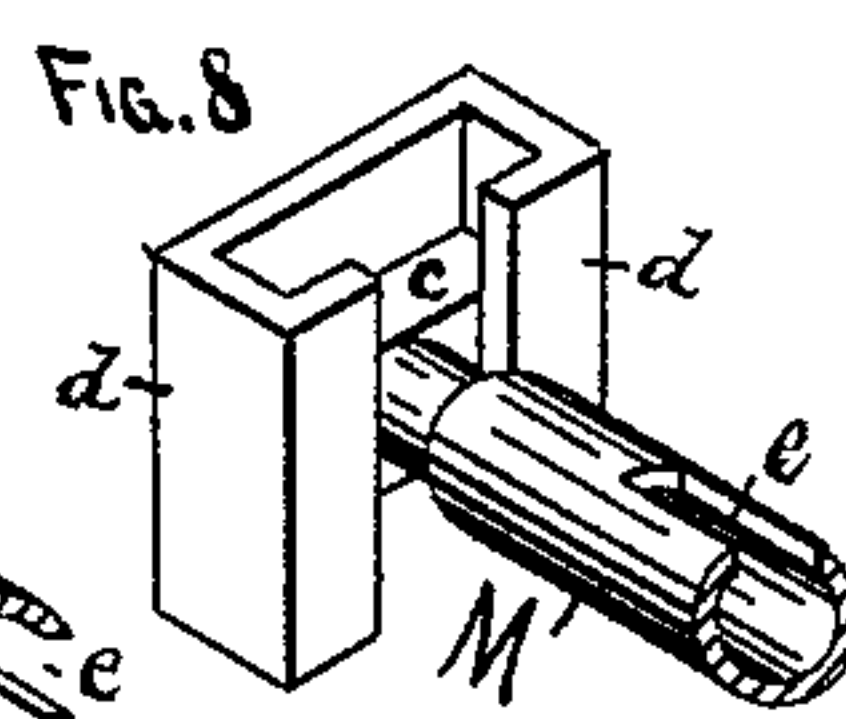
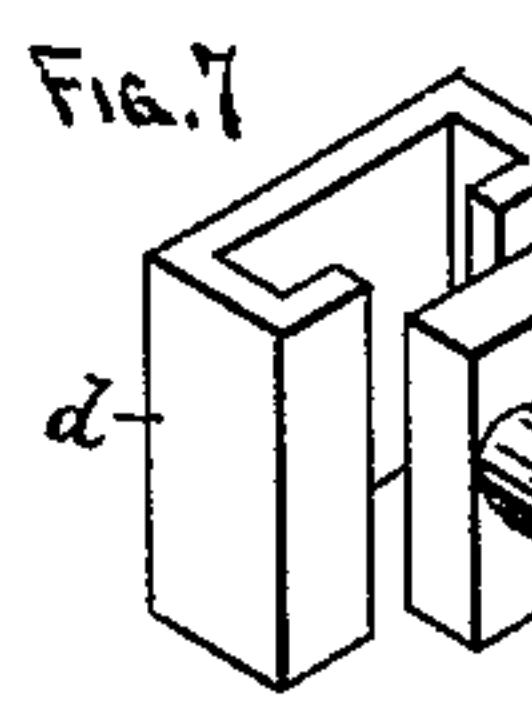
