

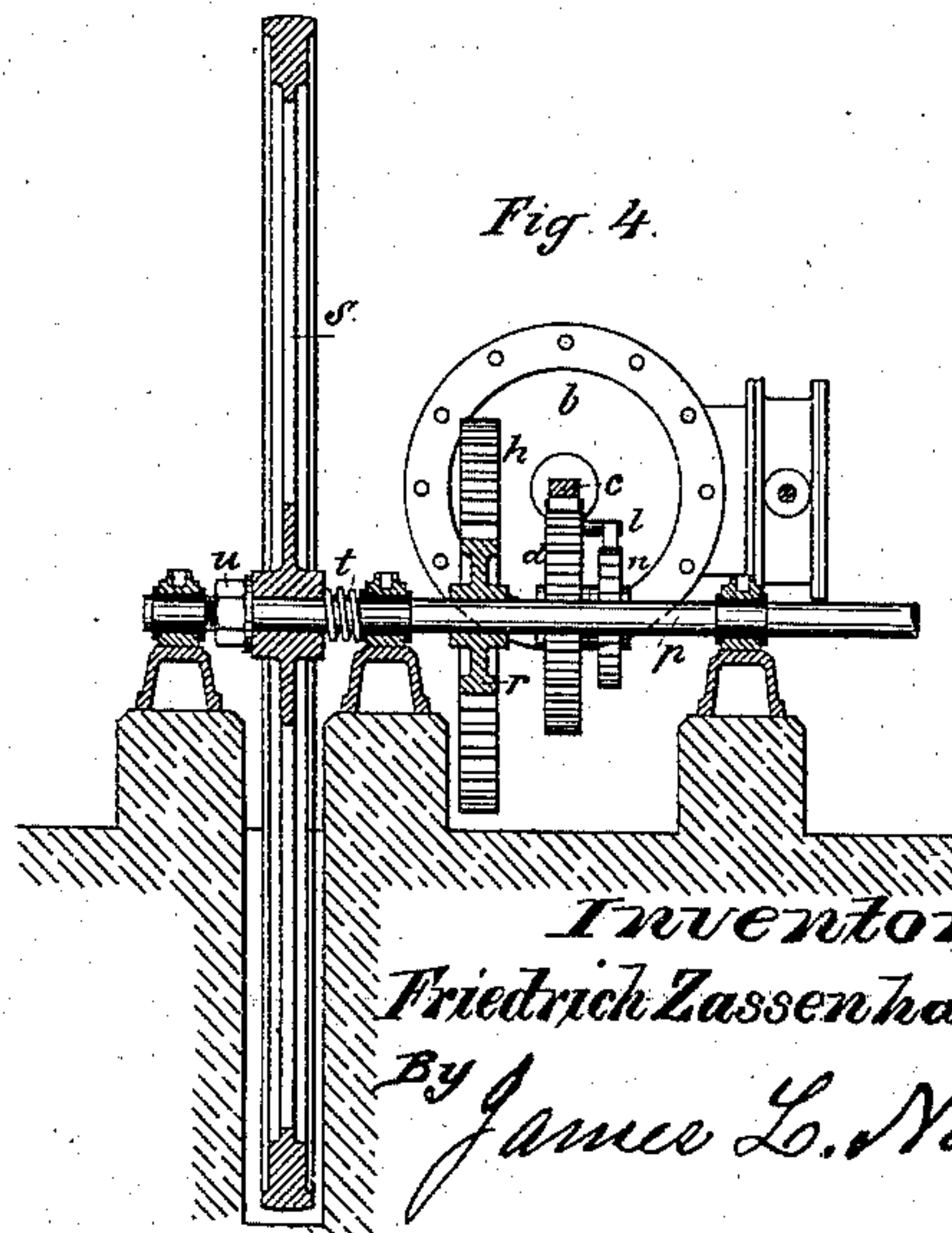
