(No Model.) 2 Sheets—Sheet 1.

H. F. CRANDALL & E. J. BIRKETT.

GRAIN BINDER.

No. 582,500. Patented May 11, 1897.

Fig. 1. *Fig. 9.*

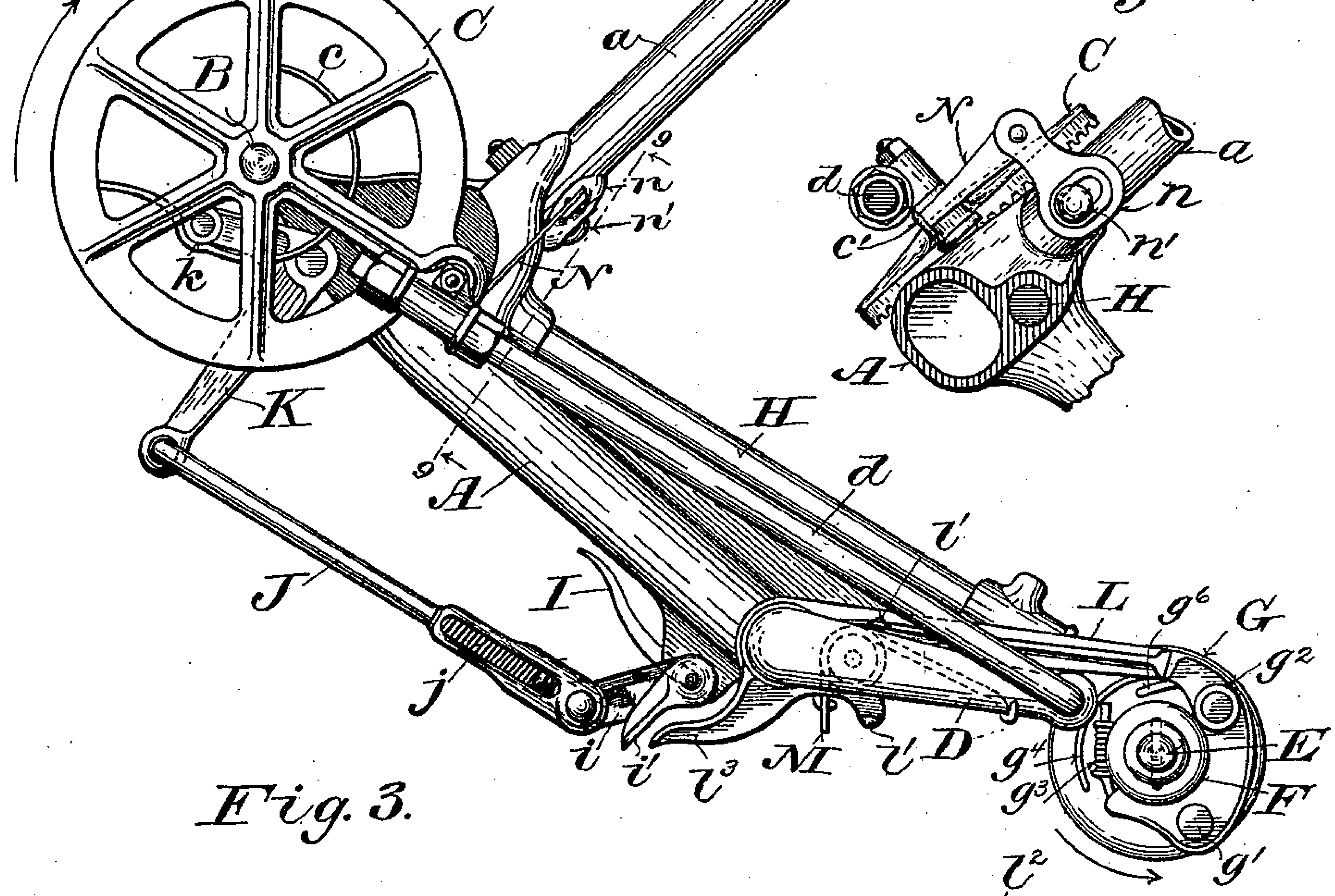


Fig. 3.