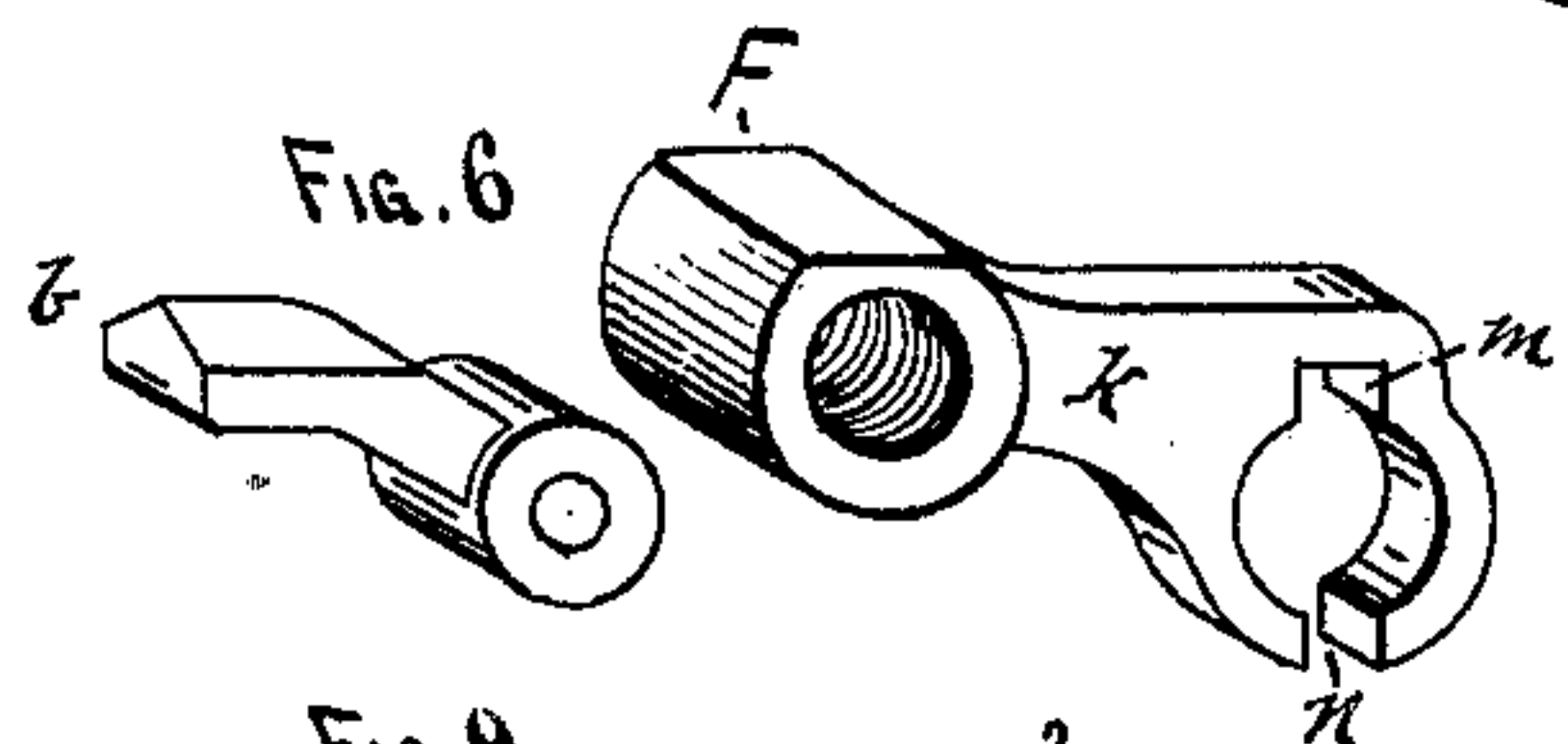
