No. 704.810. Patented July 15. 1902.

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## MECHANISM FOR CONVERTING ROTARY INTO RECIPROCATORY MOTION.

(Application filed May 8, 1901. Renewed Jan. 27, 1902.)

(No Model.)

Fig. 1.

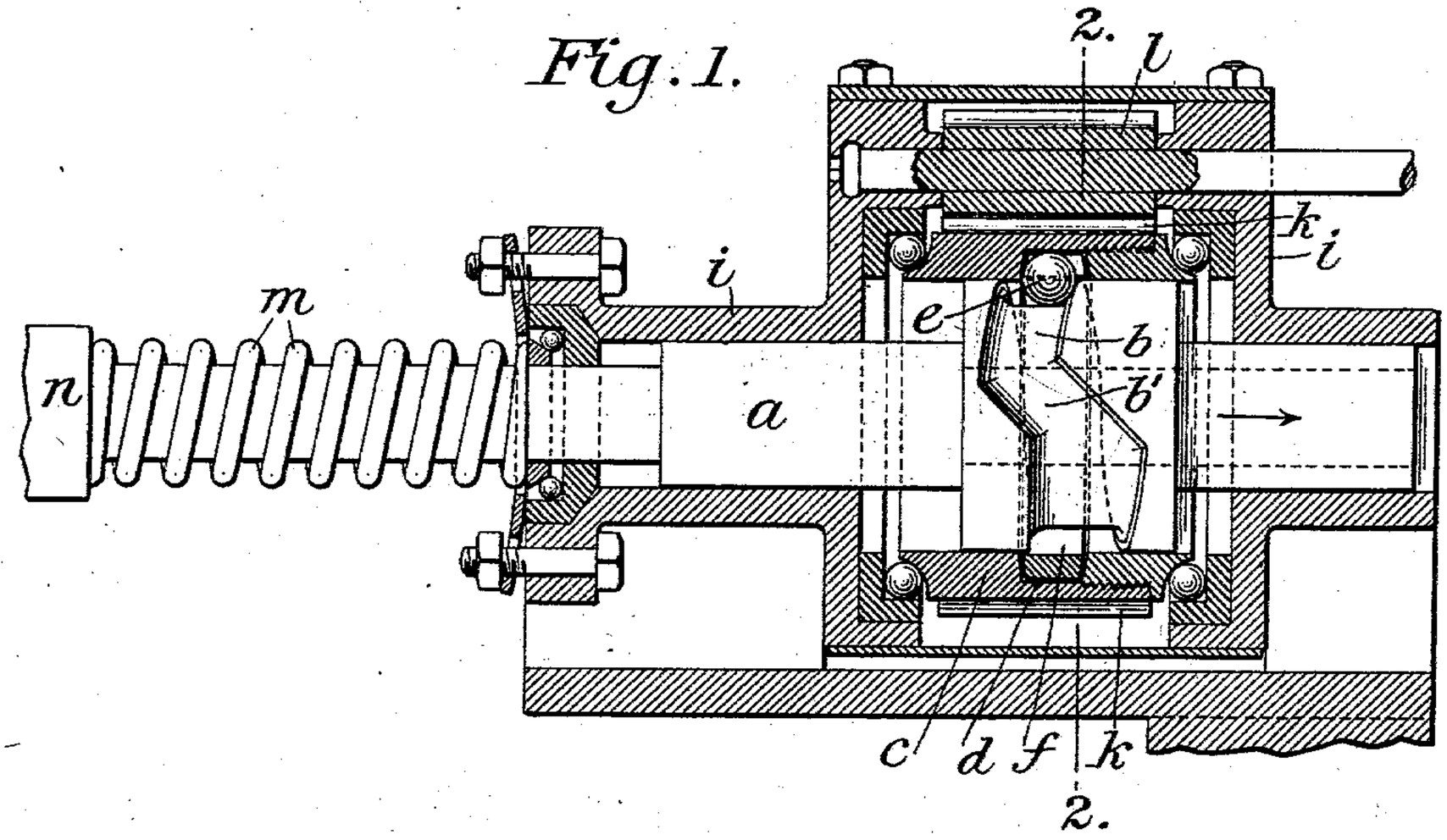
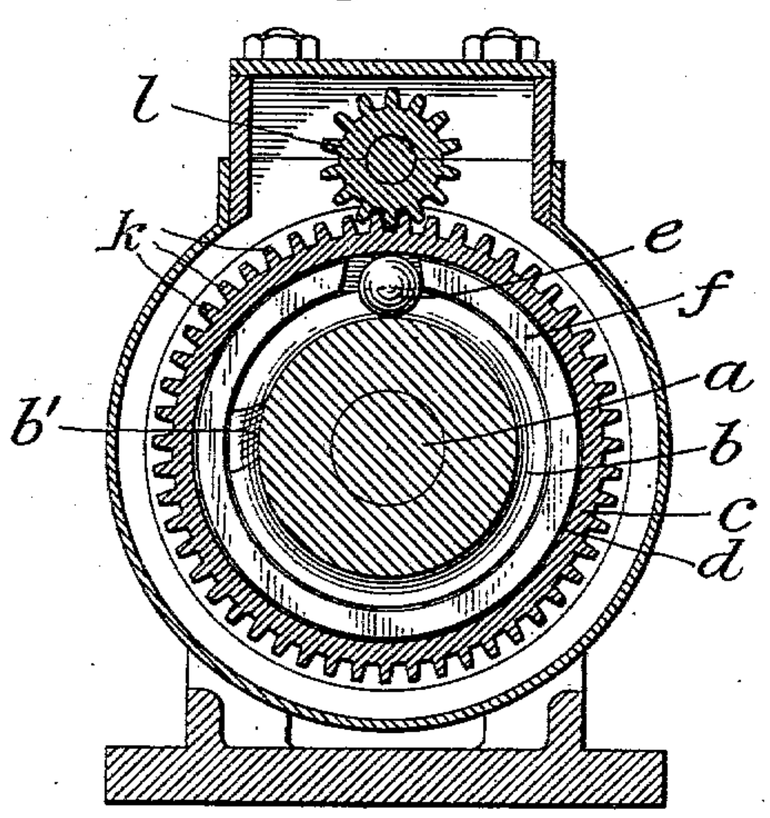