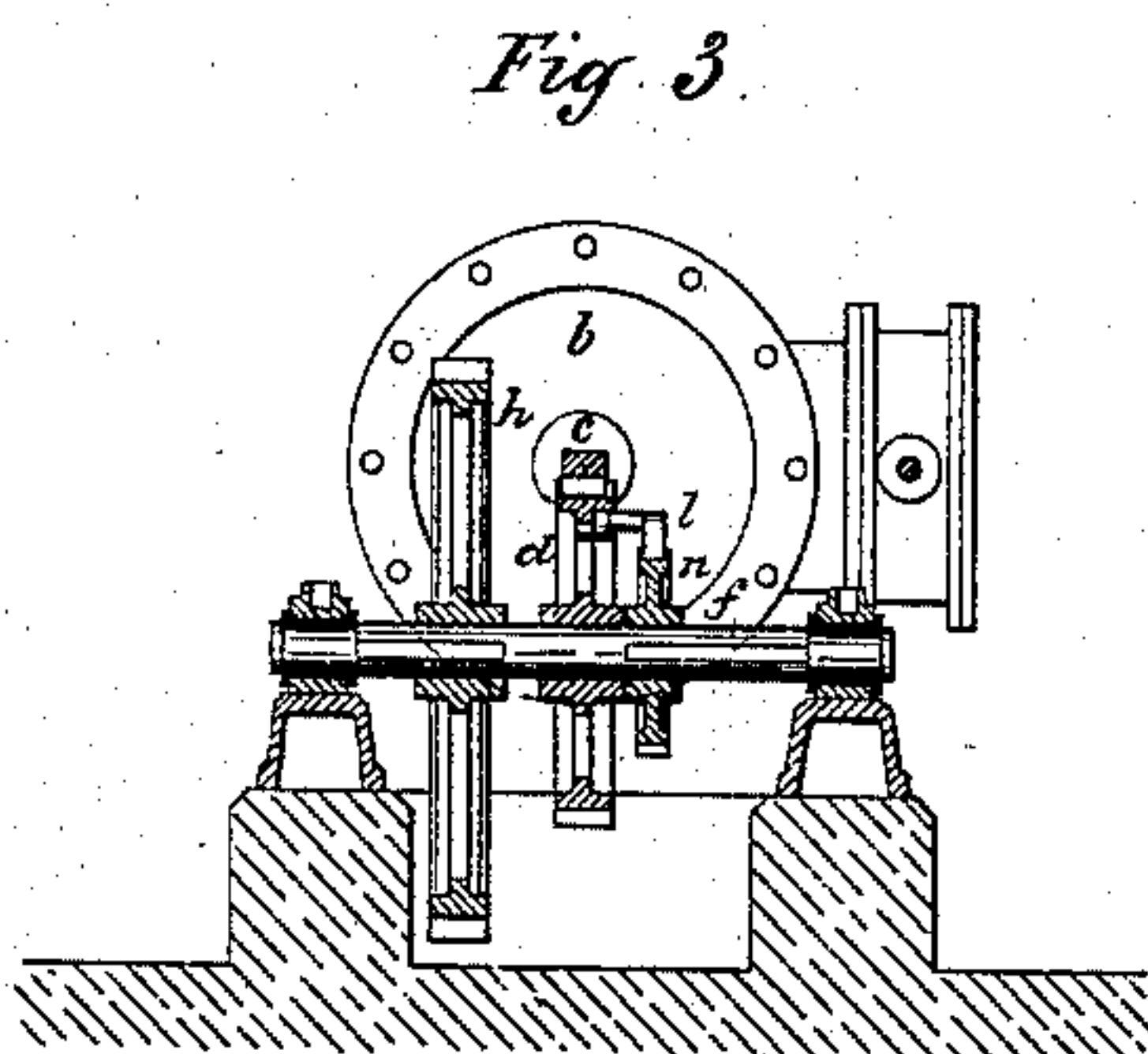
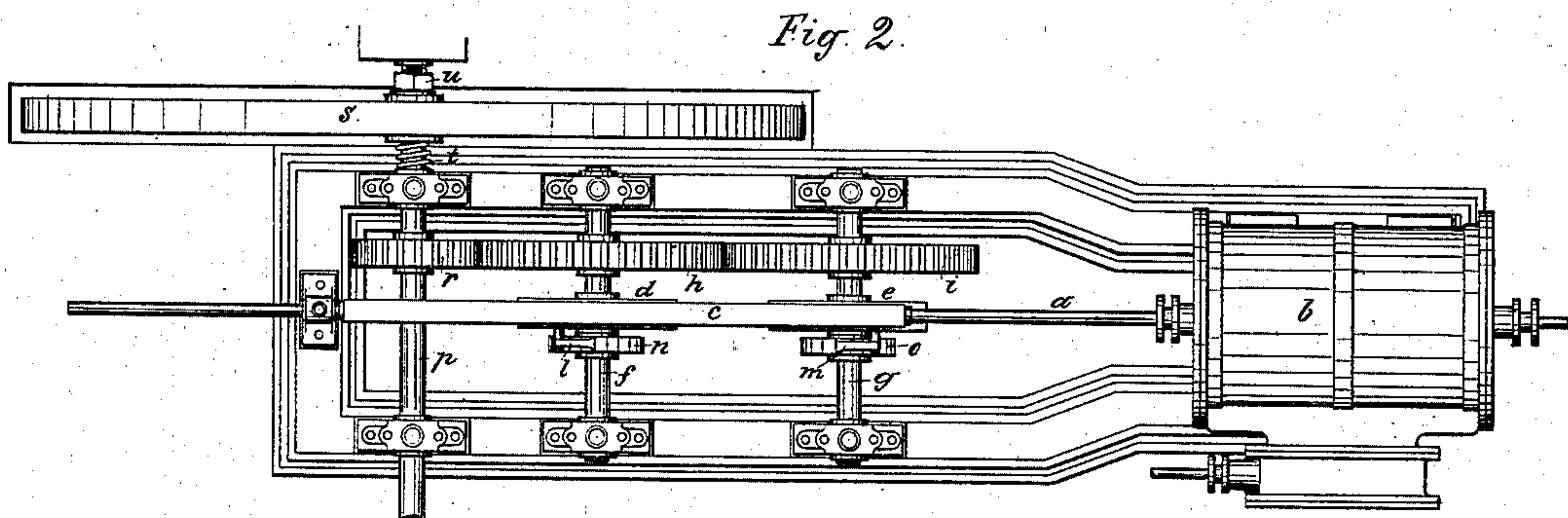