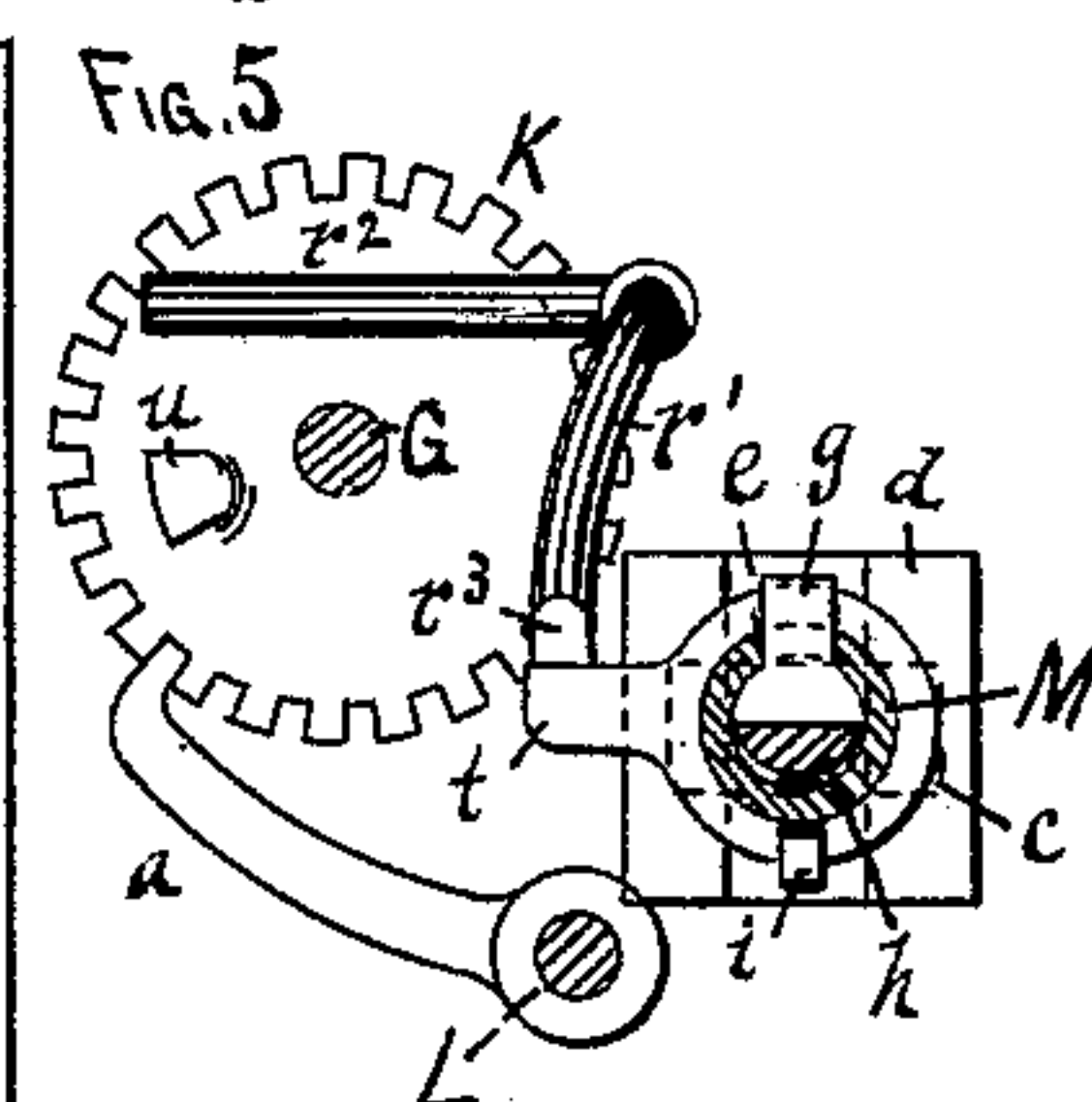
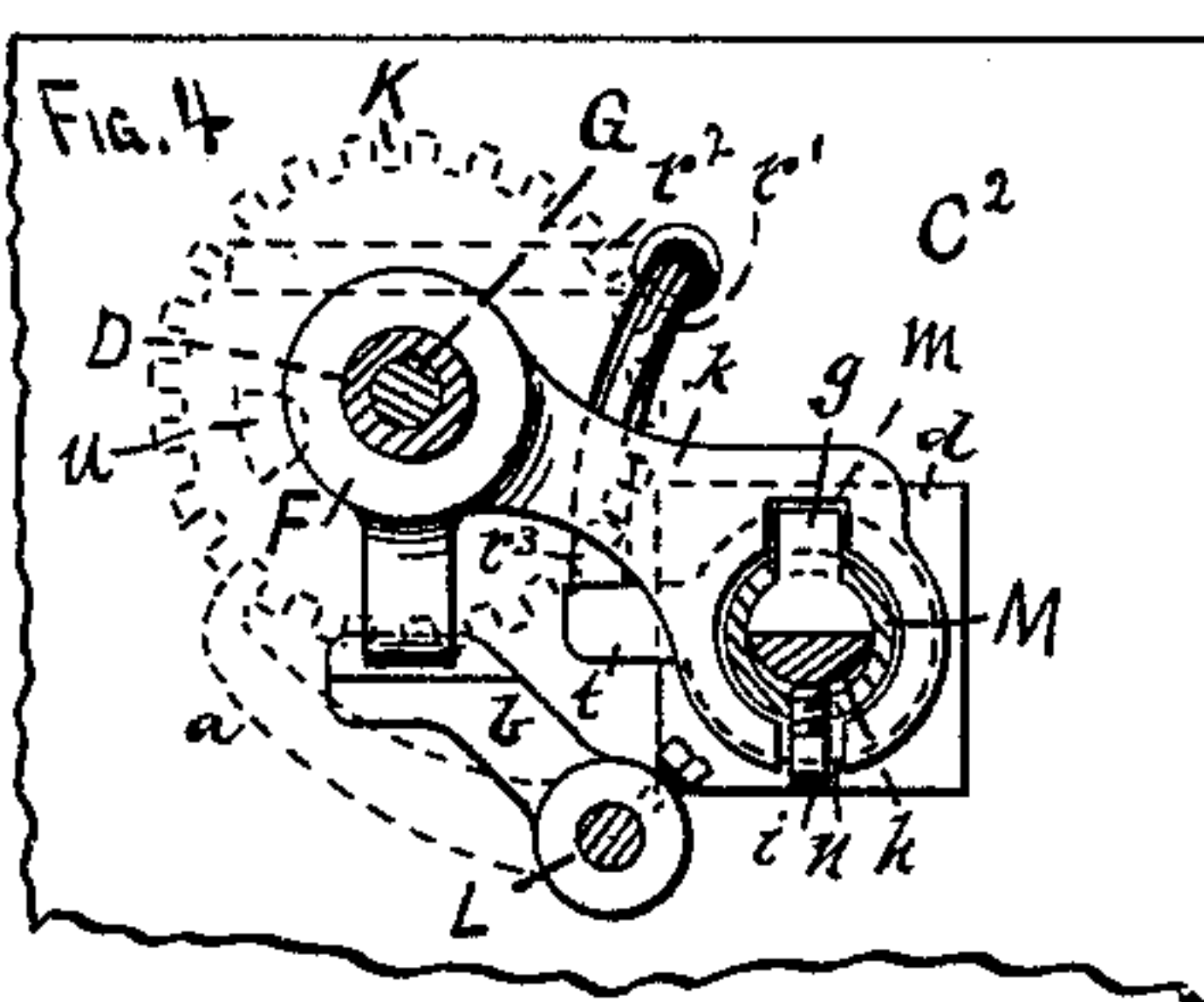