Fig. 2.

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# UNITED STATES PATENT OFFICE.

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## MECHANISM FOR CONVERTING ROTARY INTO RECIPROCATORY MOTION.

SPECIFICATION forming part of Letters Patent No. 704,810, dated July 15, 1902.

Application filed May 8, 1901. Renewed January 27, 1902. Serial No. 91,409. (No model.)

*To all whom it may concern:*

Be it known that I, BRADFORD H. LOCKE, a citizen of the United States, residing in Denver, county of Arapahoe, State of Colorado, have invented certain new and useful Improvements in Mechanism for Converting Rotary into Reciprocatory Motion, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

This invention relates to mechanism of the general character of that described in my application for Letters Patent of the United States, filed February 23, 1900, Serial No. 6,174. In the mechanism described in that application a roller or rolling coupler is employed between the rotating part and the reciprocating part, one of which parts is formed with an inclined or spiral shoulder upon which the roller or rolling coupler travels for the purpose of effecting a movement of the reciprocating part in one direction, the reciprocating part being then released and permitted to move in the opposite direction under the influence of the spring or other impelling force employed for the purpose. In the preferred form of that mechanism the roller or rolling coupler engages an annular groove or shoulder formed in or on the other part referred to, and in such construction it is desirable to provide means whereby the rolling of the coupler on or in contact with the inclined shoulder shall be assured and the otherwise consequent slipping of the coupler with respect to the inclined shoulder prevented. In Figure 6 of the drawings which accompany said application a spring is represented as adapted to press the coupler into contact with the rotating part, and thereby insure the desired rolling action. The spring is satisfactory in operation under most conditions of use; but it has been found that certainty of action may be still further assured by employing a traveler, preferably in the form of a floating ring or partial ring, which by its frictional contact with the rotating part compels the coupler to travel with it, and therefore to roll on the inclined shoulder.

The present improvement will be more fully described hereinafter with reference to the accompanying drawings, in which for the purpose of illustration and explanation it is shown as embodied in a convenient and practical form.

In said drawings, Fig. 1 is a view in longitudinal section of so much of a form of mechanism as is necessary to illustrate the application of the invention, the central shaft being shown in elevation. Fig. 2 is a view in transverse section on the plane indicated by the line 2 2 of Fig. 1.