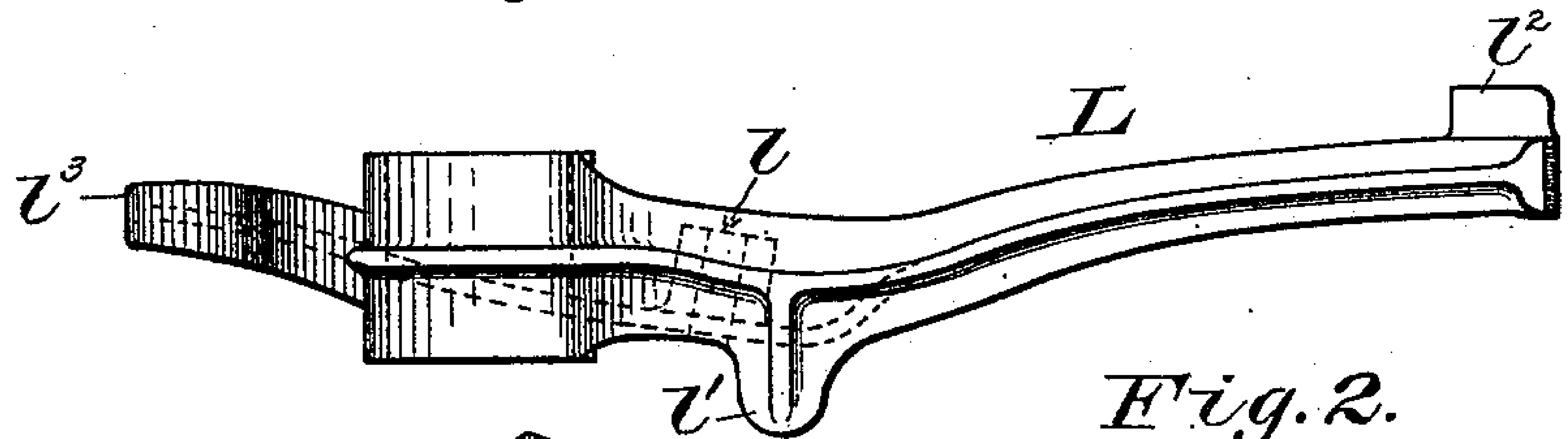
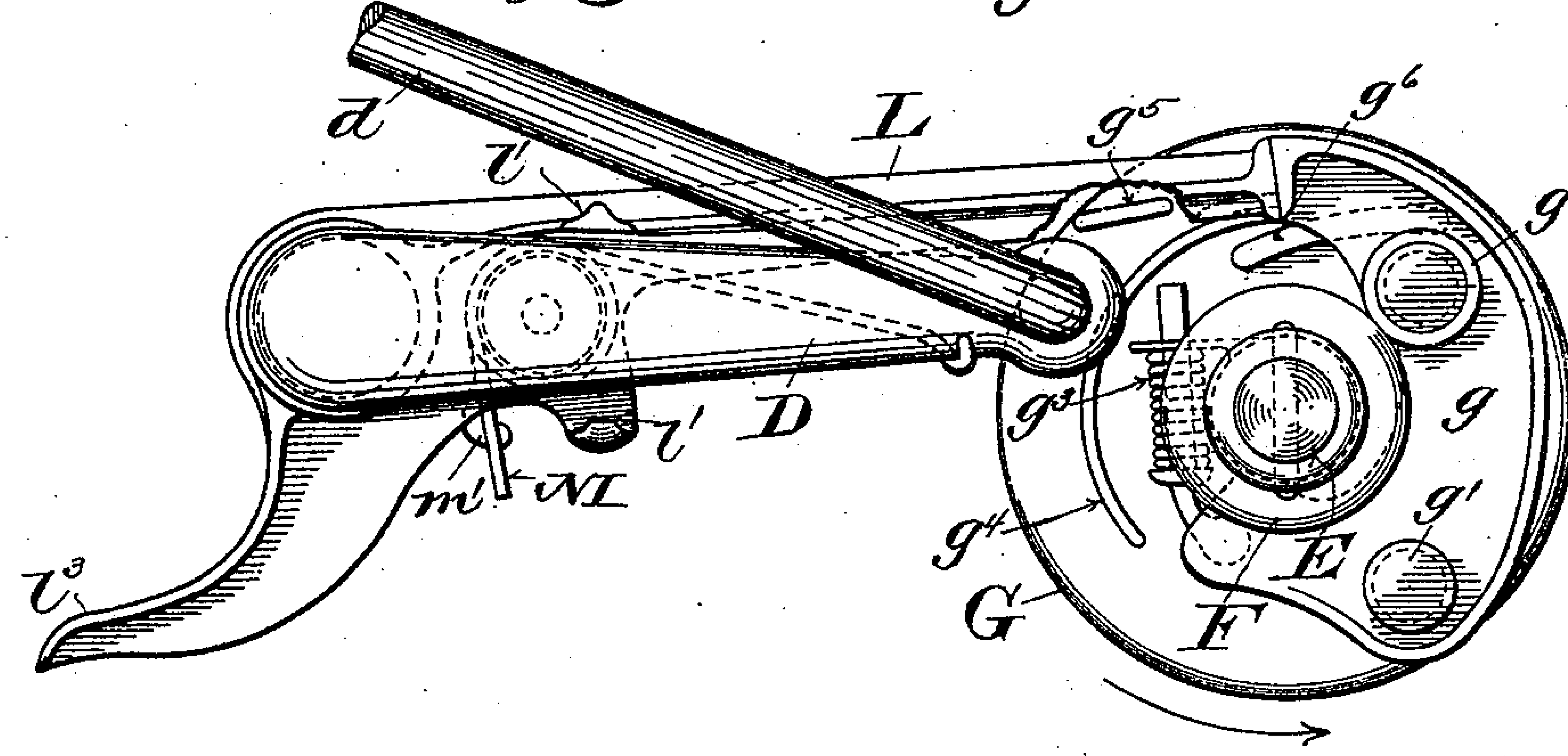


Fig. 2.