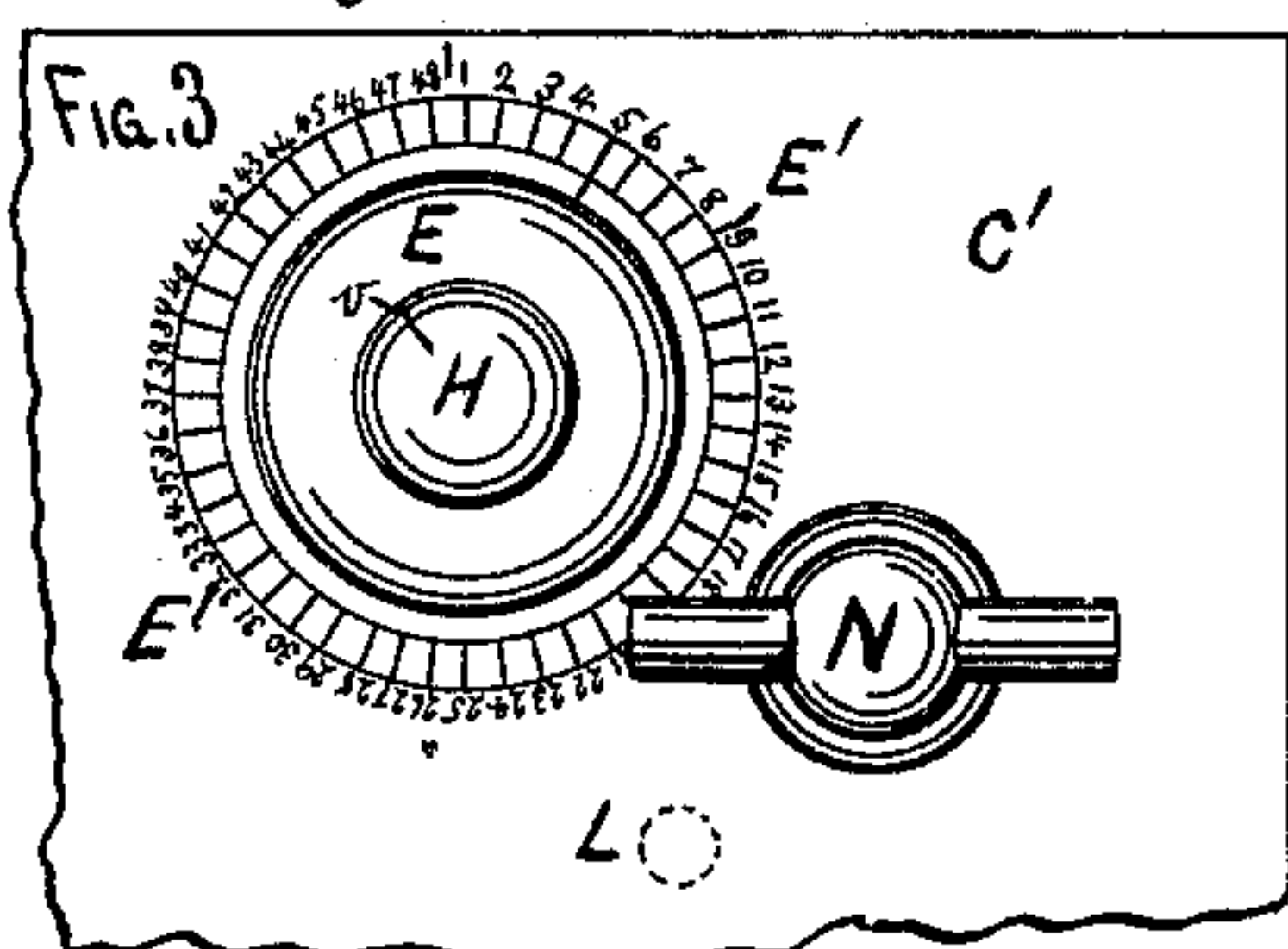
