

(No Model.)

2 Sheets—Sheet 1.

N. F. GRAHAM & H. H. YOUNG.

PROPULSION OF STREET CARS AND OTHER VEHICLES.

No. 292,483.

Patented Jan. 29, 1884.

FIG. 1.

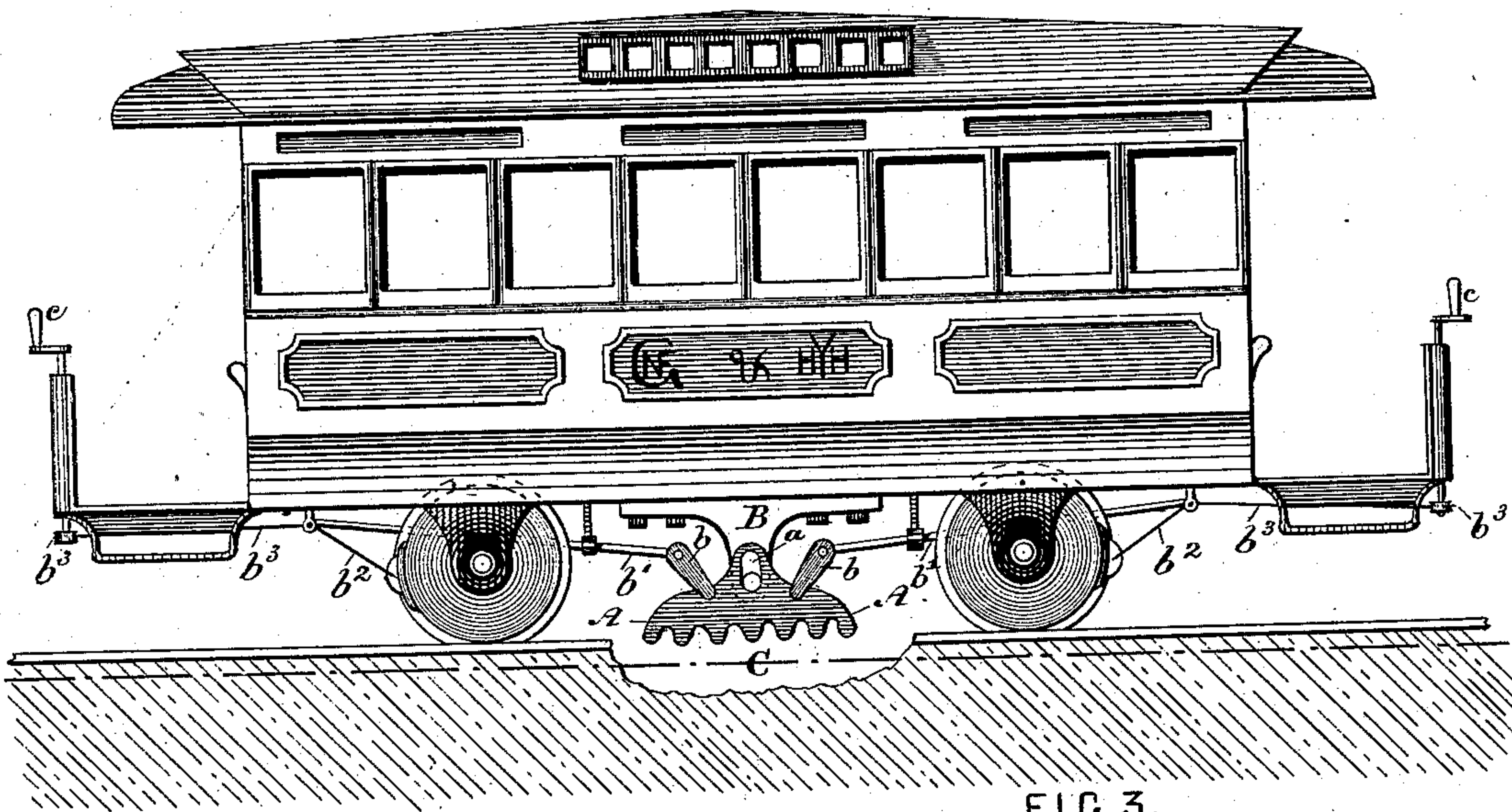


FIG. 2.