Witnesses:
Chas. L. Goss.
John H. Hurley.

Inventors:
Henry F. Crandall
Edward J. Birkett,
By Winkler Flanders Smith Bottum & Vilas
Attorneys.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

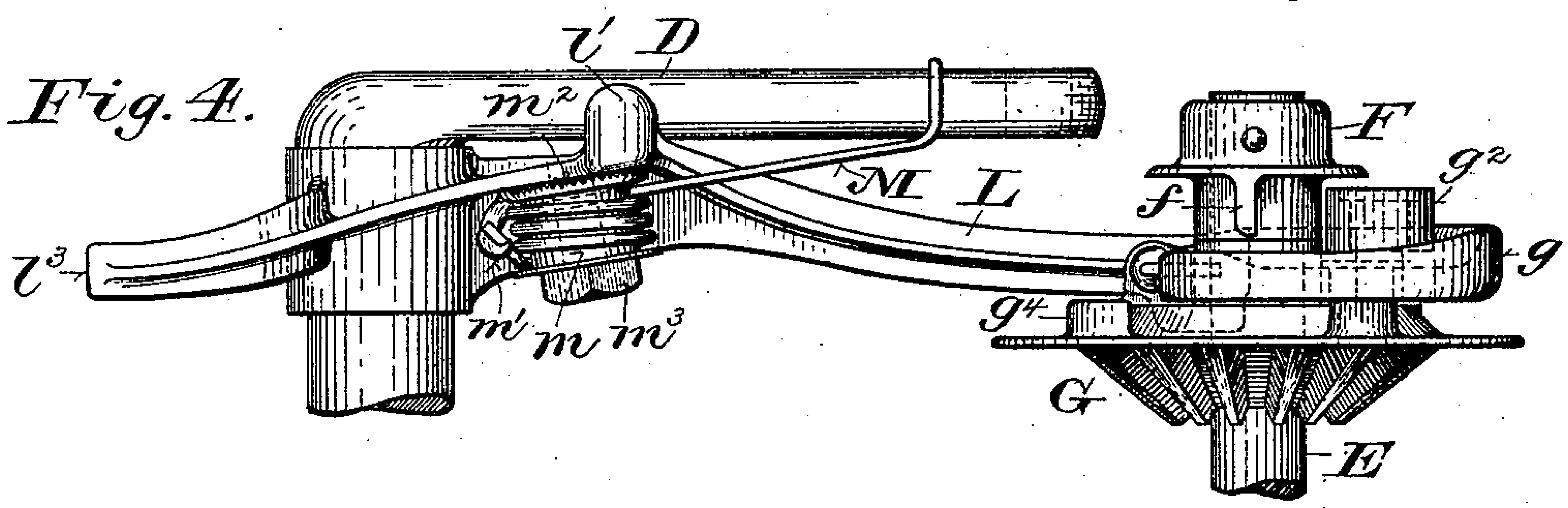


Fig. 5.