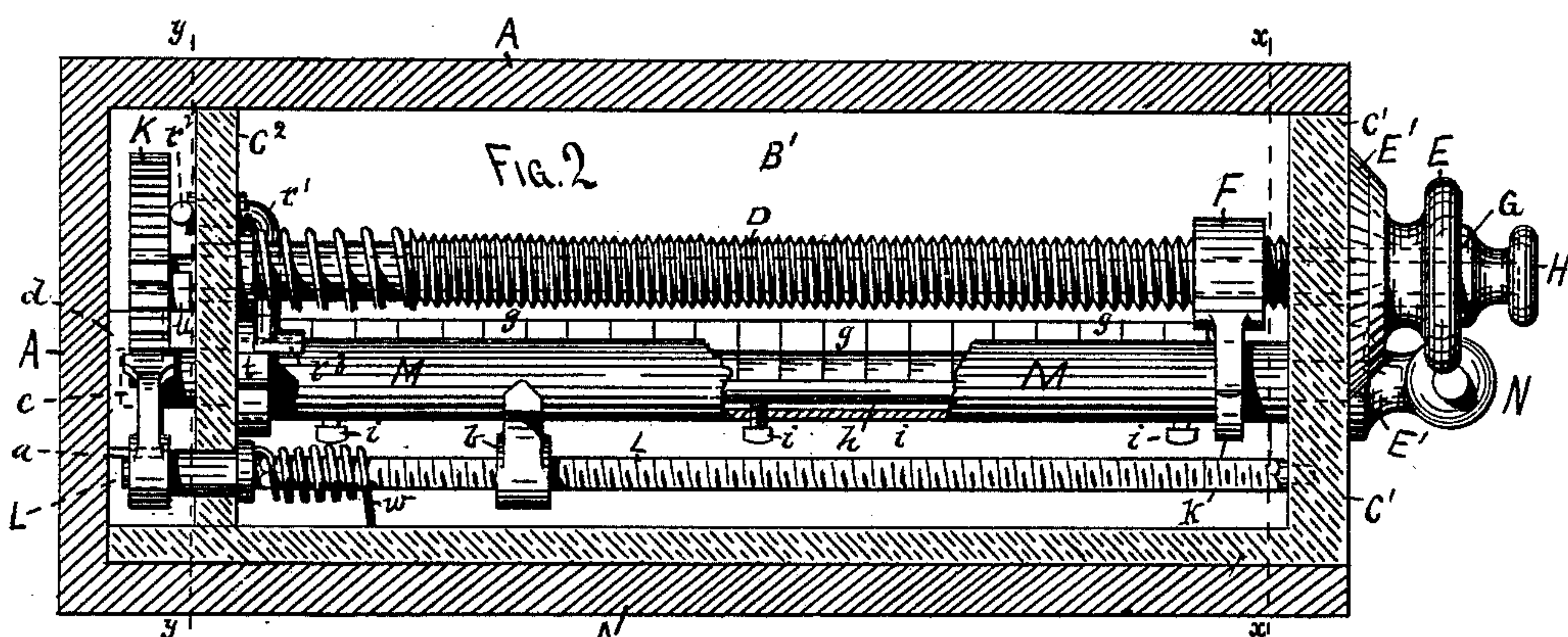
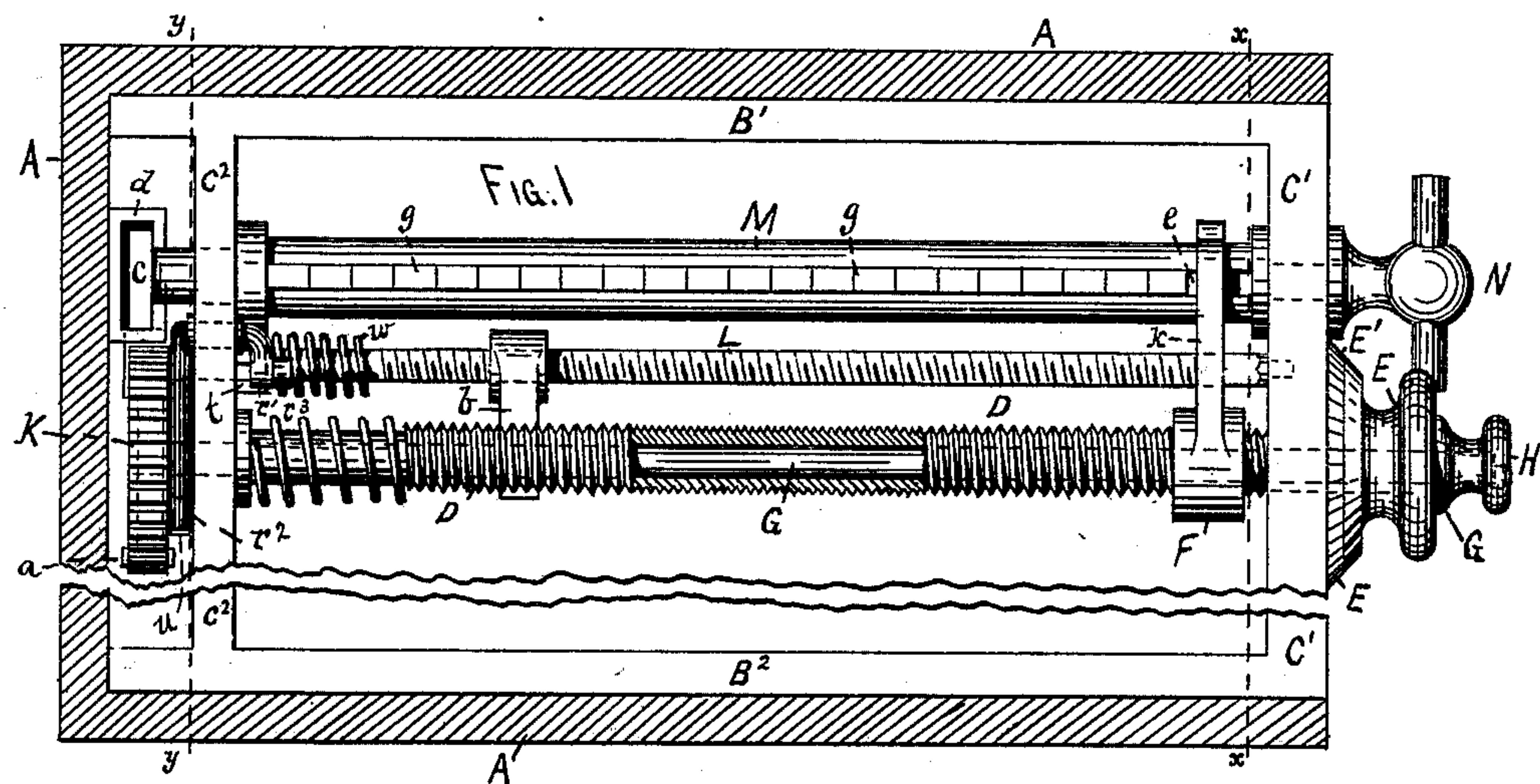


