

(No Model.)

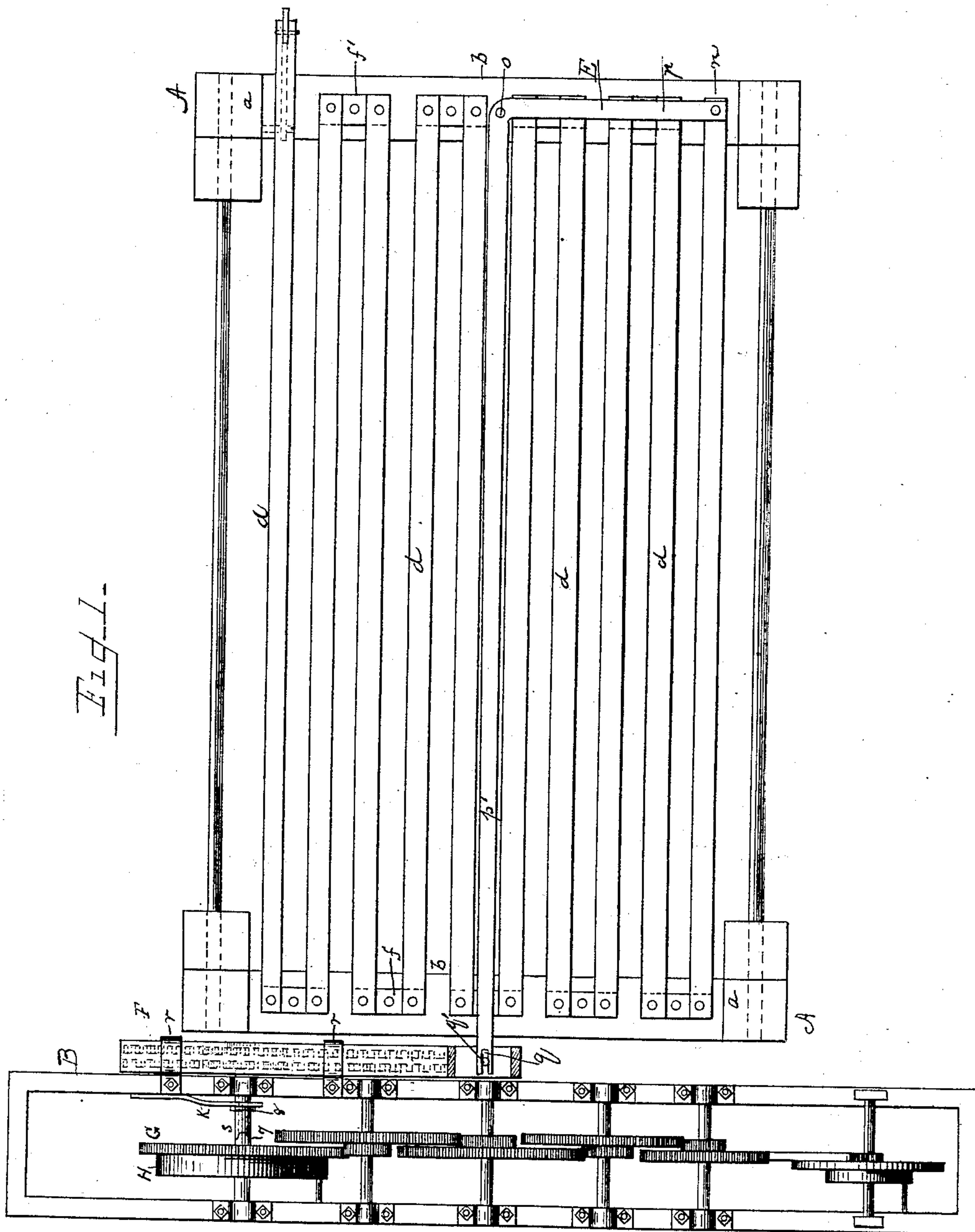
3 Sheets—Sheet 1.

F. E. HAINLEY.

APPARATUS FOR UTILIZING THE EXPANSIVE AND CONTRACTIVE POWER
OF METALS.