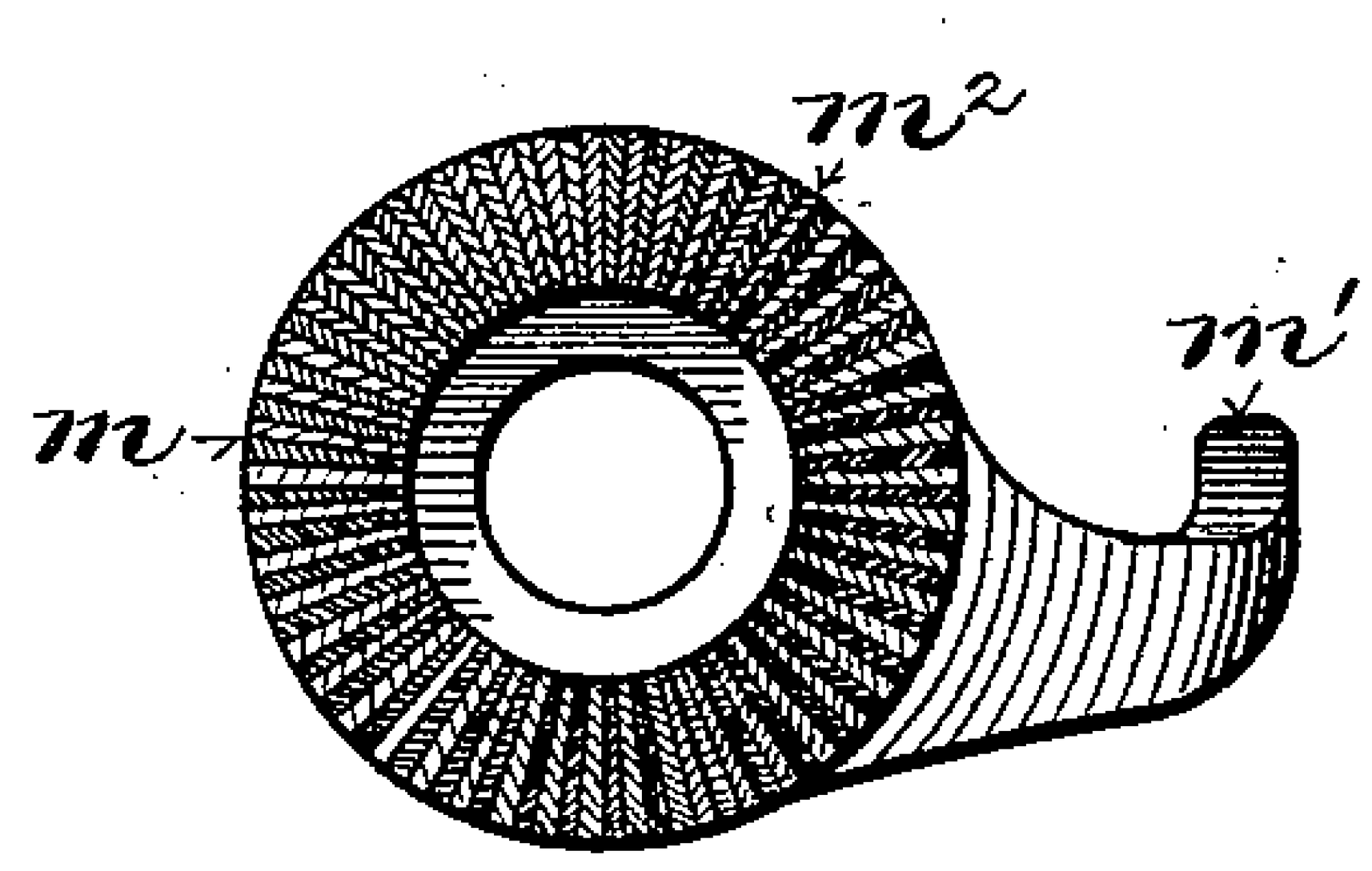


Fig. 6.