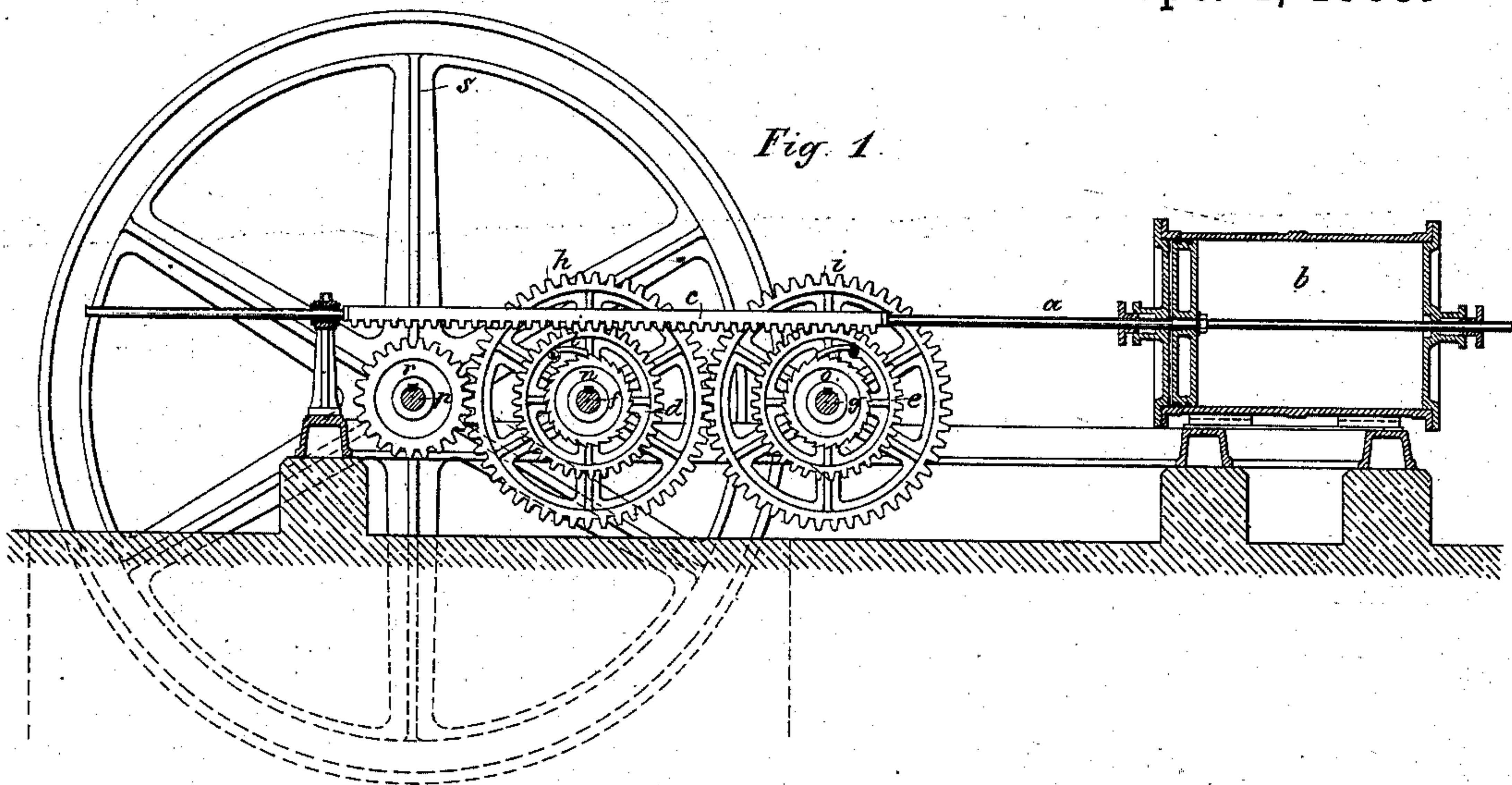
(No Model.)