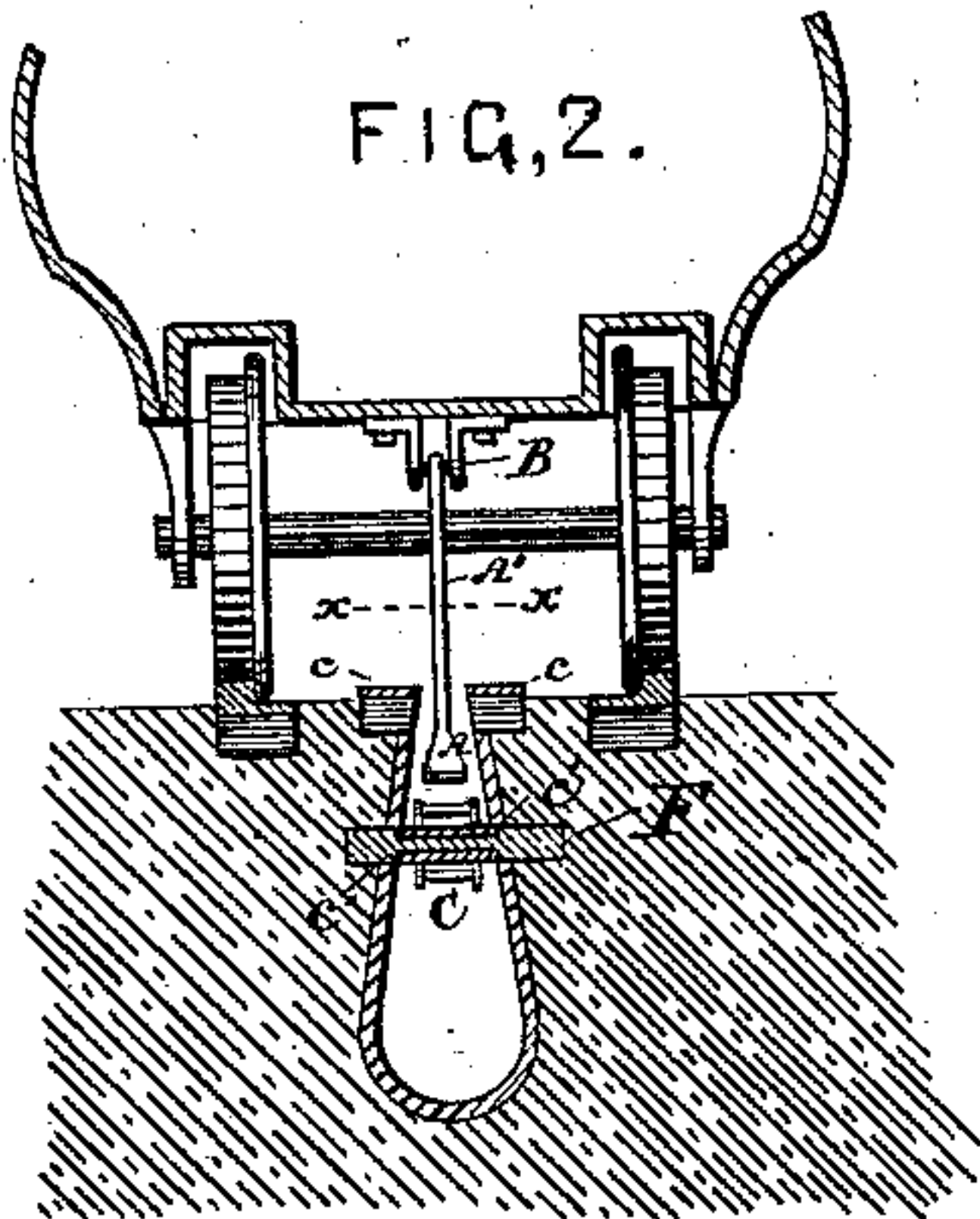


FIG. 3.

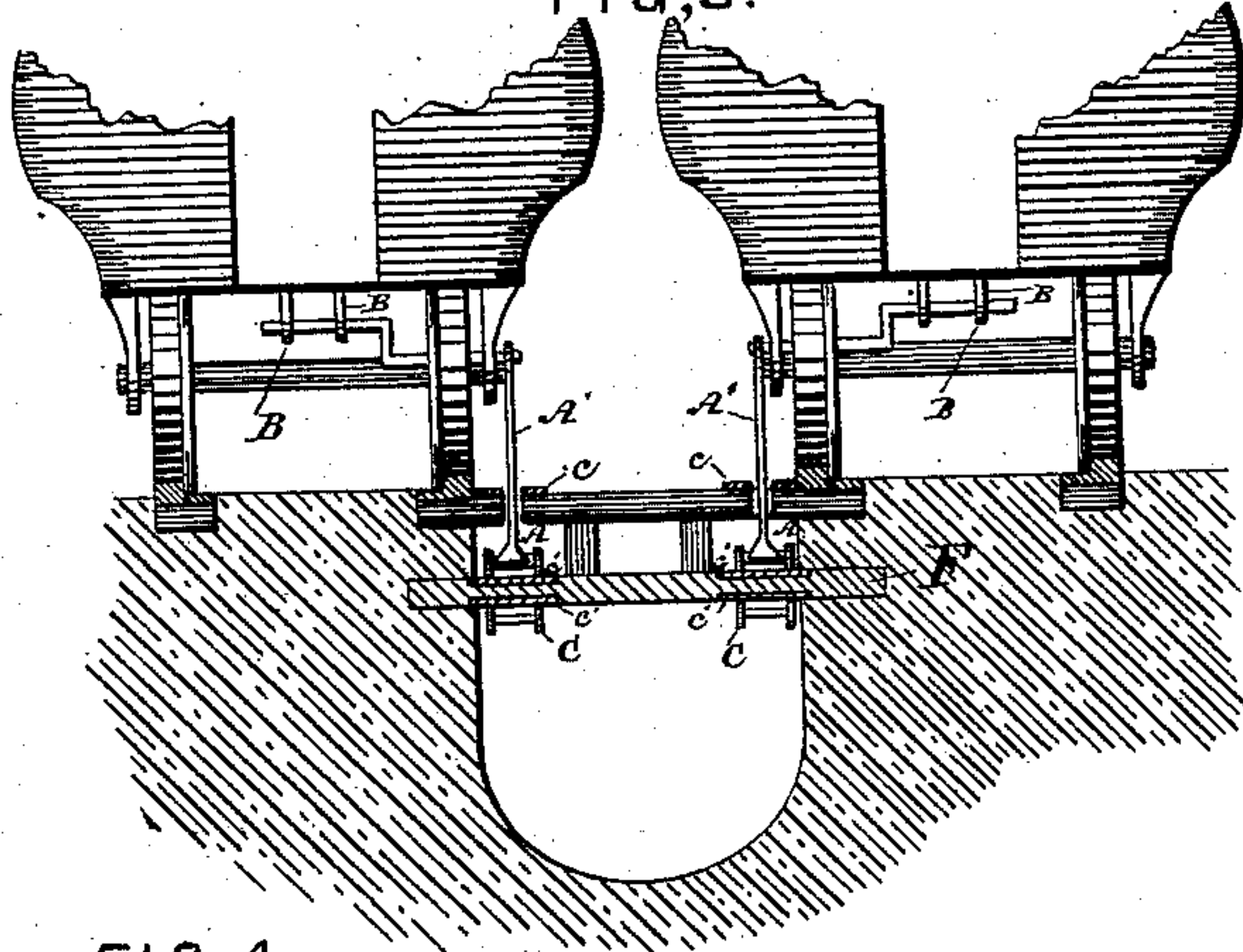


FIG. 4.

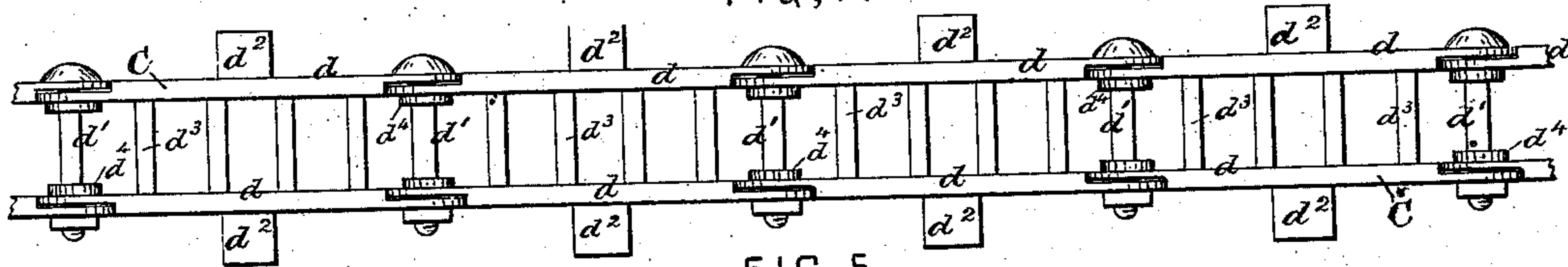


FIG. 5.

