

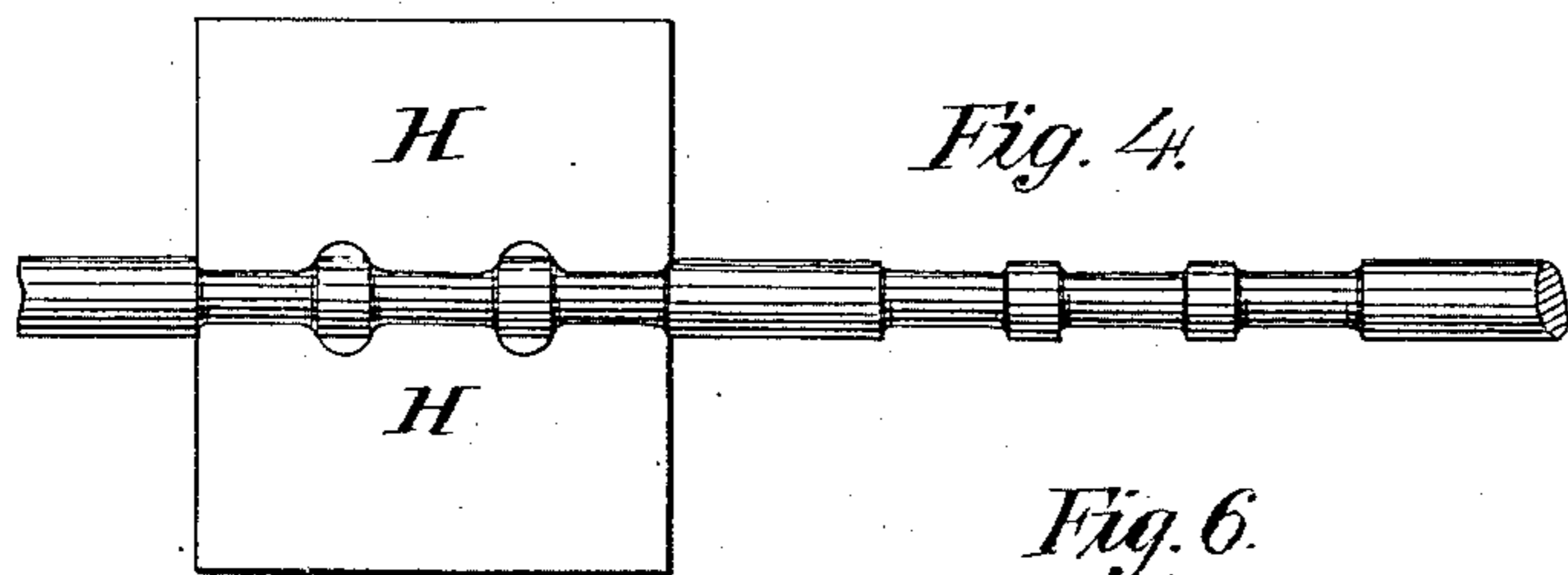
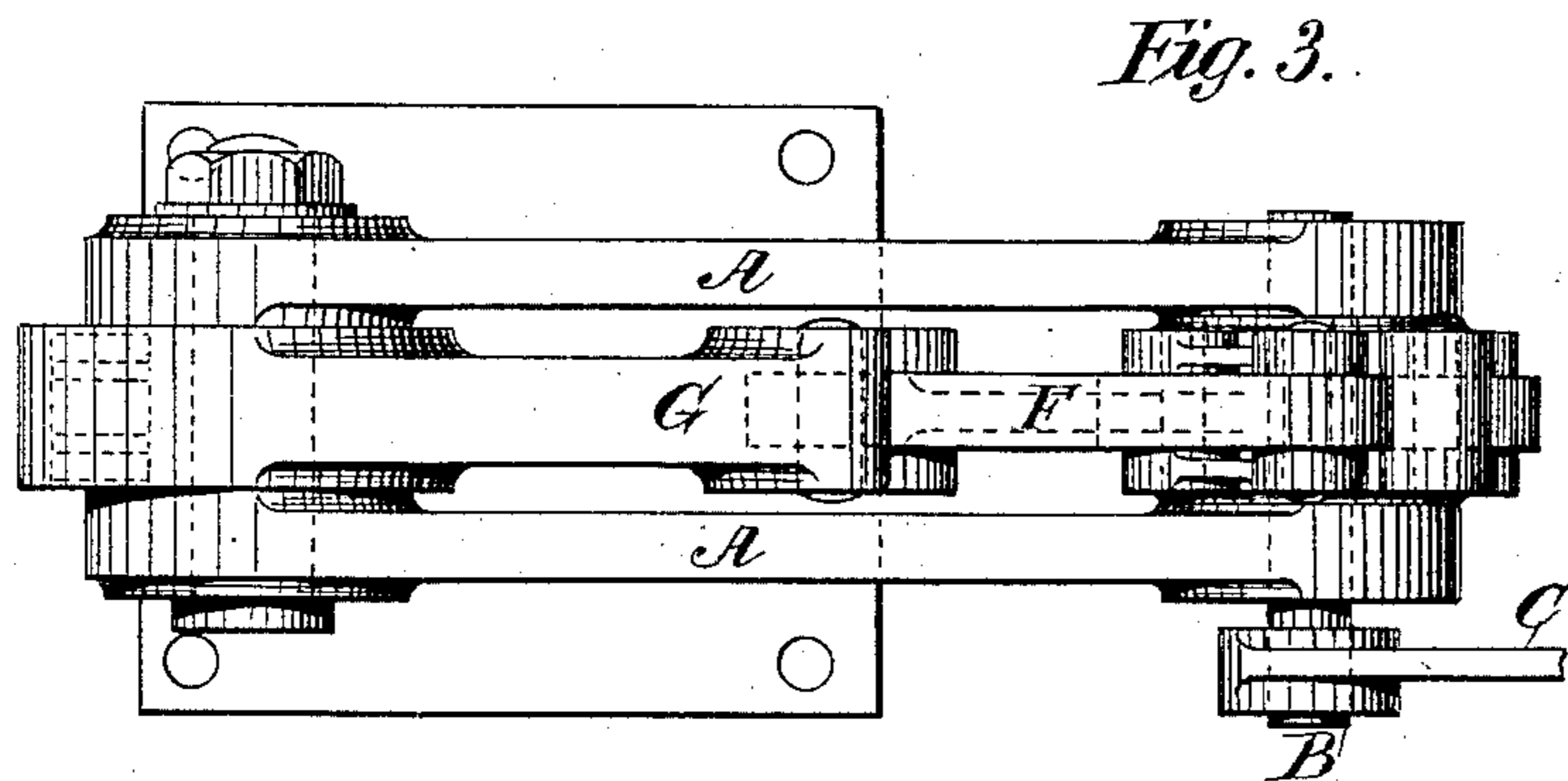