F. ZASSENHAUS.

DEVICE FOR CONVERTING MOTION.

No. 284,530.

Patented Sept. 4, 1883.



Witnesses.

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UNITED STATES PATENT OFFICE.

FRIEDRICH ZASSENHAUS, OF CLEVES, PRUSSIA, GERMANY.

DEVICE FOR CONVERTING MOTION.

SPECIFICATION forming part of Letters Patent No. 284,530, dated September 4, 1883.

Application filed June 15, 1883. (No model.)

To all whom it may concern:

Be it known that I, FRIEDRICH ZASSENHAUS, of the city of Cleves, in the Kingdom of Prussia, and German Empire, have invented certain new and useful Improvements in Converting Motion in Steam-Engines, of which the following is a specification.

This invention relates to means for converting motion in steam or similar engines; and the object of my said invention is to dispense with the intermediate crank mechanism heretofore employed for the purpose of transmitting the motive power from the piston-rod unto the driving-shaft of the engine, it being a fact well known to engineers that with the steam-engines as heretofore constructed but little useful effect is obtained—that is to say, that a small part only of the steam applied is converted into actual effective power, part of the said steam being lost in overcoming the friction of the machinery and another considerable part in changing the reciprocating motion of the piston into the rotary motion of the driving-shaft by means of the well-known crank mechanism heretofore applied for the latter purpose, the crank-lever of the said mechanism continually changing its position and transmitting only when in two of its positions, the full power of steam-pressure acting upon the piston, while when in its other positions the transmission of the said power is successively reduced to naught. In order to obviate the difficulty of such unequal transmission of power—that is to say, to substitute a uniform crank-lever for the variable crank-lever as hitherto used, and thereby to increase considerably the useful effect of the engine—I have invented the following improvements, as will be hereinafter specified.

My said invention therefore consists in forming the piston-rod of a steam or similar engine with a rack-bar, and in combining with the said rack-bar and the driving-shaft of the engine suitable intermediate mechanism for continuously and uniformly transmitting the reciprocating motion of the said bar into the rotary motion of the said shaft.

In the accompanying drawings, forming part of my specification, Figure 1 is a side view of a steam-engine, partly in section, embodying

my said improvement. Fig. 2 is a top view, and Figs. 3 and 4 are transverse sections, of the same.

Reference being had to the accompanying drawings, *a* is the piston-rod, applied to and reciprocated by the piston in the steam-cylinder *b*, said piston-rod being formed with a rack in gear with two spur-wheels, *d* and *e*, of equal diameter. These two wheels *d* and *e* are applied loosely upon the two parallel shafts *f* and *g*, respectively, while two other spur-wheels, *h* and *i*, are rigidly fastened upon the said shafts. The said two wheels *h* and *i* are of larger diameter than the loosely-fitted wheels *d* and *e*; but they are both of equal diameter and in gear with each other. Next to the wheels *d* and *e*, and rigidly mounted upon the same respective shafts *f* and *g*, are the two ratchet-wheels *n* and *o*, the ratchet-teeth in the circumference of the one wheel, *n*, pointing in an opposite direction to the teeth in the circumference of the other wheel, *o*.

l and *m* are pawls pivoted to the loosely-fitted wheels *d* and *e*, respectively, near the circumference of the latter, and being so arranged as to also point in opposite directions and to be held in contact with the said teeth in the ratchet-wheels *n* and *o*.

r is a spur-wheel, of any convenient diameter, rigidly mounted upon the driving-shaft and in gear with the spur-wheel *h*. To the driving-shaft is also applied the fly-wheel *s*, which is loosely mounted upon the said shaft, being held in place by means of an adjustable nut, *u*, the latter bringing the hub of the said wheel to bear against the coiled spring *t*.