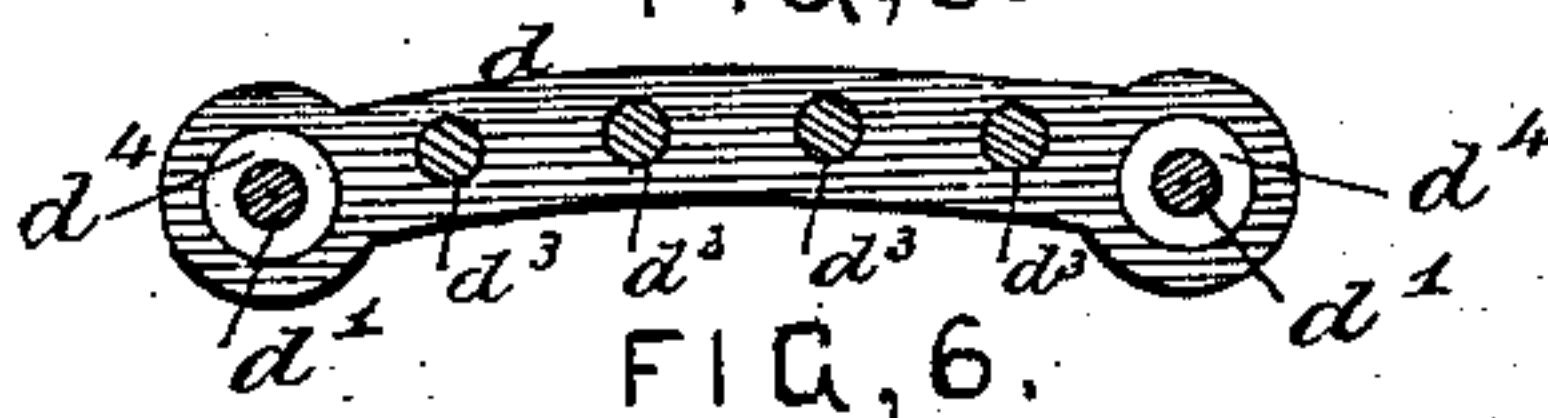


FIG. 6.



WITNESSES

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FIG. 7.

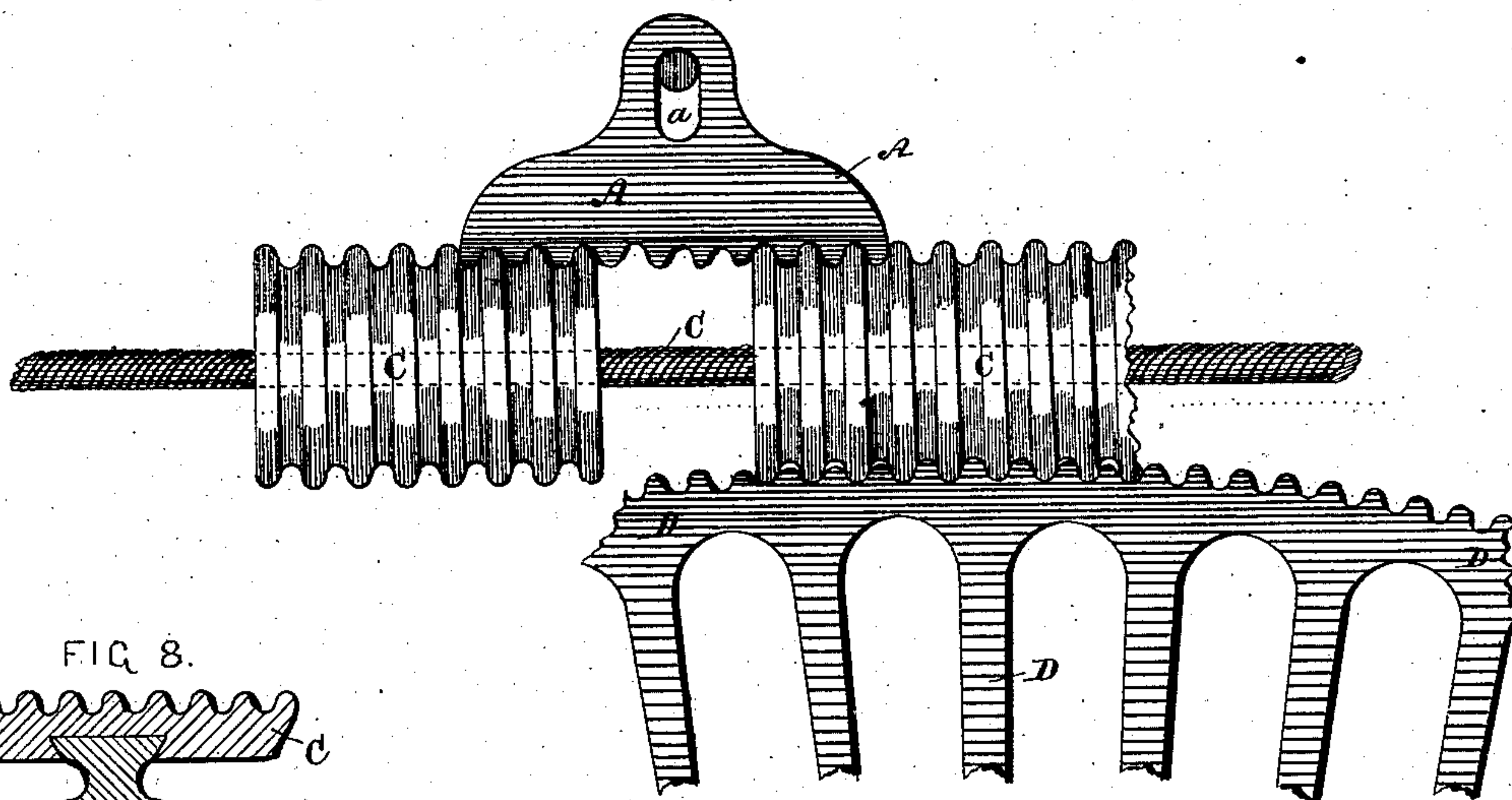


FIG. 8.

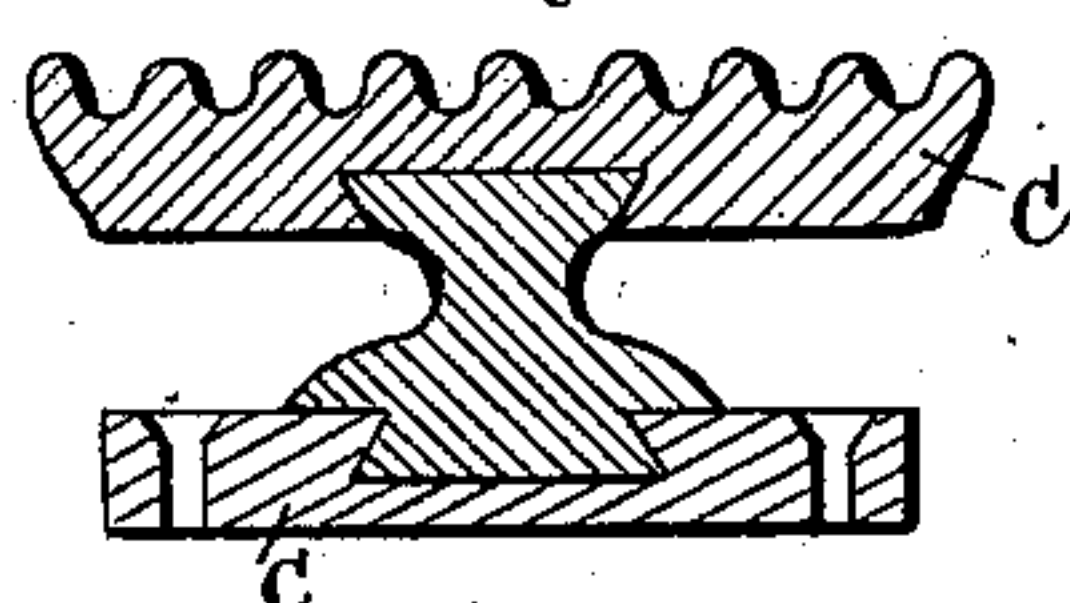


FIG. 9.