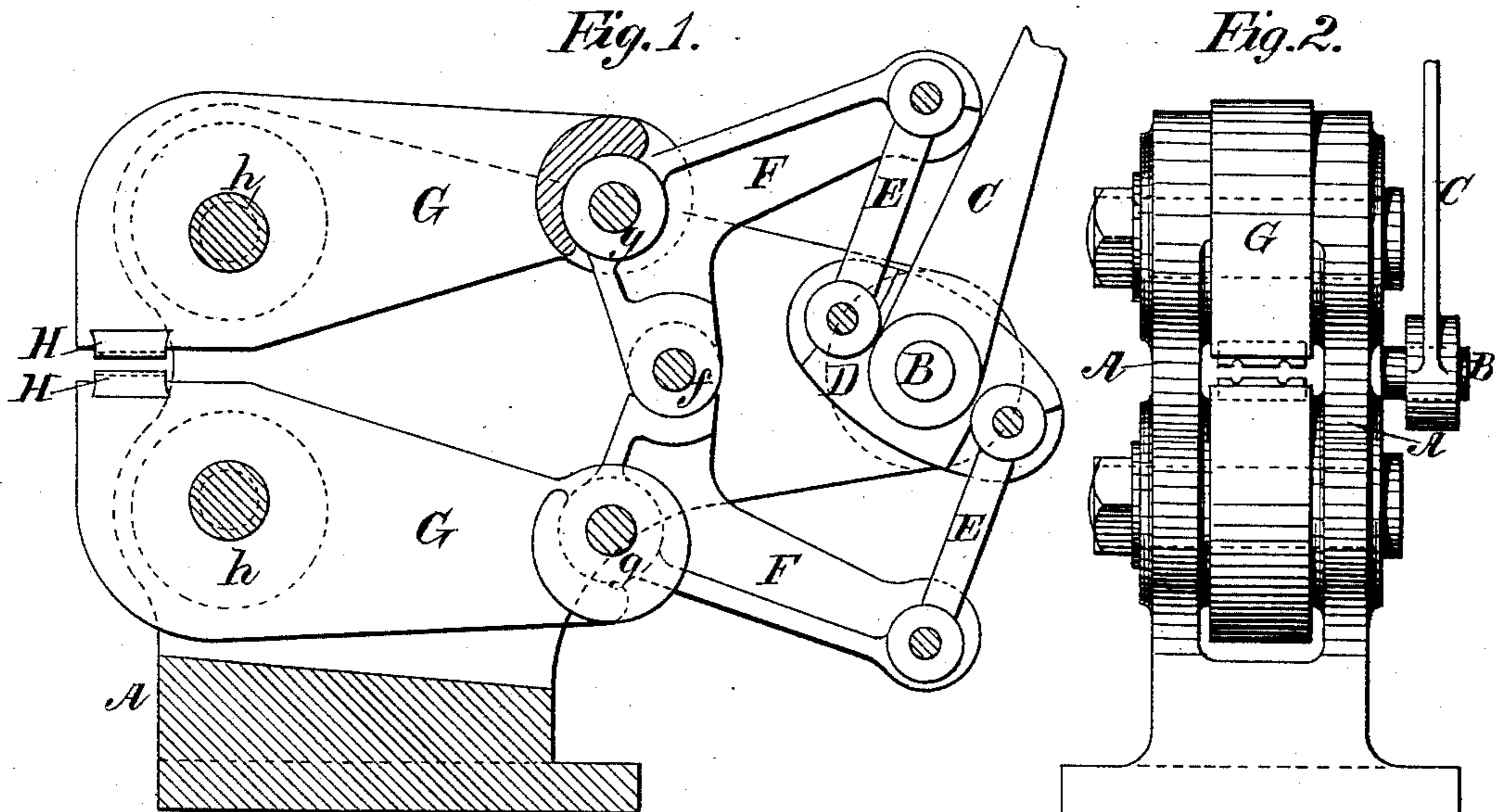
(No Model.)