Having thus described the construction of my improved means for transmitting the reciprocating motion of the piston into the rotary motion of the driving-shaft, I will now proceed to describe its operation.

During each forward stroke of the piston the rack *c* on the piston-rod *a* will turn or partly rotate the loosely-fitted spur-wheels *d* and *e* to the right, and in consequence thereof the pawl *l*, pivoted to near the periphery of the wheel *d*, catching into the ratchet-teeth of the wheel *n*, will impart the same rotary motion unto the latter, while the pawl *m*, pivoted to near the periphery of the other wheel, *e*,

will slide freely over the teeth of the other ratchet-wheel, *o*. Now, by thus turning the ratchet-wheel *n*, mounted rigidly upon the shaft *f*, rotary motion is also imparted unto the latter and to the rigidly-fitted spur-wheel *h*, applied to the same, which, therefore, is also turned to the right, and, being in gear with the corresponding spur-wheel, *i*, will turn the latter and its shaft *g* to the left, of which movement the ratchet-wheel *o* is also bound to partake. The stroke of the piston having been reversed, the rack *c* will now commence turning the wheels *d* and *e* in an opposite direction—that is to say, to the left—and consequently the pawl *m* will act upon the ratchet-wheel *o* and drive the same positively to the left, the same motion being thereby imparted to the shaft *g* and the wheel *i*, the latter now driving in its turn the wheel *h* to the right. Thus will be seen that during each stroke of the piston the same rotary motion is imparted to the shafts *g* and *h* and to the wheels *h* and *i* rigidly applied thereto. This rotary motion may be imparted to the driving-shaft *p* of the engine by any convenient means. In the drawings, a spur-wheel, *r*, is fitted upon the shaft *p*, said wheel being in gear with the spur-wheel *h*, which, being rotated continuously and uniformly to the right, will impart a uniform and continuous rotary motion of an opposite direction to the wheel *r* and the driving-shaft *p*. It is not absolutely necessary that with this improved construction the latter shaft should be provided with a fly-wheel, since in many instances the spur-wheels *h* and *i* may be made of such dimensions as to insure a uniform motion by their own rotation. In such cases, where a fly-wheel is considered available, I prefer to apply the same in the manner as shown in the drawings, which construction allows of an easy removal of the fly-wheel in such cases where the latter may be dispensed with.

I wish to have it understood that I do not confine myself to applying my herein-described invention to steam-engines only, inasmuch as I propose to apply the same in any such cases where reciprocating motion is transmitted into rotary motion. I also wish to have it understood that I do not limit myself to the form shown of the loosely-fitted wheels *d* and *e*, since toothed segments or other equivalent means applied in a similar manner may be substituted for the same.

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

1. The combination, with the piston-rod having the rack *c*, of the spur-wheels *d* and *e*, being mounted loosely upon the shafts *f* and *g*, and having the pawls *l* and *m*, respectively, substantially as and for the purpose set forth.

2. The combination, with the ratchet-wheels *n* and *o*, rigidly applied to the shafts *f* and *g*, respectively, and provided with ratchet-teeth, as described, of the pawls *l* and *m*, alternately catching in and sliding freely over the said ratchet-teeth, substantially as described, and for the purpose specified.

3. In combination, the rack *c*, formed on the piston-rod *a*, the spur-wheels *d* and *e*, mounted loosely upon the shafts *f* and *g*, and having the pawls *n* and *o*, respectively, the ratchet-wheels *n* and *o*, rigidly connected to the said shafts, respectively, and having their teeth arranged in opposite directions, and the spur-wheels *h* and *i*, being of equal diameter and in gear with each other, substantially as and for the purpose set forth.

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

FRIEDRICH ZASSENHAUS.

Witnesses:

H. LEWIS,

H. KÜDEVING.