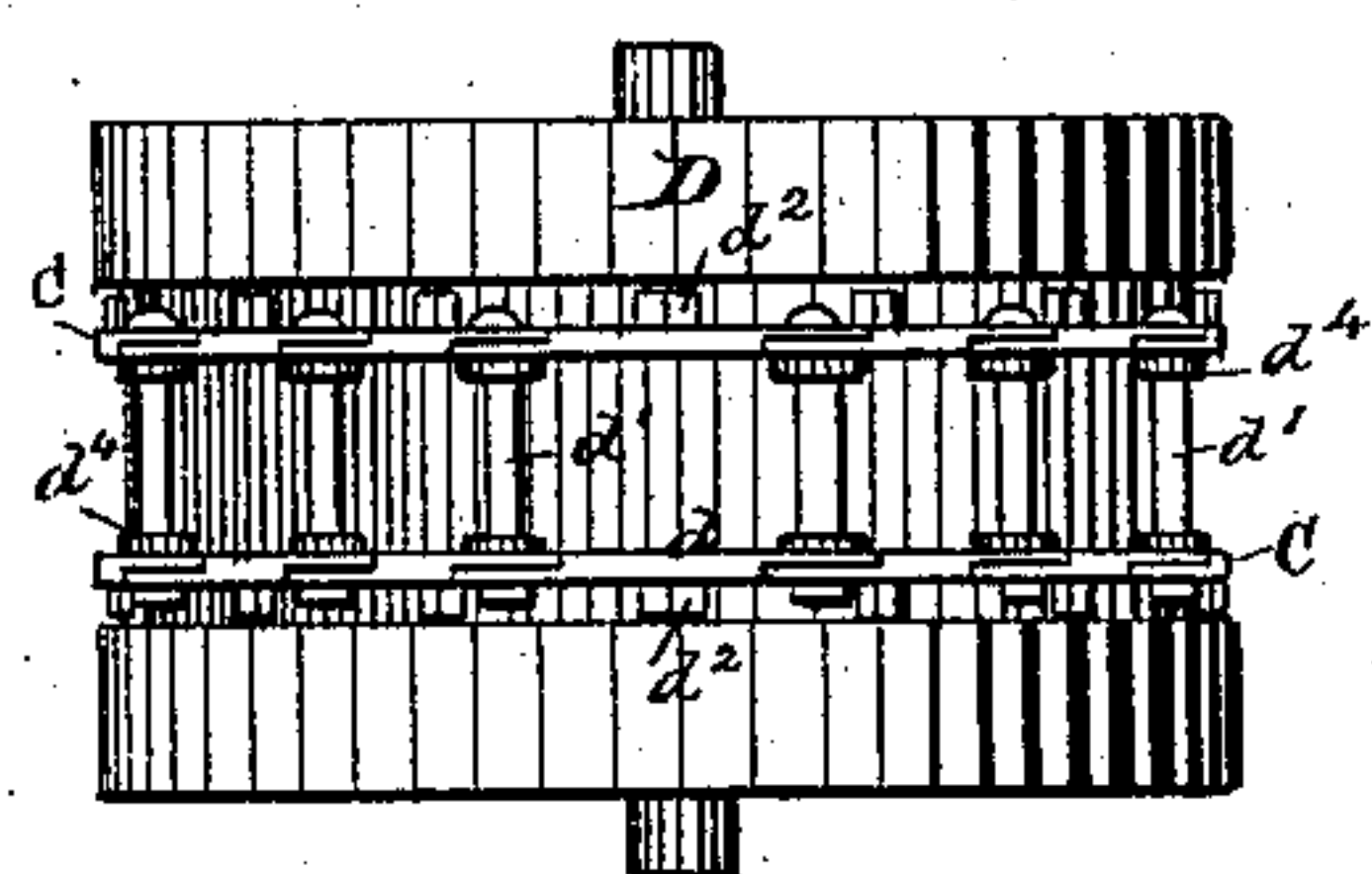


FIG. 10.