W. B. & M. H. RICE.

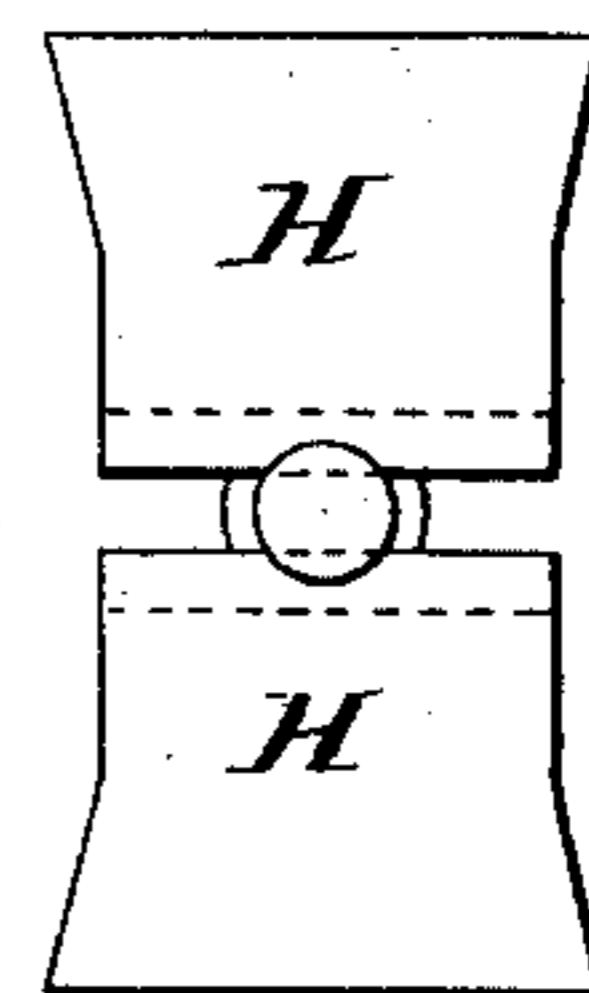
SWAGING MACHINE.

No. 328,143.