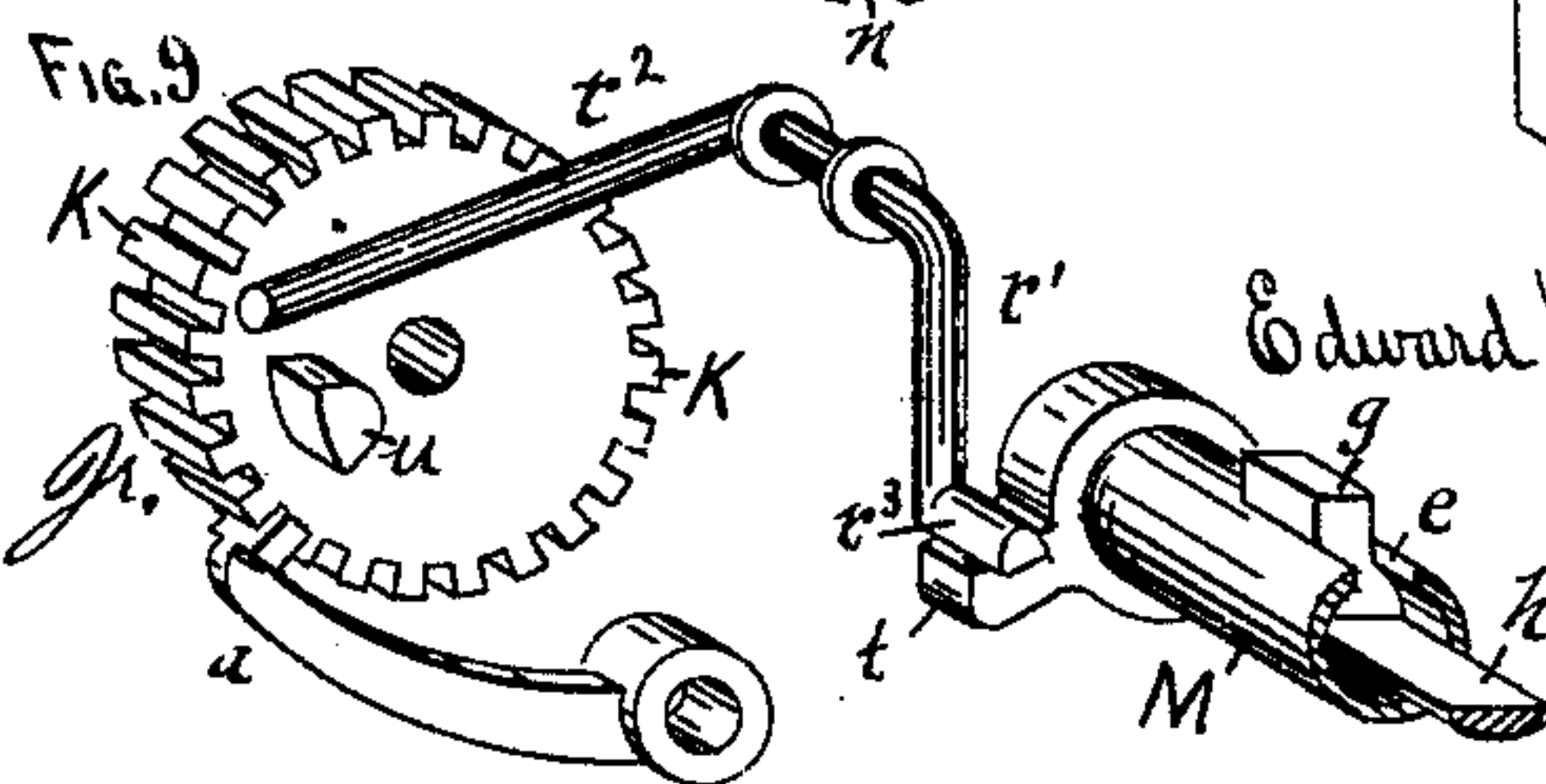
E. HERBERT & O. T. DOUGHERTY.
Permutation Lock.