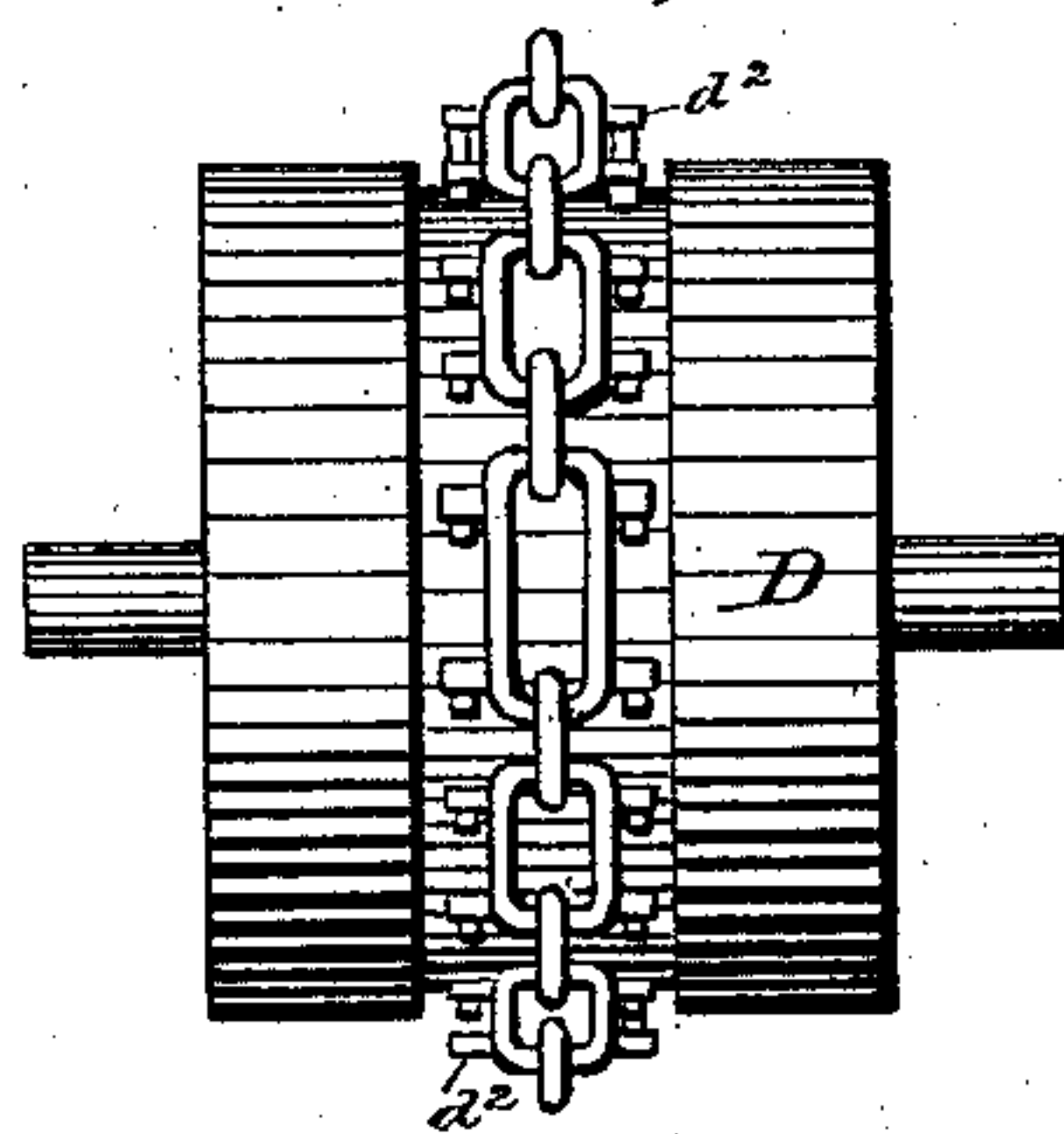


FIG. 11.

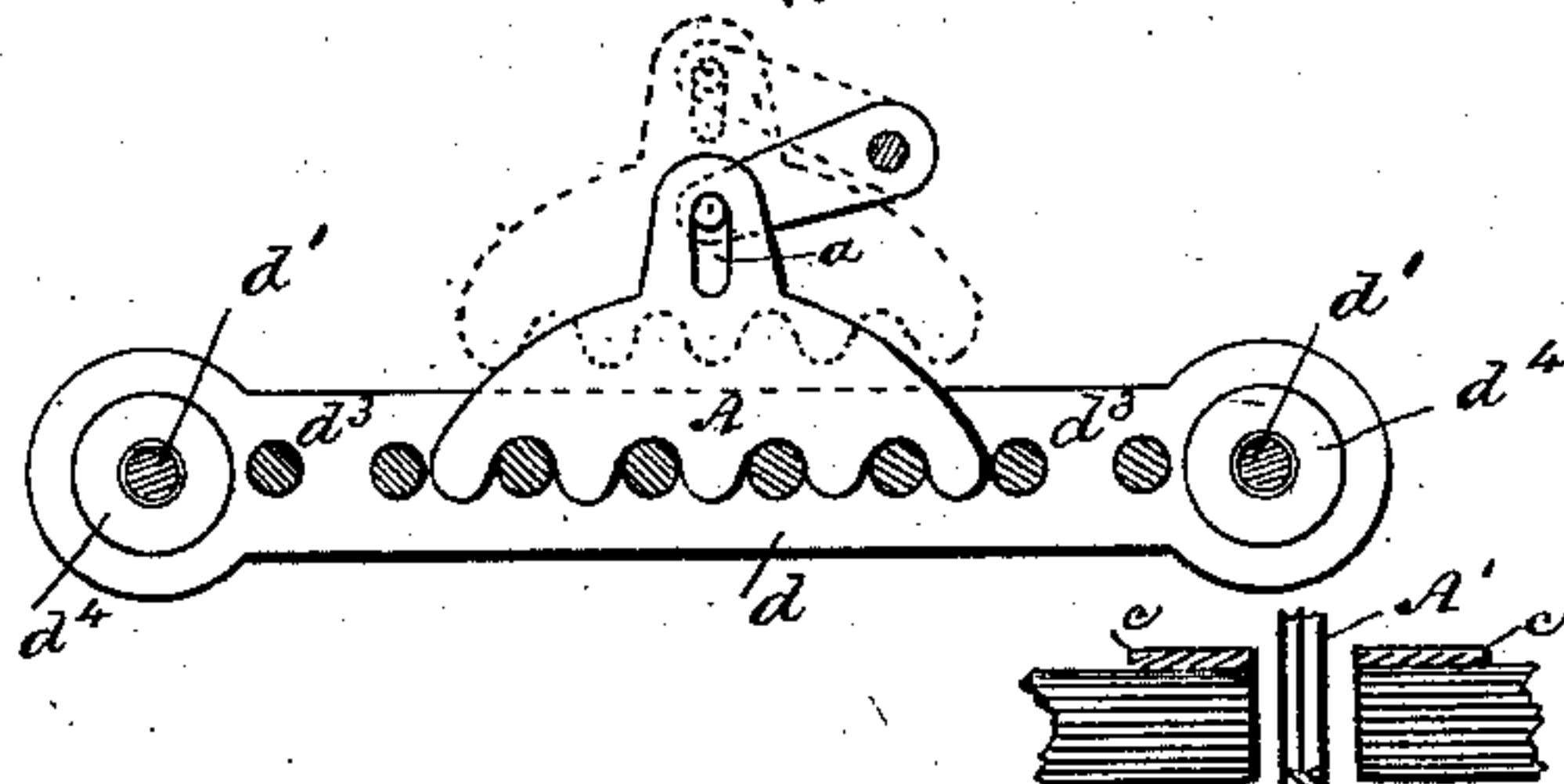


FIG. 12.