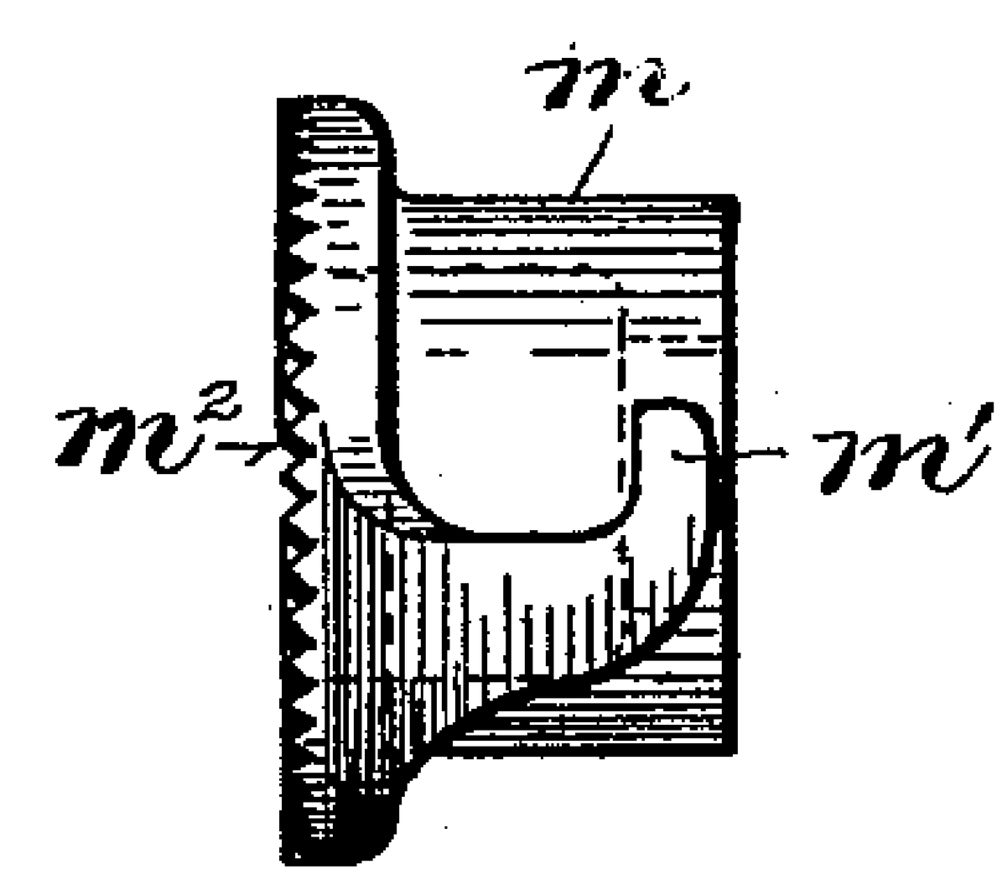


Fig. 7.