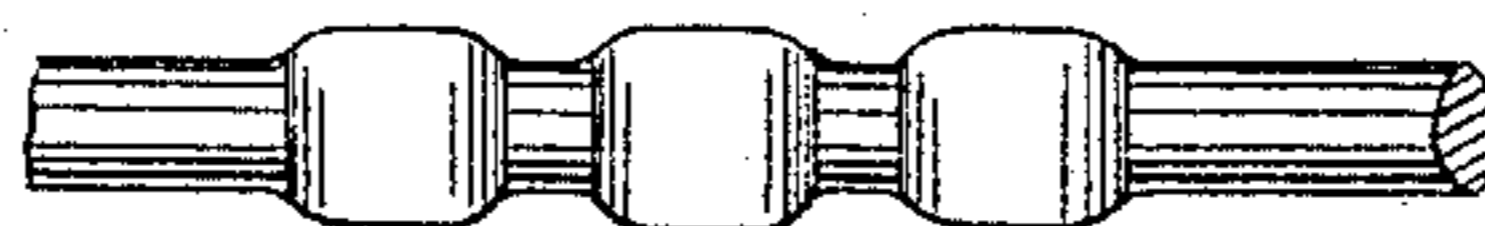
Patented Oct. 13, 1885.



*Fig. 5*



*Fig. 6.*



WITNESS:

Edw. F. Tontellotte.

Harry Suydam

INVENTORS:

W. Billings Rice,  
BY Merrick Rice.

Harold A. Rice,  
ATTORNEY

# UNITED STATES PATENT OFFICE.

W. BILLINGS RICE AND MERRIT H. RICE, OF NEW YORK, N. Y., ASSIGNORS  
OF ONE-HALF TO WILLIAM D. CAMERON, OF SAME PLACE.

## SWAGING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 323,143, dated October 13, 1885.

Application filed March 17, 1885. Serial No. 159,163. (No model.)

*To all whom it may concern:*

Be it known that we, W. BILLINGS RICE and MERRIT H. RICE, both of the city of New York, in the county and State of New York, have invented certain new and useful Improvements in Compound-Lever Mechanism, of which the following is such a full, clear, concise, and exact description, as will enable others skilled in the art to which our invention appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

Owing to the want of suitable mechanism for operating machinery the swaging of wire, rods, and other forms of metal has heretofore been done mainly by hammering the material into the required form or shape. This method is of course slow and expensive. Large forms have been shaped or swaged in dies; but the machinery by which such shaping or swaging has been done has usually been cumbersome and expensive, beside which there has been difficulty in getting the requisite pressure for doing the work.

The principal object of our invention is to construct mechanism adapted to be used for operating the dies or forms of a swaging or other machine requiring a like pressure and to produce a completed machine for the purpose of swaging wire, rods, and other forms of material capable of being similarly operated upon, and which will serve as a practical illustration of the use of the mechanism which we have devised for the purpose of operating the same and other machines requiring a similar pressure movement; and our invention consists, primarily, in the production of a compound-lever mechanism adapted to operate the dies or forms of a swaging or other machine; and, secondarily, in the construction of a machine capable of being used to swage wire, rods, or other like forms of any material which will admit of a similar operation being performed upon it.

In the drawings, Figure 1 is a side view, partly in section, of a machine for swaging wire, &c., showing the arrangement of the lever mechanism for operating the same. Fig. 2 is a front view of such machine, and Fig. 3

is a plan or top view thereof. Fig. 4 is a front view of the dies or jaws of the machine, showing also a rod or wire gripped between them, as well as one form of the die or faces of the jaws, and one form into which the metal may be swaged. Fig. 5 is a side view of the jaws detached from the machine, and Fig. 6 represents a piece of wire or rod after it has been operated upon and is taken out of the machine.

In the drawings, A A represent different portions of the frame of the machine, which frame may be made of iron, steel, or any material which will stand the strain to which the different parts are subjected. A shaft, B, may be made to pass through one end of the frame, and to this shaft a lever, C, may be attached or secured, which lever, when so attached, may be made to serve the purpose of setting the mechanism in motion, and thus furnish the power by which the work may be performed.

To the shaft B a lever, D, having two arms may be secured or fulcrumed, preferably at its center, which may be done either by having the shaft B pass through the lever D or in any other desired manner. In securing this lever to the shaft care should be taken to see that the arms are secured at such an angle as will permit of their connection and adjustment with relation to the remaining lever attachment.

The arms of the lever D may be adjustably connected to one of the arms of each of two L-shaped or elbow-levers, F F, which may be done by means of the intermediary arms E E. The arms of the elbow-levers, with which the arms of the lever D are connected, are preferably made longer than the other arm of each such lever. The remaining or shorter arms of these elbow-levers are preferably joined or connected together by a knee or toggle joint, f. If such joining of these arms be made, then and in that case the angles or elbows of the levers F F may respectively be connected with the working parts or with one of the arms of two working-levers G G, as at g g; but instead of having the shorter arms of the elbow-levers F F connected together by a

knee or toggle joint, such arms may be connected to the working parts or levers G G, and the elbows of the levers F F may in such case be united together by a knee or toggle joint. Such change while reversing the position of the elbow-levers from that shown in the drawings, so far as respects their connection with each other and with the working parts or levers, would nevertheless be equally effective and perhaps not less desirable. It will be found advantageous to make the knee or toggle joint *f* tongued and grooved and with cylindrically convex and concave bearings, inasmuch as this would save the pivot from too great strain and wear; but this joint can be made in any desired manner and either single or double. The angle of the elbow-levers may be either a right, acute, or obtuse angle, as desired.

