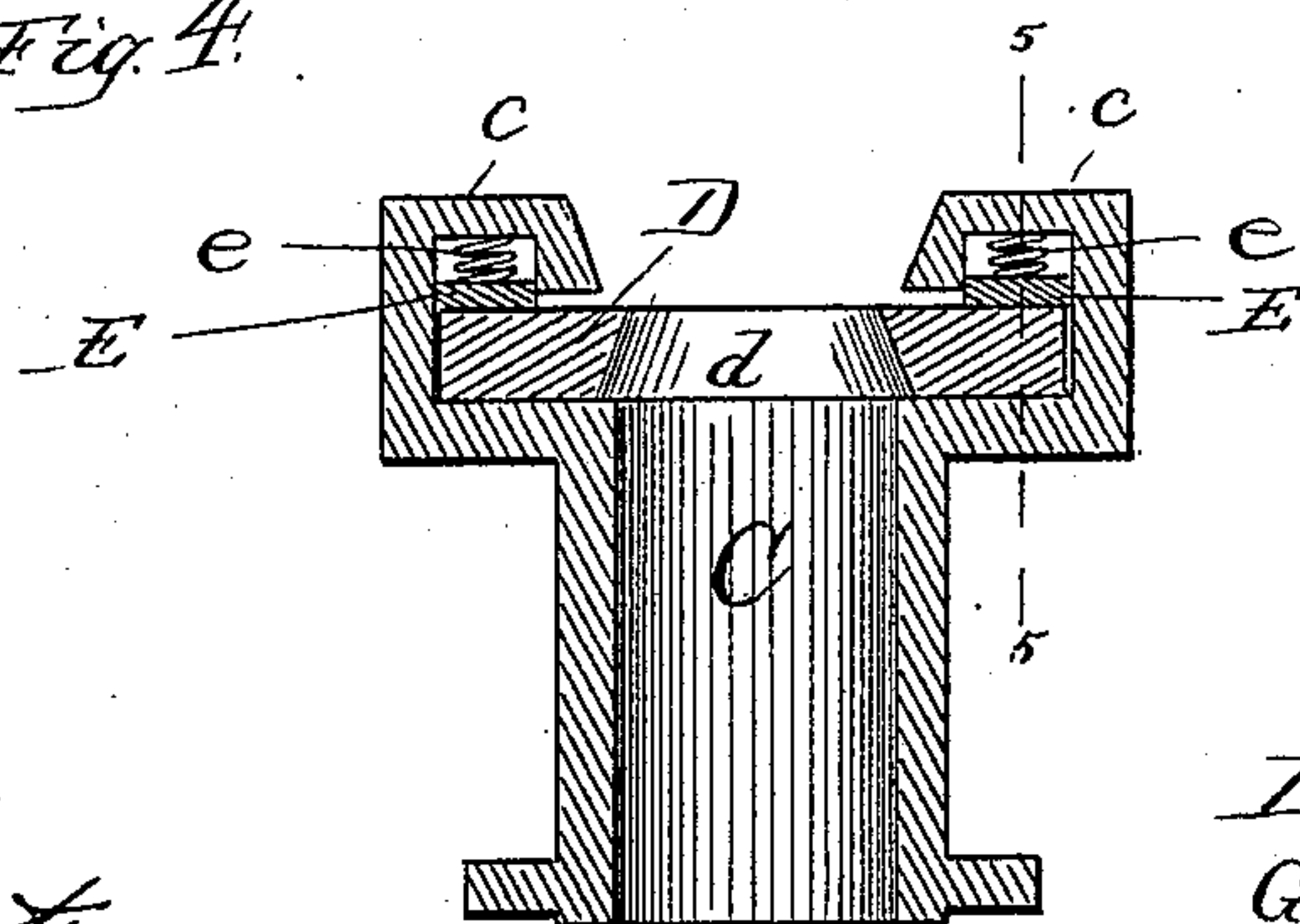


Fig. 4.



Witnesses:

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Inventor:

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# UNITED STATES PATENT OFFICE.

GEORGE H. WATSON, OF ST. LOUIS, MISSOURI.

## VARIABLE EXHAUST-NOZZLE FOR LOCOMOTIVES.

SPECIFICATION forming part of Letters Patent No. 502,796, dated August 8, 1893.

Application filed January 23, 1893. Serial No. 459,493. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE H. WATSON, a citizen of the United States, residing in St. Louis, in the State of Missouri, have invented a new and useful Improvement in Variable Exhaust-Nozzles for Locomotives, of which the following is a specification.

This invention is an improvement upon previous constructions of variable exhaust nozzles and is designed to simplify such previous constructions and also to obviate some objections encountered in their working.