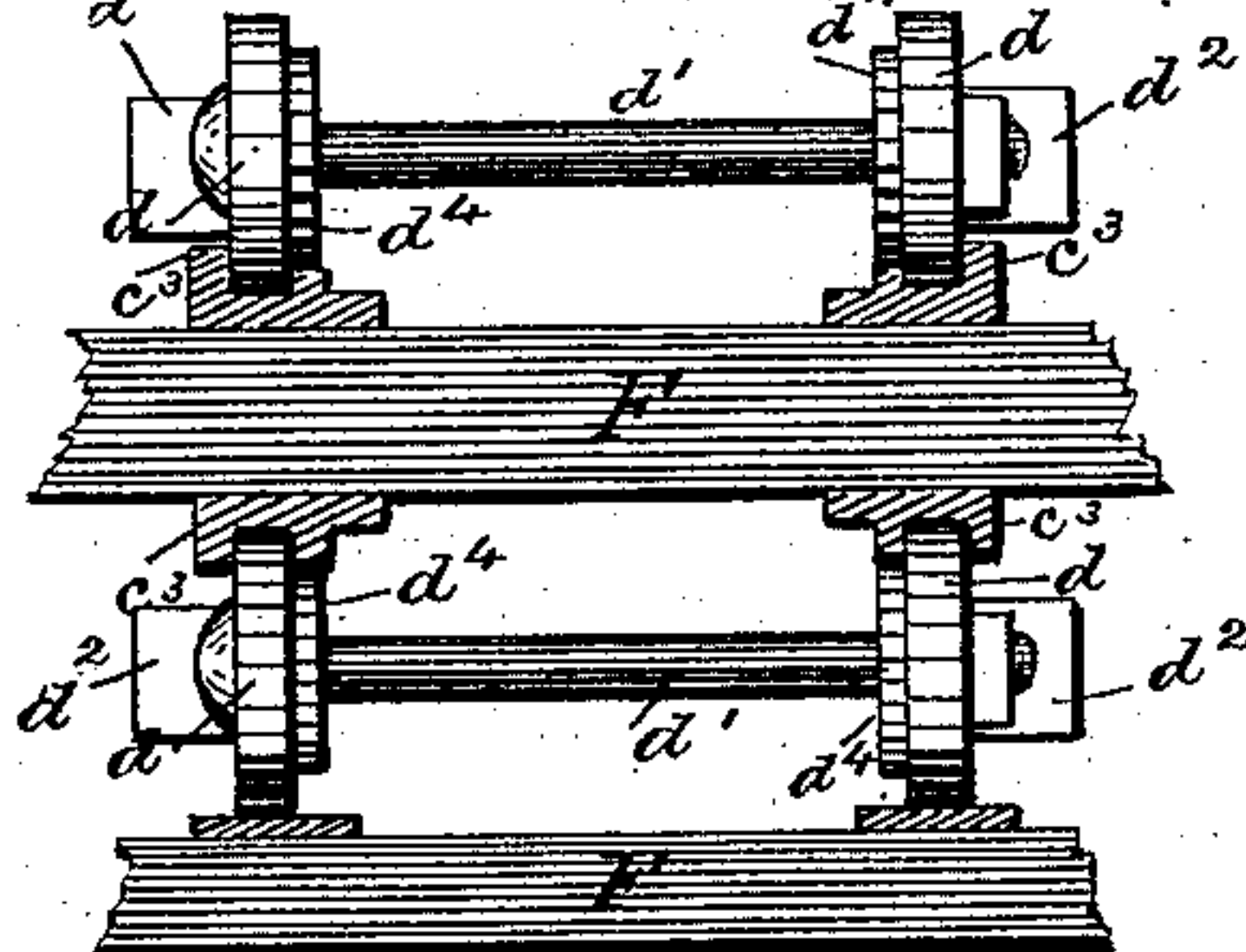


FIG. 13.

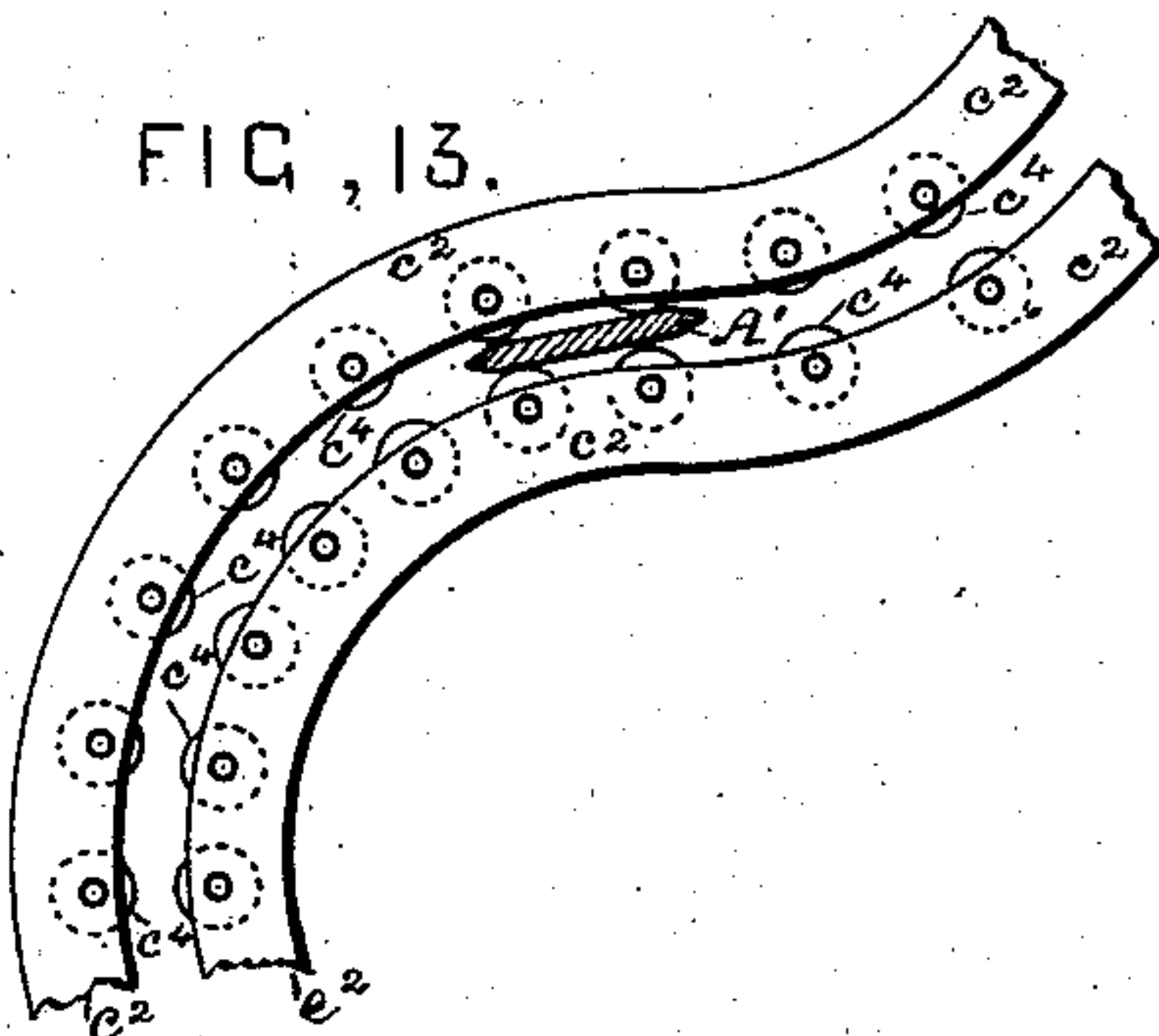


FIG. 14.