No. 348,841

Patented Sept. 7, 1886.



Witnesses—

G. A. Traubschmidt
Frank W. Pickell

Inventor—

Franklin E. Hainley
by *R. K. Evans*
att'y.

(No Model.)

3 Sheets—Sheet 2.

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Fig. 2.

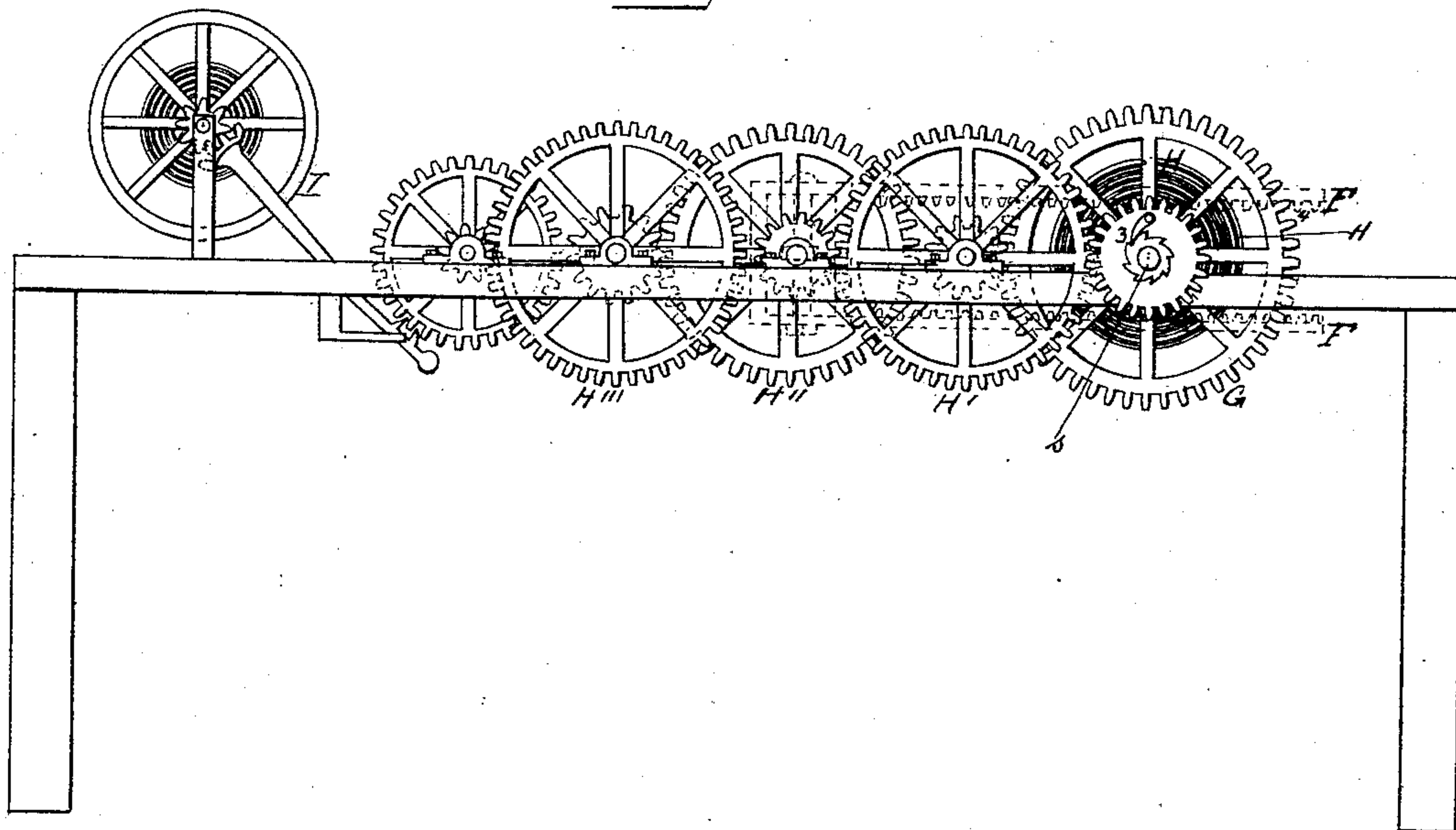


Fig. 3.