The working parts or levers G G may be fulcrumed or secured to the frame, as at *h h*; but it may be desirable to have that portion of the frame to which such levers or parts are fulcrumed or secured provided with steel heads to take the strain. The working parts or levers G G may be set at such distance apart as is required by the work to be done on the machine. The distance apart at which they should be set would of course have to be determined by the size of the wire, rod, or other object to be swaged or operated upon, and by the size of the forms or dies, if removable, which are intended to be used in connection with the working parts or levers. The working-levers G G may be made to terminate in jaws H H, which can easily be adapted to the swaging of rods, wire, &c., by being faced with case-hardened iron or steel, which faces may be so constructed as to leave spaces between the swaging-surfaces at right angles or otherwise to the line of passage of the material or object to be swaged. In Fig. 4 the swaging-surfaces are shown as being at right angles to the passage of the material, and this figure represents a form adapted to the swaging of wire, rod, &c., into the shape shown in Fig. 6. The working parts may, however, be constructed so that removable dies or forms can be used in the machine, and it would thus be adapted to the production of such different shapes as might be required.

The mechanism can be set in motion by actuating the hand-lever C, or this lever may be dispensed with, and any attachment adapted to connect with power and produce the proper motion may be substituted, in which case the whole system of levers may be operated by power instead of by hand, and this would of course be desirable if not necessary in the use of very large machines. The operation of the mechanism will be readily understood from the drawings; but it may be stated that the movement of the shaft B, upon which the lever D is fulcrumed, gives action to such lever, which in turn imparts motion to the

remaining levers connected with the working parts or levers which operate the jaws, dies, or forms made to come in contact with the material to be swaged or operated upon. The pressure is thus made to come upon the working-levers which operate simultaneously upon the material from opposite sides, and the pressure is of course much greater than where one side only receives the stroke or active force.

The lever mechanism may of course be used to operate machines for doing various kinds of work requiring great pressure, and the construction of the working parts or mechanism, as well as that of the dies or forms, may be varied according to the purpose for which the machine is intended to be used. The swaging or other work to be done upon large objects may be done by the employment of the lever mechanism in connection with such working parts, jaws, dies, or forms as may be requisite to the desired operation.

As an illustration of the power or pressure which can be exerted by our system or arrangement of levers, it may be remarked that in the use of a small wire-swaging machine—such as that shown in the drawings—a pressure of several tons can be applied upon the wire by simply moving the lever C by hand, and this without requiring any great strain or exertion on the part of the operator.

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

1. Compound-lever mechanism, consisting of a lever adapted to be fulcrumed upon a shaft and having two arms respectively adjustably connected with one of the arms of each of two elbow-levers, the other arms of the respective elbow-levers being united by a knee or toggle joint, and the respective elbows thereof being adapted to be connected with mechanism or working parts to be operated by such compound-lever mechanism, substantially as described.

2. Compound-lever mechanism, consisting of a lever adapted to be fulcrumed upon a shaft and having two arms respectively adjustably connected with one of the arms of each of two elbow-levers which have their elbows united by a knee or toggle joint, the other arms of such elbow-lever being adapted to be respectively connected with mechanism or working parts to be operated by such compound-lever mechanism, substantially as described.

3. In a swaging-machine, two levers or parts, one end of each of which forms or presents a jaw upon or connected with the face of each of which jaws is a form or die, said levers being set in such position as that the jaws will face each other, and being respectively connected with the compound-lever mechanism above herein claimed, whereby the forms or dies may be simultaneously operated

and pressure exerted upon opposite sides of the material to be swaged or operated upon, substantially as described.

5 4. In a swaging-machine, the combination of the hand-lever C with the shaft B, having the lever D secured thereto, which lever is made to communicate by a series of lever-connections with the working parts or levers

G G, made to actuate the dies or forms, whereby such dies may be operated by moving the lever C, substantially as described.

W. BILLINGS RICE.  
MERRIT H. RICE.

Witnesses:

W. D. CAMERON,  
HUBERT A. BANNING.