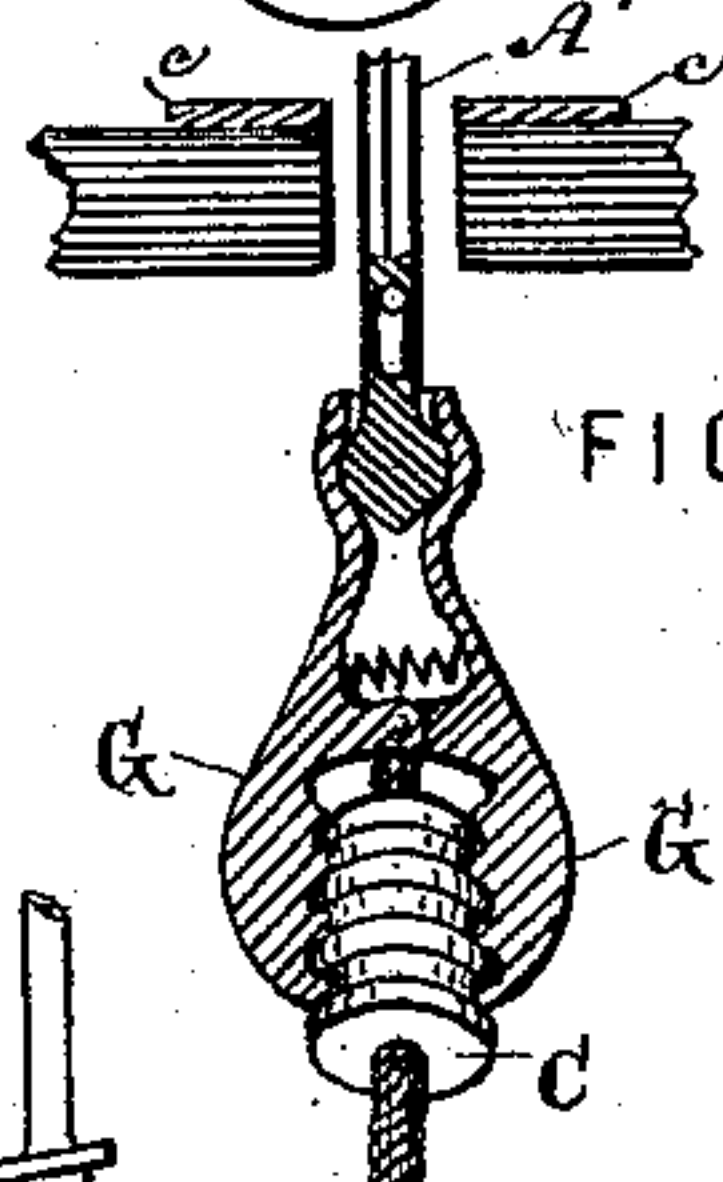
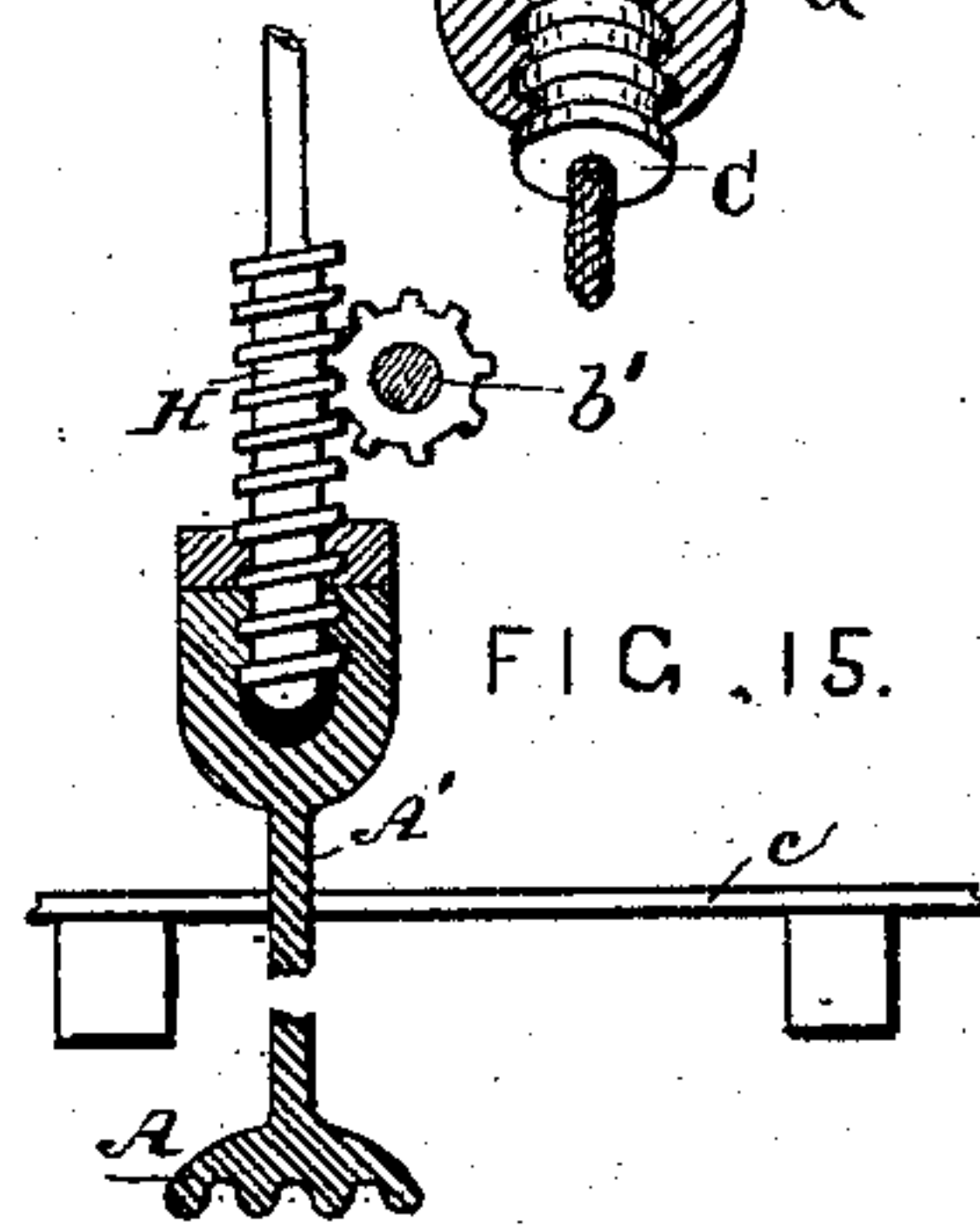


FIG. 15.



WITNESSES

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# UNITED STATES PATENT OFFICE.

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## PROPULSION OF STREET-CARS AND OTHER VEHICLES.

SPECIFICATION forming part of Letters Patent No. 292,482, dated January 29, 1884.

Application filed May 29, 1883. (No model.)

*To all whom it may concern:*

Be it known that we, NEIL F. GRAHAM, residing at Falls Church, in the county of Fairfax and State of Virginia, and HOWARD H. YOUNG, residing at Carlins Springs, in the county of Alexandria and State of Virginia, both citizens of the United States, have invented certain new and useful Improvements in the Propulsion of Street-Cars and other Vehicles, of which the following is a specification.

Our invention relates to the propulsion of street-cars and other vehicles by stationary motors at one or both termini of the road, arranged to rotate corrugated drums for imparting motion to a corrugated endless chain or its equivalent operating within a wedge-shaped excavation or sewer; and it consists, specifically, in the use of a reversible, detachable, and adjustable corrugated shoe or shoes, attached to the cars and arranged in such a manner as to have the corrugated face thereof engage with corresponding rounds or corrugations on the endless conveyer, and when raised, lowered, tilted, or unclamped to a degree sufficient to clear the shoe from contact with the endless conveyer will automatically operate the brakes.