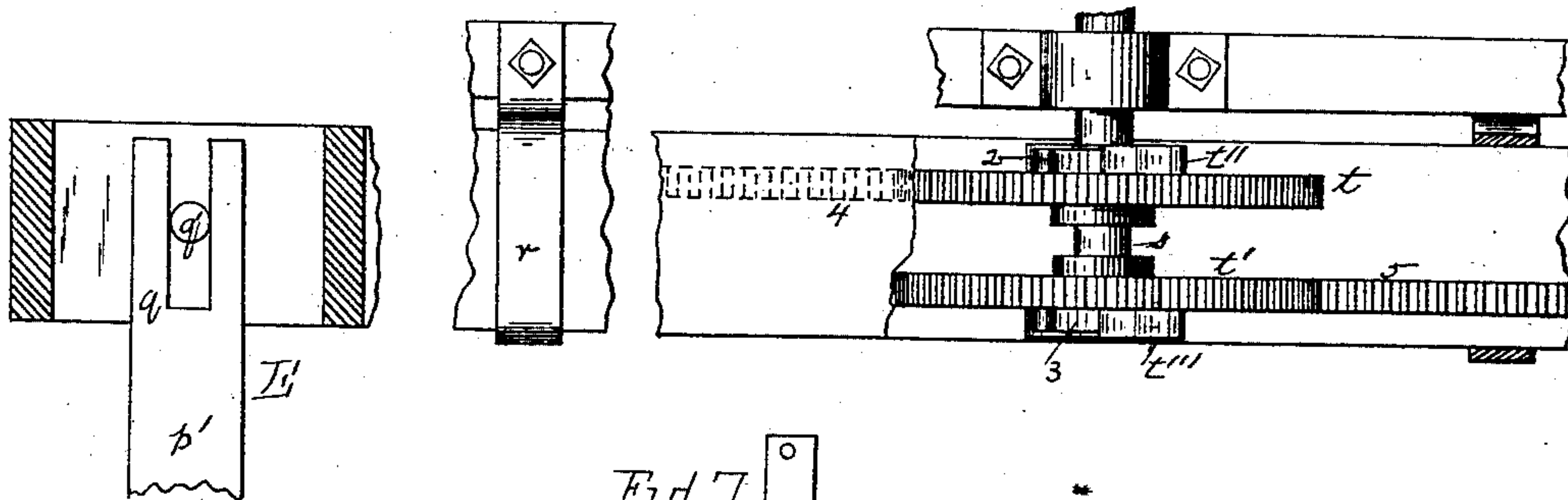
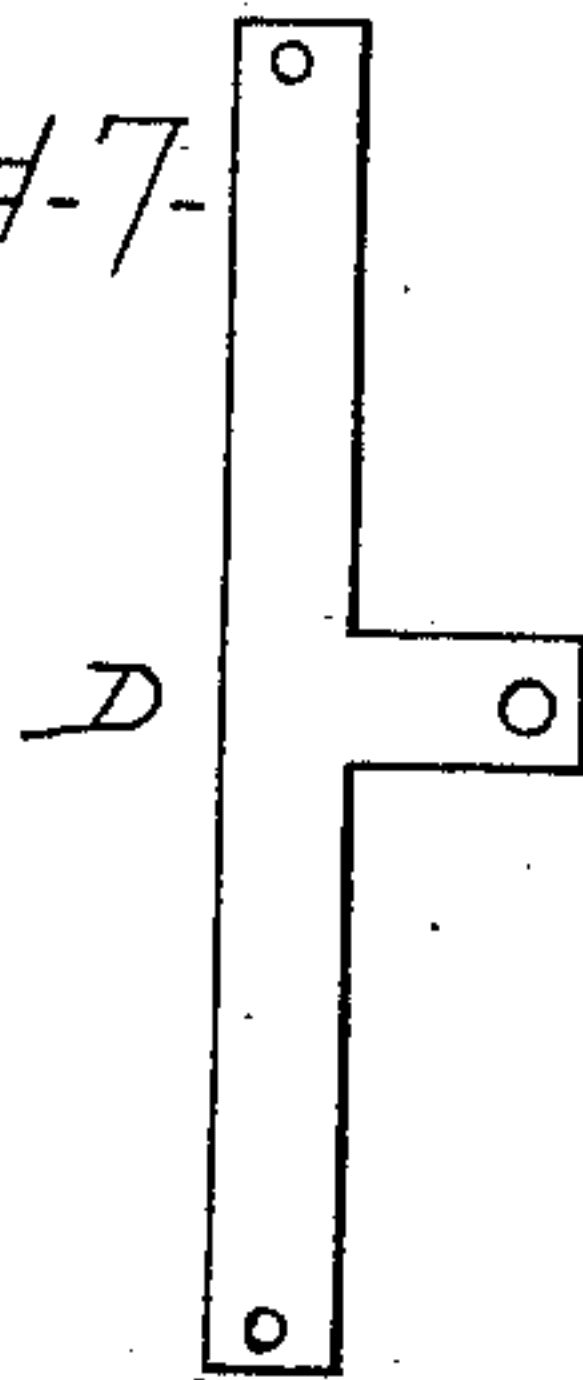