No. 231,166.

Patented Aug. 17, 1880.



WITNESSES.
J. F. Orcutt.
Louis Feser Jr.



Edward Herbert & Owen Thomas Dougherty,

INVENTORS, BY
Louis Feser
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Attys.

UNITED STATES PATENT OFFICE.

EDWARD HERBERT AND OWEN T. DOUGHERTY, OF MINNEAPOLIS, MINN.,
ASSIGNORS OF ONE-THIRD OF THEIR RIGHT TO PETER MELCHISEDECK,
OF SAME PLACE.

PERMUTATION-LOCK.

SPECIFICATION forming part of Letters Patent No. 231,166, dated August 17, 1880.

Application filed February 26, 1880.

To all whom it may concern:

Be it known that we, EDWARD HERBERT and OWEN THOMAS DOUGHERTY, both of Minneapolis, in the county of Hennepin and State of Minnesota, have invented a certain new and useful Improvement in Combination-Locks, of which the following is a specification.

Our invention relates to that class of locks known as "combination" or "computation" locks, wherein the wards and bolts are manipulated by turning knobs back and forth from the outside and without the use of keys; and it consists in a hollow screw carrying a cam back and forth by its revolution, which cam, acting upon a tripping-dog, serves to release a toothed wheel upon a shaft running through the hollow screw, this toothed wheel being arranged to act upon a tripping-latch to throw the latter off from a catch upon a holding-bolt and allow it to be revolved, and thus open the lock, as hereinafter set forth.

The invention further consists in a series of dogs or stops arranged in a slot in the holding-bolt, and adapted to be moved along back and forth and held in any desired position to alter the combination or regulate the number of turns of the screw necessary to open the lock, as hereinafter set forth.

This lock may be applied to drawers, safe and vault doors, &c.; but in the drawings hereto annexed, and which illustrate the mechanism we use to attain the above objects, the device is shown applied to a drawer.

Figure 1 is a plan view, and Fig. 2 is a sectional side elevation, of our lock arranged upon a drawer. Fig. 3 is a view of the outside of a portion of the front of the drawer, showing the arrangement of the knobs, &c. Fig. 4 is a cross-section on the line *xx* of Figs. 1 and 2. Fig. 5 is a view on the line *yy* of Figs. 1 and 2. Fig. 6 is a perspective view of the traveling cam and tripping-dog detached; Figs. 7 and 8, perspective views of the locking-bolt and its method of holding the drawer closed. Fig. 9 is a perspective view of the toothed wheel and dog and the bolt-tripping mechanism, illustrating the method of holding the bolt and showing the arrangement of the dogs within the hollow shaft.

A represents the outer casing, B' B² the sides, and C' the front, of the drawer proper. The back C² runs across the drawer a short distance from the rear end, and in this and the front C' a hollow screw, D, is journaled, being provided on the outside with a knob, E, by which it may be revolved.

The escutcheon E' of the knob E will be graduated, as shown in Figs. 1, 2, and 3, in the usual manner, to enable the combination to be arranged substantially as shown.

F is a cam provided on its interior with a screw-thread, (see Fig. 6,) and arranged to be run back and forth by the revolution of the hollow screw D, upon which it fits.

G is a shaft running through the entire length of the hollow screw D, and provided on the front end with a knob, H, outside of and close up against the knob E, while to the other end, outside the back C², is a toothed wheel, K.

L is a second shaft, journaled at one end in the front C', while the other end passes through the back C² of the drawer, and is provided with a dog or pawl, *a*, arranged with its forward point to catch into one of the teeth of the wheel K. (See Figs. 2 and 5.)

b is a small cam or trip attached to the shaft L by a set-screw, so that it may be adjusted laterally thereon and adapted to be acted upon by the cam F, whereby the shaft L is partially revolved and the dog *a* disconnected from the toothed wheel K, as hereinafter described.

M is a hollow shaft or tube journaled like the screw D and shaft L in the front C' and back C², and provided on the front end with a knob, N, outside the drawer, and on the opposite end, outside the back C², with a T-head, *c*, adapted to enter and be turned around one-half ($\frac{1}{2}$) a revolution in a socket, *d*, secured to the back of the casing A, (see Figs. 1, 7, and 8,) whereby the drawer may be locked into the casing, as hereinafter shown.

A slot, *e*, runs nearly the entire length of this hollow shaft or tube M, and is provided with small stops or studs *g*, having semicircular-shaped shoulders at their bottoms, (see Fig. 9,) which enable them to be inserted into the slot endwise, while the shoulders prevent their

removal in any other manner. The tops of the studs project upward through the slot *c*, and form, when a number of them are placed end to end, a ridge or rib along the tube, as shown in Figs. 1 and 2. A semicircular rod, *h*, is inserted between the bottoms of these studs *g* and the tube *M*, and held up against the studs by set-screws *i*, tapped through the bottom of the tube at intervals, thus holding the studs firmly in place.

The slot *c* will be longer than the row of studs *g*, so that a space may be left at either end, or between any two of the studs, to alter the combination of the lock, as hereinafter shown.

A projection, *k*, from the cam *F*, is arranged to embrace the tube *M*, as shown, being provided with a notch, *m*, at the top of the opening encircling the tube, to allow the studs *g* to pass through, and an open slot, *n*, at the bottom, to enable it to pass over the set-screws *i*. (See Figs. 4 and 6.) By this means, when the cam *F* is moved along until one of the studs *g* is inside the notch *m*, the tube *M* cannot be revolved, as hereinafter shown.

A latch or catch is journaled in the back *C*², and provided with two legs, *r*¹ *r*², at right angles to each other, one inside the back and projecting downward, while the other is outside the back and projects horizontally.

The inside leg, *r*¹, is provided with a foot, *r*³, which rests upon a lug or stop, *t*, upon the side of the tube *M*, while the outside leg, *r*², runs alongside the toothed wheel *K*. (See Fig. 9.)

A lug or pin, *u*, on the side of the toothed wheel, is adapted, by the revolution of the wheel, to lift the leg *r*¹ and throw the foot *r*³ off from the stop *t*, to allow the tube *M* to be revolved, as hereinafter set forth.