The invention consists in the combination with an exhaust nozzle of a plate movable over the nozzle opening and furnished with a series of openings graduated as to their area and adapted to be severally positioned in line with the nozzle opening so as to contract or enlarge the same, those portions of the plate between the openings being beveled to a knife-edge at the bottom so as to afford as little resistance as possible to the steam during the changes in position of the plate. The plate is preferably a sliding one and it may be operated by a screw or any appropriate actuating device and be under the control of the engineer. The openings in the plate are also preferably tapering, diminishing in the direction of the discharge. I further provide a series of springs bearing downward upon this plate and acting to hold it to its seat, such springs yielding and thus permitting the free movement of the plate under the varying expansion of the different parts due to heat, and also allowing for the scale and other foreign matter which may form or accumulate upon the plate or the ways within which it moves, and which would otherwise interfere seriously with its movement. As a still further precaution against friction I provide the plate with anti-friction rollers adapted to ease its movements. All these features are fully shown in the accompanying drawings, wherein—

Figure 1 is an elevation of my improved nozzle and its actuating screw, showing its application to the smoke box of the locomotive. Fig. 2 is an enlarged plan of the nozzle. Fig. 3 is a vertical section on the line 3—3 of Fig. 2. Fig. 4 is a vertical section on the line 4—4 of Fig. 2. Fig. 5 is a still more enlarged section on the line 5—5 of Fig. 4.

In said drawings A may represent the smoke

box of the locomotive and B the exhaust nozzle.

C is the tip portion of the nozzle which is enlarged to form overhanging ways *c* adapted to support and hold the movable plate D. This plate is intended to regulate the area of the nozzle orifice according to the necessities of the work which the locomotive may have to do, and to adapt the plate to this function, it is made to move horizontally across the nozzle and is provided with a series of openings *d* which are graduated in area as shown, and any one of which may be positioned over the nozzle and serve to enlarge or contract the orifice thereof as will be fully understood from the drawings. The openings *d* taper in diameter, diminishing from the under side of the plate toward the top thereof as indicated whereby the area of the openings is gradually reduced, and the area of all the openings is made to agree at the point where the steam enters them, with the diameter of the bore of the nozzle tip C, and thus to avoid the presence at such point of any abrupt shoulder against which the steam would pound.

Within each of the ways *c* and above the plate D is a series of springs *e* and a bearing plate E. This feature is intended to allow the plate D to move easily, notwithstanding the formation of scale, the accumulation of foreign matter upon the surfaces and the unequal expansion under heat of the several parts, the springs yielding to the extent rendered necessary by these causes. I prefer also, in addition to the yielding bearing, to further ease the movements of the plates by means of anti-friction rollers *f* located in the sides of the movable plate where they will bear against the under surface of the bearing plates E, as clearly indicated.

To actuate the plate any suitable device may be employed. I have illustrated as a suitable means a screw G stationarily confined at one end in the depending lip *b* upon one side of the nozzle and having a threaded engagement with a depending leg *m* upon the plate. This screw may be rotated by the hand wheel *n* located upon the outside of the smoke box, the screw passing through a stuffing box *o* in the wall of the smoke box. Instead of the hand wheel, or in conjunction with it, additional operating mechanism extending to



the cab may be provided whereby the engineer may turn the screw without leaving the cab, and while the locomotive is in motion.

As other forms of variable nozzles have been provided with mechanism whereby they may be operated from the cab and as many different constructions of such mechanisms may be used, I have not thought it necessary to illustrate any operating device except the hand wheel.

Inasmuch as the plate D will often require to be changed in position while the locomotive is running, it is desirable that those portions of the plate lying between the openings *d* and forming the partitions between them, and which must be passed across the nozzle opening, should offer as little resistance to the steam as possible, and hence I reduce them, as nearly as may be, to a knife edge at the bottom, as plainly illustrated, and thus adapt the partitions to cut or divide the current of steam as it passes, and to offer as little resistance as possible.

I claim—

1. The combination with an exhaust nozzle

having suitable ways therefor, of a movable plate furnished with a series of graduated openings adapted to be severally positioned over the nozzle, and yielding ways for the plate, whereby the plate is rendered easily movable notwithstanding unequal expansion, corrosion &c, substantially as set forth.

2. The combination with an exhaust nozzle having suitable ways therefor, of a sliding plate D furnished with a series of graduated openings, and springs acting downwardly upon the plate, thus easing its operation and allowing for unequal expansion of the parts, corrosion &c, substantially as set forth.

3. The combination with an exhaust nozzle having suitable ways therefor, of a sliding plate D furnished with a series of graduated openings, and with springs and anti-friction rollers adapted to ease its movements, substantially as set forth.

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Witnesses:

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