Fig. 7.



Witnesses.

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(No Model.)

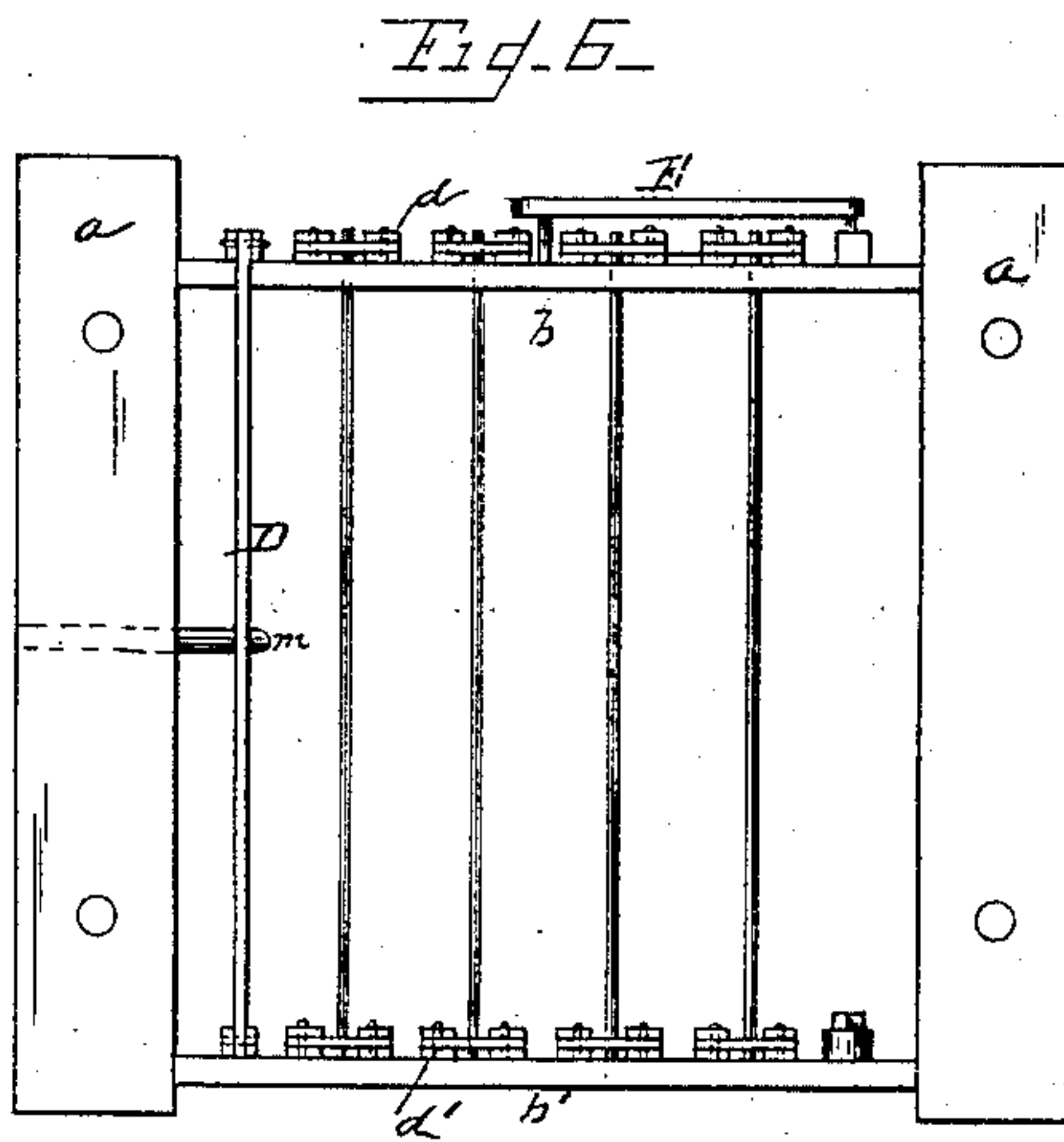