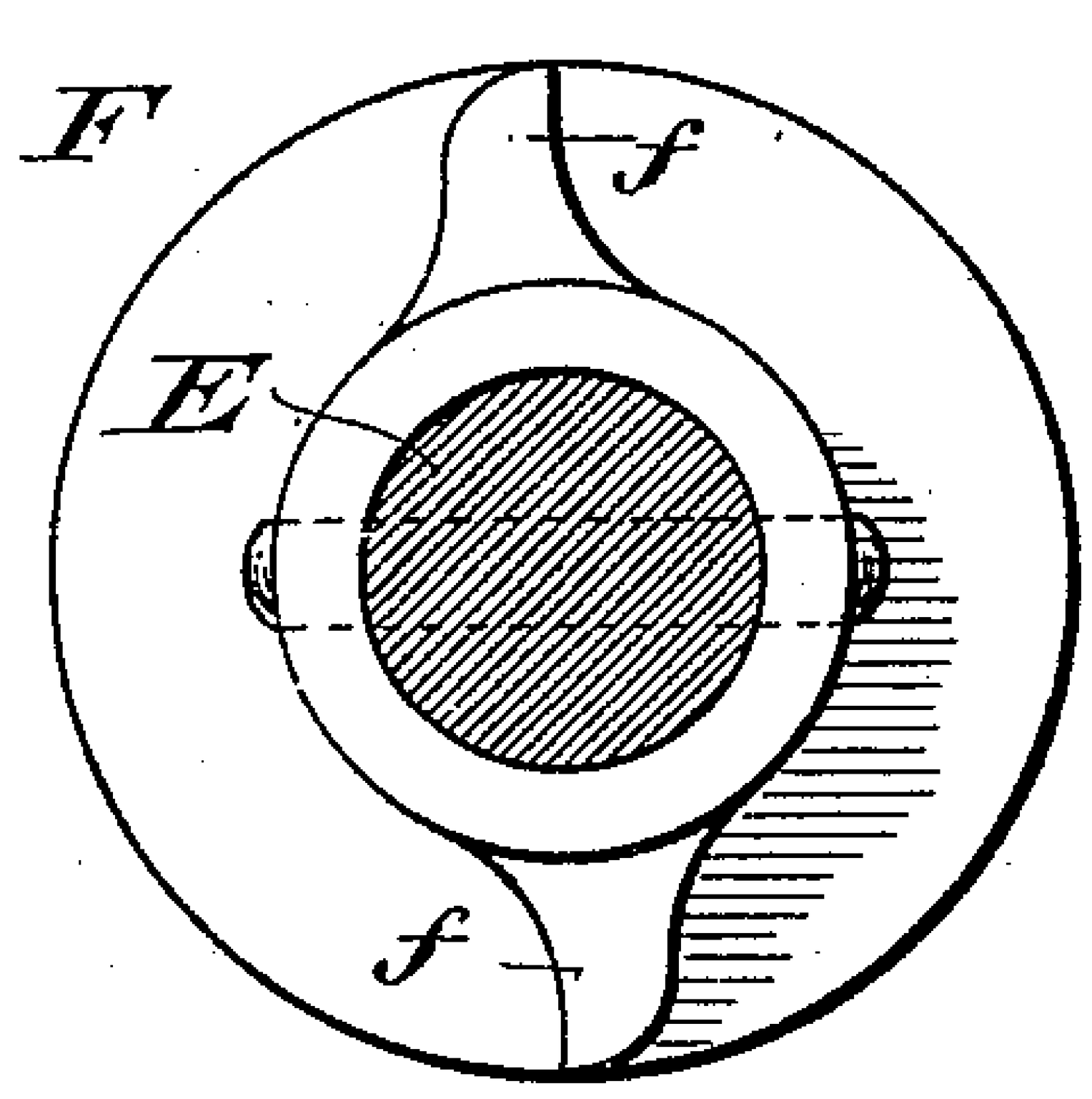
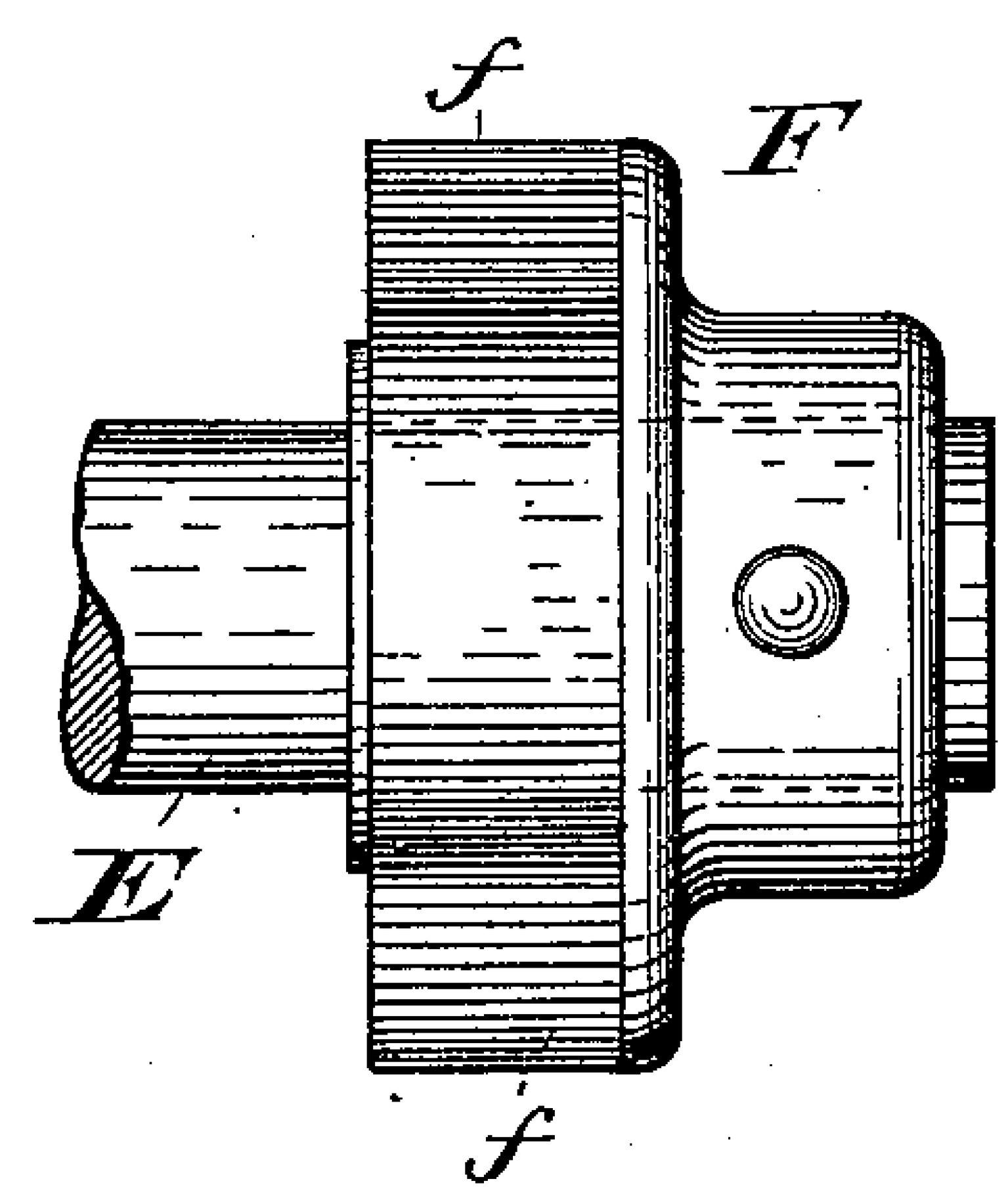


Fig. 8.



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Edward J. Birkett,

By Winkler Flanders Smith Bottum & Vilas
Attorneys.

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UNITED STATES PATENT OFFICE.

HENRY F. CRANDALL AND EDWARD J. BIRKETT, OF MILWAUKEE, WISCONSIN, ASSIGNORS TO THE MILWAUKEE HARVESTER COMPANY, OF SAME PLACE.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 582,500, dated May 11, 1897.

Application filed September 30, 1895. Serial No. 564,135. (No model.)

To all whom it may concern:

Be it known that we, HENRY F. CRANDALL and EDWARD J. BIRKETT, of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Grain-Binders; and we do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

Our improvements relate particularly to the tripping mechanism by which the binding mechanism is automatically started and stopped at the proper times.