To set the lock a combination of four numbers is determined—say, for instance, 27 12 19 16. The small cam *b* is adjusted along the shaft *L* until it is underneath that part of the screw *D* which, when revolved twenty-seven (27) times to the left, will carry the cam *F* along on the screw *D* until the cam strikes the trip *b* and forces it down, and thus, as before described, releases the dog *a* from contact with the toothed wheel *K*. The knob *H* is then set so that the mark *r* upon its rim is opposite No. 12 of the escutcheon *E'*. This will bring the dog *a* in contact with tooth No. 12 of the wheel *K* and the lug *u* in such a position that when the wheel is revolved by the knob *H* until the mark *r* is opposite No. 19 of the escutcheon *E'*, the lug *u* will be in an upright position, and thus raise the latch *r*¹ *r*² and release the lug *t* on the tube *M*. The set-screws *i* are then released and the studs *g* in the tube *M* moved along endwise until a space the length of the width of the projection *k* on the cam *F* is left between the two studs that come opposite the sixteenth screw-thread from the cam *b*, either forward or backward, so that after the screw *D* has been revolved

twenty-seven times and the dog *a* released from the toothed wheel *K*, as before described, the knob *E* is revolved sixteen times more to left, if the space between the studs *g* is between the rear of the drawer and the trip *b*, and to the right if the space is between the trip and the front of the drawer. This will bring the projection *k* opposite the space between the studs and allow the tube *M* to be revolved. Being thus set to this combination—viz., 27 12 19 16—the operation of opening the lock is as follows:

The knob *E* is revolved twenty-seven times to the left, after being revolved to the right until the cam *F* is brought up against the front *C'* of the drawer. This will bring the cam *F* above and in contact with the trip *b*, throwing it down and releasing the dog *a* from the wheel *K*. This will enable the knob *H* to be revolved until its mark *r* is opposite No. 19 of the escutcheon *E'*, to bring the lug *u* upright and throw the foot *r*³ off from the stop *t* and release the tube *M*. The knob *E* is then revolved sixteen times to the right or left, according to which side of the cam *F* the space between the studs *g* occurs, the knob *H* being held by the hand with its mark *r* opposite No. 19 of the escutcheon until the cam *F* has run off from the trip *b* and the spring *w* thrown the dog *a* into contact with the nearest tooth in the wheel *K*, thus holding the foot *r*³ away from the stop *t*. When the cam *F* has thus been brought backward or forward by the sixteen revolutions of the knob *E* above mentioned the projection *k* will be opposite the space between the studs *g*, and thus the tube *M* will be free to be revolved one-half ($\frac{1}{2}$) a revolution, which will allow its head *c* to be withdrawn from the socket *d*, as shown in Fig. 7, and the drawer opened.

To summarize, the knob *E* is turned twenty-seven times to the left, the knob *H* turned from No. 12 to No. 19, the knob *E* turned sixteen times to the right or left, as the case may be, the knob *N* turned one-half a revolution, and the drawer opened, thus forming the combination 27 12 19 16.

Any desired combination may be arranged to complicate the operation.

The wheel *K* will be arranged so that it may be revolved upon its shaft and clamped at any desired point to alter the combination.

A train of gears may be inserted between the shaft *G* and the toothed wheel *K*, to increase or decrease the speed.

A portion of the screw-thread on the shaft *D*, near the rear end, is removed, as shown at *D'*, Figs. 1 and 2, and this smooth portion provided with a coiled spring, so that should the cam *F* be run backward too far it will simply run off the thread, and the shaft continue to revolve harmlessly, thus preventing the possibility of the cam becoming jammed up against the back *C*². When the shaft *D* is revolved backward again, however, the spring will force the cam up toward the threaded

portion, and thus cause it to mount the thread again.

What we claim as new is—

1. The screw-shaft D, provided with the knob E and graduated escutcheon E', and carrying the cam F, in combination with the shaft L, cam b, dog a, toothed wheel K, shaft G, and knob H, arranged and operating in the manner and for the purpose hereinbefore set forth.

2. The combination and arrangement of the shaft G, carrying the knob H, toothed wheel K, provided with pin u, latch r' r^2 r^3 , stop t, and shaft M, provided with the T-head c, substantially as set forth.

3. The combination and arrangement of the screw-shaft D, cam F, having projection k, tube M, and studs g, substantially as set forth.

4. The combination and arrangement of the cam F, having the notched and slotted projection k m n, tube M, studs g, T-head c, and socket d, substantially as set forth.

5. In combination-locks, the combination,

with the screw-shaft D, having a portion of the thread wanting at D', of the cam F and a coiled spring wound around the smooth portion of the shaft, whereby the cam F is prevented from being run or jammed against the back of the drawer and held in position to re-engage with the thread on the shaft when the latter is reversed, substantially as described.

6. The combination and arrangement of the tube M, having the slot e, of the studs g, (capable of being moved to change the combination,) held therein by the rod h and set-screws i, substantially as set forth, and for the purpose described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

EDWARD HERBERT.

OWEN THOS. DOUGHERTY.

Witnesses:

C. N. WOODWARD,
EDWARD ROTERT.