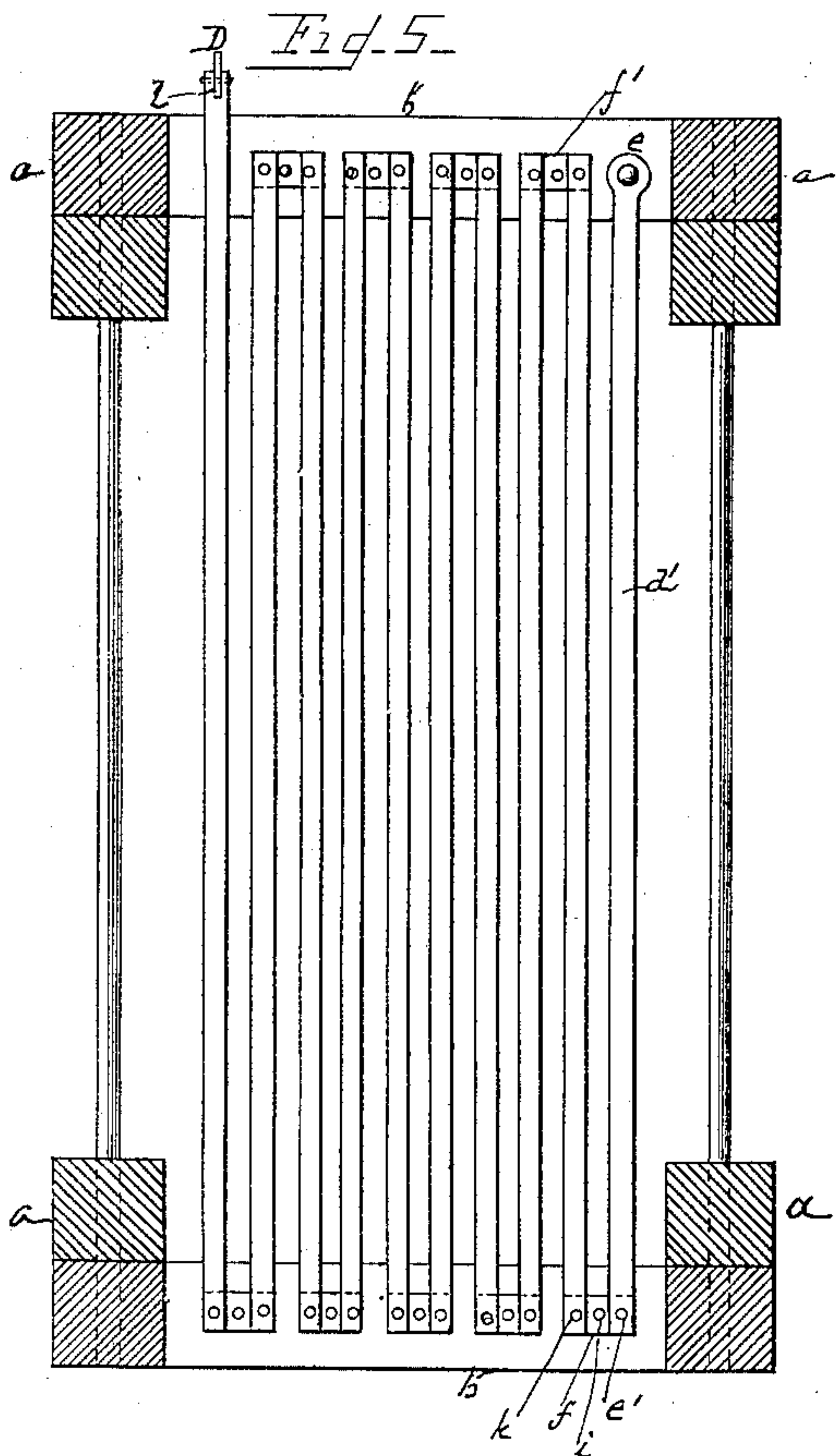
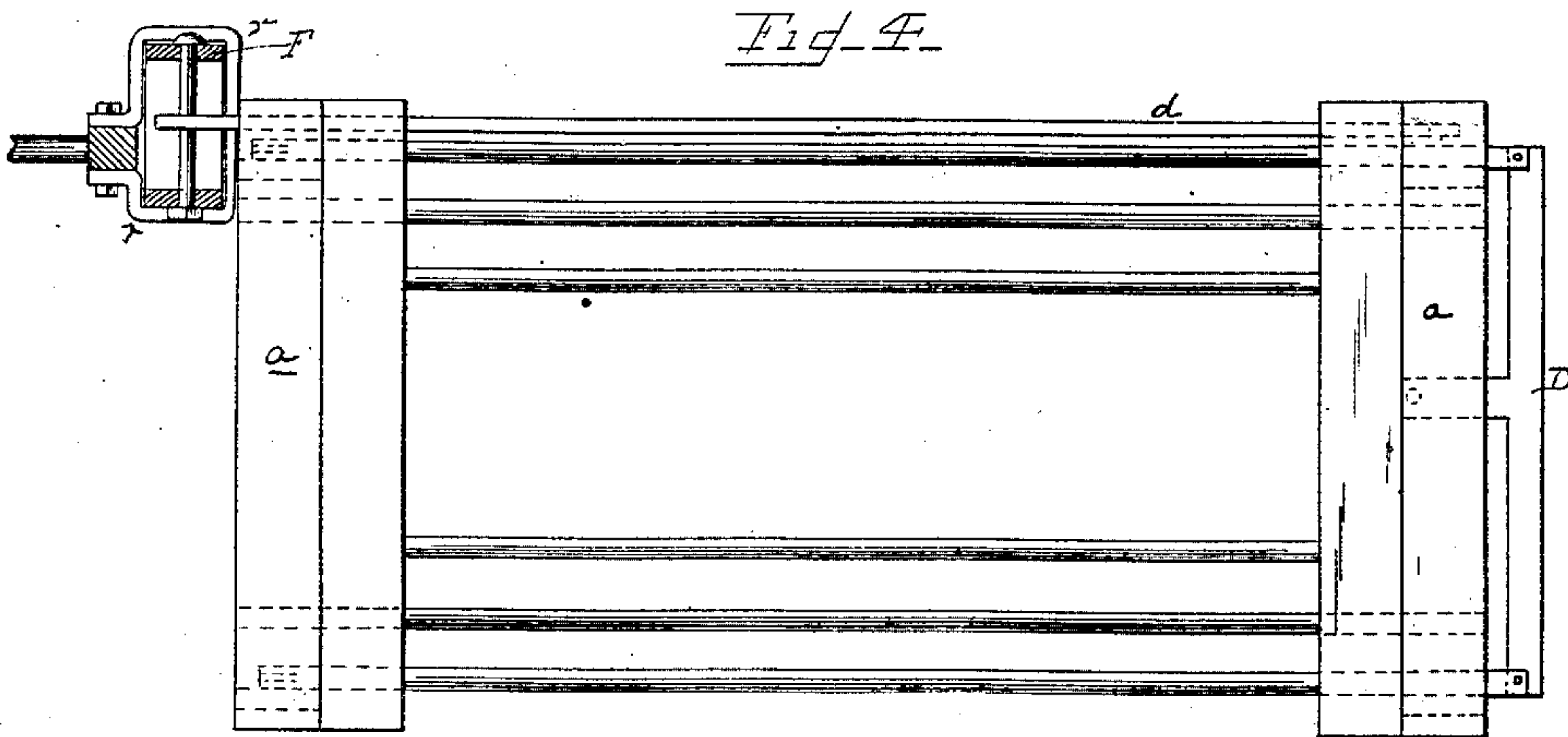
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Franklin E. Hainley
by R. K. Evans
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UNITED STATES PATENT OFFICE.