The main object of our invention is to simplify and improve the construction and operation of devices of this class.

It consists of certain novel features in the construction and arrangement of the component parts of the tripping mechanism, as hereinafter particularly described, and pointed out in the claims.

In the accompanying drawings like letters designate the same parts in the several figures.

Figure 1 is an end view of a binder to which our improvements are applied. Fig. 2 is a like view, on an enlarged scale, of parts of the binder embodying our improvements. Fig. 3 is a plan view of the trip-arm. Fig. 4 is an inverted plan view of the parts shown in Fig. 2. Figs. 5 and 6 are detail views, on an enlarged scale, of the device for adjustably attaching to the trip-arm the spring by which it is yieldingly connected with the needle-arm, Fig. 5 being an end, and Fig. 6 a side, view. Figs. 7 and 8 are detail views, on an enlarged scale, of the driver, Fig. 7 being an end view and Fig. 8 a side view; and Fig. 9 is a section on the line 9 9, Fig. 1, showing the under side of the adjustable spring-catch for holding the knotter-shaft from turning backward.

A designates the binder-frame; B, the knotter-shaft, provided with a gear and cam wheel C; D, the needle crank-arm, which is connected with the gear-wheel C by a rod *d*; E, a continuously-rotating driving-shaft, which may be the packer-shaft, provided with a driver F, fixed thereon, and a pinion G, loosely mounted thereon, and connected by bevel-gears or pinions (not shown) and a shaft H with the gear-wheel C, and I the compressor-arm, all of the usual or any suitable construction and arrangement. The compressor-shaft is provided with a crank-arm *i*, which is connected by a rod J with a bell-crank lever K, fulcrumed to the binder-frame at its elbow adjacent to the gear-wheel C and provided at its opposite end with a friction-roller *k*, which engages with a cam or guide *c*, formed or provided on the face of said gear-wheel C. The rod J has a longitudinal yielding spring connection *j*, whereby the compressor-arm I is permitted to yield to the pressure of grain accumulated against it by the packers, so as to shift the trip-arm and set the binding mechanism in operation, as hereinafter explained, while the friction-roller *k* is stationarily held by its guide *c*, the function of which is to permit the compressor-arm to drop below the binder-deck at the proper time for discharging the bundle, and after the bundle is discharged to turn it upwardly into operative position. The guide *c* is formed with a seat or depression for the roller *k* to complete the movement of the binding mechanism in case the driver fails for any reason to bring it home. The pinion G has on its outer face, next to the driver F, a dog *g*, pivoted thereto by a bolt or stud *g'* and provided with a stud carrying a friction-roller g^2, which a spring g^3 tends to force into the path of wings or projections *f f* of the driver F. The movement of the dog *g* is limited in both directions by its engagement with the hub of pinion G.

L is a trip-arm loosely mounted upon the needle-shaft next to the needle crank-arm D and adapted to engage with the dog *g* and hold it, against the force of spring g^3, out of engagement with the driver F. It is yieldingly connected with the needle crank-arm by a spring M, which is coiled around a thimble *m* (shown in Figs. 5 and 6) and caught at one end on an overhanging lug *m'*, formed with said thimble, the other end being hooked or caught under the needle crank-arm D, as shown in Figs. 2 and 4.

The thimble *m* is formed at one end, as

shown in Figs. 5 and 6, with a toothed or clutch face adapted to engage with a corresponding face on the trip-arm L, to which it is secured by a bolt m^3, as shown in Fig. 4. To relieve the bolt of strain and hold the thimble securely in place, the arm L is formed on one side with a stud l, as indicated by dotted lines in Fig. 3, upon which said thimble is fitted and adapted to turn. The arm L is also formed on opposite sides of the needle crank-arm with overhanging projections l' l', by which its movement with respect to said needle crank-arm is limited.

The pinion G is formed on its outer face with a curved ledge g^4, which is adapted to engage with a projection l^2 on the adjacent side of the trip-arm L and guide the free end of the latter into engagement with the end of dog g, as shown in Fig. 2.

It sometimes occurs in the operation of a binder that the knotter and needle-shafts are not quite returned to their home positions after a bundle is bound and discharged on account of the slow movement of the machine, as in turning corners, or other causes, and to insure a complete return movement of the parts named under all conditions we provide the cam or guide c with a seat or depression, as hereinbefore mentioned. In case the driver fails to carry the raised portion of the cam or guide c, just before said seat or depression, past the roller k, as soon as the compressor-arm I is subjected to the pressure of grain it will tend to force said roller against the guide into said seat or depression and thus turn the gear C forward.