In the form of mechanism illustrated in the drawings the reciprocating part *a* is shown as a shaft which may or may not be rotated. At a suitable point the shaft is provided with an inclined or spiral groove *b*, one side of which forms the inclined or spiral shoulder hereinbefore referred to. The two extremes of the inclined or spiral groove are represented as connected by a passage *b'*, inclined in the opposite direction to permit the return of the rolling coupler from one end of the inclined or spiral groove to the other end. The rotating part *c* is shown as a sleeve which receives the shaft with a free fit, so that the shaft may reciprocate freely within the sleeve while the latter rotates freely about the shaft, the sleeve being provided with an annular groove *d*. The rolling coupler, which travels on the inclined or spiral shoulder of one part, engaging the other part at the same time, so that one of the parts is moved longitudinally in one direction, and then being released moves in the opposite direction under the influence of a spring or other suitable impelling force, is shown as a ball *e*, which is the most desirable form for the coupler to receive. In the construction shown the ball is received partly in one groove and partly in the other, and revolving with the sleeve *c* about the axis of the shaft *a* and traveling on the inclined or spiral shoulder of the shaft occasions the movement of the shaft in the direction of the arrow thereon. At the end of the incline referred to the ball reaches the return-channel *b'* and permits the movement of the shaft in the opposite direction, the ball again engaging the other or forward end of the incline or spiral *b*. It will be obvious that in order to produce the desired longitudinal movement of the shaft *a* the ball or other rolling coupler *e* should revolve about the axis of the shaft, although it is not desirable that the

ball or coupler should be carried with the rotating part or sleeve positively, it being desirable, on the contrary, that the ball or coupler should be independent of said sleeve as well as of the shaft. As stated heretofore, a spring has been used to press the ball into contact with the rotating part to insure its revolution and the desirable rolling action in contact with the inclined shoulder; but in the present case a traveler *f* is substituted for the spring, such traveler consisting in the form shown of an open or partial ring, which fits freely in the annular groove *d* and receives the ball or coupler *e* between its ends. In the drawings the distance between the ends of the traveler is represented as only sufficient to receive between them the ball or coupler *e* with the necessary freedom; but as only one end of the traveler makes contact with the ball or coupler it is evident that the traveler may be much shorter. The action of the traveler upon the ball depends upon the frictional contact between the traveler and the rotating part, and the traveler, therefore, needs to have only such length as will secure this desirable frictional contact, and thereby insure the proper movement of the ball with the rotating part without having the ball or coupler carried positively by the rotating part.

In the form of mechanism shown in the drawings the reciprocating part and the rotating part are supported by a suitable casing *i*, suitable bearings being provided for the rotating part, and said rotating part or sleeve is provided with gear-teeth, as at *k*, which are engaged by a driving-pinion *l*, or any suitable means for supporting or rotating the sleeve *c* may be employed. Means for impelling the reciprocating part in a direction opposite to that in which it is moved by the inclined or spiral shoulder are represented in the drawings by a spring *m*, which is shown as confined between the end of the casing *i* and a shoulder *n* on the shaft or reciprocating part *a*; but it will be understood that any other suitable impelling means may be employed.

It will be understood that the floating ring or traveler *f* by reason of its frictional contact with the rotating part will carry the ball or coupler beyond the lowest or dead point of the spiral groove into contact with the side of such groove or the spiral shoulder at such a point as to insure the rolling of the ball or coupler upon the shoulder and the desired cooperation of the several parts, while at the same time the traveler, and therefore the ball or coupler, may lag somewhat behind the sleeve in its rotation or may cease their movement of revolution altogether, as the conditions of operation of the mechanism may determine.

I claim as my invention—

1. A device for converting rotary into reciprocatory motion, comprising a sleeve, a shaft passing freely through the sleeve, one of said parts being arranged to rotate and the other of said parts being arranged to reciprocate, one of said parts having an inclined or spiral shoulder and the other of said parts having an annular shoulder, a rolling coupler for said parts engaging said shoulders to cause longitudinal movement of the reciprocating part in one direction, and a traveler having frictional engagement with the rotating part and coming in contact with said coupler to cause the same to revolve with the rotating part.

2. A device for converting rotary into reciprocatory motion, comprising a sleeve, a shaft passing through the sleeve, one of said parts being arranged to rotate and the other of said parts being arranged to reciprocate, one of said parts having an inclined or spiral shoulder and the other of said parts having an annular shoulder, a rolling coupler for said parts engaging said shoulders to cause longitudinal movement of the reciprocating part in one direction, and a partial ring having frictional engagement with the rotating part and coming in contact with said coupler to cause same to revolve with the rotating part.

3. A device for converting rotary into reciprocatory motion, comprising a sleeve having an annular groove, a shaft passing freely through the sleeve and having an inclined or spiral shoulder, a rolling coupler for said sleeve and shaft engaging said groove and said shoulder, and a partial ring in said annular groove having frictional engagement with the walls thereof and coming in contact with said coupler to cause the same to revolve with said sleeve.

This specification signed and witnessed this 6th day of May, A. D. 1901.

BRADFORD H. LOCKE.

In presence of—
ANTHONY N. JESBERA,
LUCIUS E. VARNEY.