FRANKLIN E. HAINLEY, OF MARTINSVILLE, ILLINOIS, ASSIGNOR OF ONE-
FOURTH TO WILLIAM G. DELASHMUTT, OF SAME PLACE.

APPARATUS FOR UTILIZING THE EXPANSIVE AND CONTRACTIVE POWER OF METALS.

SPECIFICATION forming part of Letters Patent No. 348,841, dated September 7, 1886.

Application filed February 18, 1886. Serial No. 192,473. (No model.)

To all whom it may concern:

Be it known that I, FRANKLIN E. HAINLEY, of Martinsville, in the county of Clark and State of Illinois, have invented a new and Improved Apparatus Whereby the Power Exerted by the Expansion and Contraction of Metals may be Stored and Utilized; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a general plan of the apparatus, showing the means of connecting the power-generator with the storing device. Fig. 2 is a side elevation of the storing device. Fig. 3 is a plan view of the devices immediately connecting the power-generator with the storing device, the parts being on an enlarged scale. Fig. 4 is a side elevation of the power-generator. Fig. 5 is a plan view of the same, the supporting-timbers being in section. Fig. 6 is an end elevation of the same. Fig. 7 is a detail, to be referred to.

My invention relates to the utilization of the power generated by the expansion and contraction of metals due to a change in temperature; and it consists in the combination and arrangement of mechanical devices, as hereinafter fully set out, and specifically pointed out in the claim.

In order that those skilled in the art may make and use my invention, I will proceed to describe the exact manner in which I have carried it out.

In the said drawings, A is a frame-work supporting the power-generator, and B is a frame-work supporting the storing device. These frames are secured so as to rigidly maintain a fixed relation to each other.

The frame A consists of uprights *a a*, held in position at the sides by bars of steel and brass, having thrusts in opposite directions, so that the expansion of the brass in one direction compensates for the expansion of the steel in the opposite direction, and the frame never elongates by change of temperature, but maintains a normal dimension. Sustained by the uprights *a a*, at each end, are two cross-bars, *b b*, lying in the same plane, near the top of the frame, and in a lower plane are secured

two additional cross-bars, *b' b'*. The cross-bars *b* and *b'* sustain a series of metal bars, *d d'*, laid in two parallel series, and each individual bar forming a factor in the length of the expanding and contracting medium. The first one of the lower series of bars is rigidly secured to one of the lower cross-bars, *b'*, at *e*, at its extreme end, while its opposite end is pivoted at *e'* in one end of a short lever, *f*, pivoted at *i* to the opposite lower cross-bar *b'*. The next bar, *d'*, of the series is pivoted to the end *k* of the short lever *f*, and its opposite end pivoted to one end of a short pivoted lever, *f'*, on the same cross-bar to which the initial rod had its end rigidly secured, and so on across the frame are the bars *d'* arranged, each end pivoted, as shown, to one of the ends of the short levers *f f'*, until in the number shown the tenth bar is provided in its free end with a slot, *l*, to receive the end of a vertically-arranged rocking lever, D, which has its fulcrum on a pivot, *m*, formed by a transverse bar set in the uprights. The upper end of lever D rises to a line with the upper tier or series of metal bars, *d*, and enters a slot in the end of the outside bar, where it is pivoted. The upper tier or series of bars are arranged in a manner similar to the lower series, their ends being coupled by means of short pivoted levers *f f'*, and proceeding in reverse order across the frame the final bar *d* is left with a free end, *n*. This free end *n* is pivoted in the end of a bent lever, E, which has a pivotal fulcrum at *o*, at any convenient point on the frame-work, so that the movement to and fro of the short arm *p* will be communicated to and enhanced in a long arm, *p'*, of the bent lever. The end of the long arm *p'* of the lever E is bifurcated or slotted at its end, as seen at *q*, to receive a pin, *q'*, by which said lever engages the end of a double rack-bar, F, mounted in ways *r r* on the storing-device frame B, for a purpose hereinafter set out.