The outer face of the pinion G is formed with an incline g^5, adapted to engage the upper side of the projection l^2 and positively turn the trip-arm L into position to engage the end of dog g, as shown in Fig. 2, and thereby stop the binding mechanism in case said trip-arm should be held against the tension of spring M out of the path of the dog by the compressor-arm I becoming entangled with straw and failing to be returned home or by any other cause. The projection g^6 shown on pinion G is simply a side bearing for dog g to prevent side strain upon its pivot bolt or stud g'.

The trip-arm L is formed or provided at the end opposite the driver with a toe or projection l^3 in the path of an arm i' on the compressor-shaft, which arm by engagement with said toe is adapted to throw the opposite end of the trip-arm, against the tension of spring M, upwardly out of engagement with the end of dog g, the incline g^5 terminating at its inner end, so as to clear the projection l^2 when the parts are in the positions shown in Figs. 1 and 3. Normally the arm i' is held by the spring j out of contact with the toe l^3, and the recoil of the compressor-arm and its connections when they are brought violently or suddenly home is thus prevented from being transmitted to the trip-arm and throwing it out of engagement with dog g.

N is a spring adapted to pass behind a projection c' on gear C, as shown in Fig. 9, and lock the binding mechanism in home position or prevent it from turning backward. It is attached at one end to a block n, which is slotted and adjustably secured to the binder-rail a by a bolt n'. This avoids the time, labor, and annoyance of chipping, filing, and fitting, which would otherwise be often necessary in assembling and adjusting the parts of the binder, and serves also to take up wear.

Our improved tripping mechanism operates as follows: Assuming the parts to be in the positions shown in Figs. 1 and 2, when sufficient grain has been accumulated against the compressor-arm I to overcome the resistance of the springs j and M the arm i' will be carried into engagement with the toe l^3 of the trip-arm L and will turn the latter upwardly out of engagement with the dog g. The roller g^2 of the dog, which is thus released, is thrown by the spring g^3 into engagement with one of the projections f of the driver F and locks the pinion G therewith and turns it in the direction indicated by the arrows, Figs. 1 and 2. Motion is thus communicated to the knotter and needle shafts through the connections hereinbefore described, the knotter-shaft being driven in the direction indicated by the arrow, Fig. 1. As the needle crank-arm returns to its starting-point the projection l^2, engaging with the curved ledge g^4 on gear G, positively guides the end of the trip-arm L into proper engagement with the dog g, thus stopping the pinion G and the several parts of the binder driven thereby in the positions in which they are shown in Fig. 1.

In practice the spring j is made of sufficient tension only to sustain the compressor-arm and its connections and to hold the arm i' out of engagement with the toe l^3 of the trip-arm when the compressor-arm is not subjected to pressure. The force required to start the binding mechanism is consequently controlled by the spring M, which can be easily adjusted by loosening the bolt m^3 and turning the thimble m thereon to increase or diminish its tension and thereby vary the size of the bundles as desired.

We claim—

1. In a grain-binder, the combination of a continuously-rotating driving-shaft, a driver fixed thereon, a pinion loosely mounted upon the driving-shaft and provided with a dog adapted to engage with said driver, the needle-shaft provided with a crank-arm, a trip-arm pivoted upon the needle-shaft adjacent to its crank-arm and adapted to turn and hold the dog out of engagement with the driver when the needle-crank descends to home position, said pinion having a curved ledge adapted to hold the trip-arm outwardly in the path of the dog and to guide said trip-arm into engagement with said dog, substantially as and for the purposes set forth.

2. In a grain-binder, the combination with the needle-shaft and its crank-arm, of a con-

tinuously-rotating driving-shaft having a driver fixed thereon, a pinion loosely mounted on the driving-shaft next to the driver and provided with a dog adapted when released to engage therewith, and a trip-arm pivoted on the needle-shaft and adapted to engage with and normally hold said dog out of engagement with the driver, said pinion having an incline on the side next to the trip-arm adapted to draw it toward the driver into the path of said dog, and a curved ledge inside of said incline adapted to arrest the trip-arm in its movement toward the driver in position to engage said dog, substantially as and for the purposes set forth.

3. In a grain-binder, the combination with the needle-shaft and crank-arm, the knotter-shaft and cam-wheel, and the compressor-arm having a spring or yielding operating connection with said cam-wheel, of a continuously-rotating driving-shaft provided with a driver, a pinion loosely mounted upon the driving-shaft and provided with a dog and spring tending to hold it in engagement with said driver, and a trip-arm pivoted on the needle-shaft and having a toe or projection in the path of an arm on the compressor-shaft, said arm being normally held out of contact with said toe or projection by the spring connection between the compressor-shaft and cam-wheel, substantially as and for the purposes set forth.

In testimony that we claim the foregoing as our own we affix our signatures in presence of two witnesses.

HENRY F. CRANDALL.
EDWARD J. BIRKETT.

Witnesses:
CHAS. L. GOSS,
R. C. LIVESAY.