Mounted in the frame B is a shaft, *s*, on which is mounted a cogged wheel, G, and a spring-barrel and spring, H, after the usual manner of a train of clock-work gearing. Also mounted on the shaft *s* are two loose pinions, *t t'*, held in place by proper collars, and fixed to shaft *s*. Against each pinion *t t'* is a small pin-

ion, t'' t''' . Each pinion t' is provided with a pivoted gravity-pawl, 2 3, so arranged as to rake in opposite directions and lock the pinions t'' together when they move in one direction of rotation, but allowing a separate rotation of pinion t loosely on the shaft s when the rotation is in an opposite direction, the same function being performed by pinions t' and t''' .

10 The sliding or reciprocating rack-bar F, secured to the long arm p' of lever E, is provided with two sets of teeth, 4 5, arranged in different vertical planes. The teeth 4 project downwardly, and intermesh with the teeth on the tops of pinion t , while the teeth 5 project upwardly and mesh with the teeth of pinion t' .

15 Connected up with the cogged wheel G, which receives its impulse from the energy stored up in the spring, is a train of gearing, $H' H'' H'''$, provided with any desired escapement device, I, through which the power is applied to any desired purpose.

20 To prevent overwinding of the spring H, I provide a yielding clutch in the shaft s in the following manner: The said shaft is divided by a telescopic joint, 7, and the abutting faces are made in curved or wavy lines, which, in their normal condition, will interlock, being held together by the thrust of a flat spring, K, bearing against a collar, 8, on the short section of the shaft. When the spring is fully wound, any further power applied by the power-generator will cause the thrust of the curved or wavy meeting surfaces of the sections of shaft s to force back spring K so the short section of the shaft can turn independently.

35 I have shown the pivots of the short levers $f f'$ formed by the ends of continuous bars hav-

ing their ends projecting through the cross-bars $b b'$; but any other form or construction of these pivotal fulcrums may be used without departing from the spirit of my invention. 40

The normal changes of temperature will so elongate and contract the linear dimension of the combined rods or bars $d d'$, as to move 45 back and forth, with great power, the long arm p' of the bent lever E. The movement of arm p' reciprocates the double rack-bar F, and as this bar moves one way it turns pinion t , and it being locked by pawl 2 to the ratchet-pin 50 pinion t'' , turns the shaft s and winds up spring H; meantime, pinion t' turning loosely on shaft s , as pawl 3, does not engage to resist against the teeth of pawl-pinion t''' . As a change of temperature takes place the rack-bar is moved 55 in an opposite direction, and this time the pinion t' is locked to the shaft s by pawl 3, and the shaft s is still turned so as to wind up spring H, the pinion t turning loosely on the shaft.

Having thus described my invention, what 60 I claim as new, and desire to secure by Letters Patent, is—

The upper series of metal bars and lower series of metal bars, arranged in a frame, and each series coupled together by pivoted levers 65 $f f'$, in combination with the vertical connecting-lever D, bifurcated lever E, pin q' , sliding double rack-bar F, cogs $t t'$, ratchet-pinions $t'' t'''$, pawls 2 3, shaft s , spring H, and train of gear, all constructed, arranged, and operated 70 as and for the purpose set forth.

FRANKLIN E. HAINLEY.

Witnesses:

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ALEX. LINDSEY.