We are aware that serrated surfaces have been employed to engage each other for the purpose of propelling vehicles, and therefore disclaim their use. In the use of serrated surfaces the sharpened angular-shaped cavities and points tend to make their hold uncertain and render them liable to pinch and bind the teeth in seating themselves, and consequently render their hold uncertain and attended with too much concussive force when suddenly applied. To obviate these difficulties we employ for our engaging-surfaces on the shoe and endless conveyer a series of corresponding corrugations, consisting, in form, of exact semi-circles, which, when brought in contact, adapt themselves uniformly to their counterparts, and become engaged without injury to their conformation and with the least possible concussive force, thus securing the required desideratum of applying them instantly and insuring their ready release. As we in a like manner employ semicircular corrugations on the outer periphery of the motor-drums for en-

gaging corresponding corrugations on the endless conveyer, the like advantages accrue in this case, added to which is the fact that the employment of corrugated surfaces, when used for continuous motion, tend to diminish friction, and at the same time insure traction.

We contemplate adapting our invention to the street-cars now in use without changing their form or dispensing with any of their present appliances, as the same brakes are connected to our shoe-arms, and the cranks heretofore used for applying the brakes are employed to raise and lower and clamp or unclamp the shoe, secure it in position, and automatically apply and release the brakes.

In the accompanying drawings, Figure 1 is an elevation of a two-horse street-car with our corrugated shoe pivoted on hangers secured to the bottom of the car, showing the shoe raised to prevent contact with the endless conveyer, the position of which is represented by a dotted line in this figure. Fig. 2 is a transverse section of one track, with a part of a street-car in section, showing the wedge-shaped central excavation to be utilized as a sewer, and also contains the tramway for the endless conveyer when applied to each track. The shoe disengaged from the endless conveyer is shown in this figure. Fig. 3 is a partial elevation of a portion of two street-cars, showing the excavation used for the endless conveyer applied to the intermediate space along the length of the tracks, illustrating one way of applying our shoe-arm to the sides of the cars, in order that the corrugations in each shoe may at will be brought in contact with and released from the two endless conveyers, shown as traversing in opposite directions; and in this view the shoe is shown engaging the endless conveyers. Fig. 4 is a plan of a portion of the endless conveyer when formed either of curved links, as shown in the sectional view, Fig. 5, or straight, as shown in Figs. 6 and 11. In Fig. 4 the rounds constitute the corrugations for the lower face of the shoe to engage with, as illustrated in the side elevation, Fig. 11. Fig. 6 illustrates a straight link corrugated on its upper and lower edge. The lower corrugations thereof, engaging the corrugations on the motor-drum, impart the required movement to the endless conveyer, and the upper corruga-



tions serve for engaging the corrugated shoe or clamp arm attached to the car. Fig. 7 is a side elevation, showing the corrugated conveyor applied to a wire rope or endless chain, and the corrugated shoe and section of motor-drum engaging therewith; Fig. 8, a sectional view, showing the corrugated shoe-face detachable. This feature of our invention we intend to apply to the corrugated face of both the shoe or shoes attached to the car and the corrugated face of the endless conveyor, in order to expedite repairs. Fig. 9 shows the corrugated drums used for the propulsion of the endless conveyers, which may be arranged to rotate horizontally or vertically, as required, and in Fig. 10 an endless chain is shown, the links of which engage with corresponding lugs on the drum for its propulsion. The device for having its upper face present a continuous corrugated surface throughout its length is omitted in this view. Fig. 11 is a sectional view of a straight link, showing the corrugated face of the car-shoe engaging the rounds of said link for the propulsion of the car, and illustrating by dotted lines one way of raising the car-shoe to free it from contact with the corrugations on the endless conveyor; Fig. 12, enlarged sectional view of the tramway for the endless conveyor, showing the sides of the ways (shown in Figs. 2 and 3) turned up to guide the conveyor, also a suitable track for the friction-rollers to traverse, and a lower support used to prevent the swag of the conveyor. Fig. 13 is a sectional view on a larger scale of the shoe-arm, taken on the line X X, Fig. 2, illustrating the beveled edges of the shoe-arm to assist in removing any obstruction which may find lodgment in the longitudinal groove it traverses, showing also the employment of a series of friction-rollers on the lower face of the metal bars or plates which form the groove for the traverse of the shoe-arm. These rollers, having contact with the sides of said shoe-arm, may be used, when necessary, to turn sharp curves and to lessen friction, and thus assist the movement of the cars carried by the endless conveyor. Fig. 14 is a plan of conveyor and sectional view of a corrugated clamp or shoe arranged to automatically clamp the corrugations on the endless conveyor. Fig. 15 shows the use of a screw for operating the corrugated shoe or clamp.

The excavation for the endless corrugated conveyor, whether made along the length of each track or along the intermediate space between the tracks, may be of the required depth to serve as the sewerage of the street, having suitable gradations to conduct the drainage thereof off or to other sewers, and by proper appliances arranged to connect with the water plugs or mains, in order that the tramway supporting the mechanism of the endless conveyor may be flooded, if necessary, to cleanse it.

The corrugated shoe A, pivoted to a hanger, B, may be secured on either side of the car or centrally, as shown in Fig. 2, and pro-

vided with a slot, *a*, to admit of its movement up or down by the action of crank-arms *b*, actuated by rods *b'*, *b''*, and *b'''*, all controlled and operated by the ordinary crank-arms *c* on both ends of the car.

The brake-rods *b''* are attached to crank-rods on the shoe-arm A', so that raising the shoe-arm applies the brakes, and when lowered to bring its corrugated face in contact with the endless conveyor the brakes are simultaneously released from contact with the wheels.

We contemplate operating the shoe in its upward and downward movement, or the corrugated clamp in opening and closing by the direct action of a screw applied to the shoe through the medium of suitable devices employed to cause the crank-arms *c* to raise and lower the shoe, or open and close the corrugated clamp, and in all modifications thereof the raising and lowering of the shoe-arm A' effects the automatic action of the brakes, as illustrated in Fig. 1.

The endless conveyor C may consist of a series of curved or straight links, *d*, pivoted together by bolts *d'*, and one or both sides of the links provided with strong lugs *d''*, fashioned thereon or secured thereto and arranged equidistant, so as to engage with corresponding lugs on the outer periphery of the motor-drums D, employed for the propulsion of the endless conveyor C. The bolts or rounds *d'''* (see Figs. 4, 5, and 11) on the endless conveyor are utilized in this form of conveyor to engage with the corrugations on the bottom face of the shoe, as illustrated in Fig. 11 and in Fig. 6. The corrugations on the links engage similar corrugations on the motor-drums D, and also those on the shoe or clamps A.

A wire rope, as shown in Fig. 7, surrounded throughout its length by a corrugated face, E, may be employed to engage the shoe; or the endless band shown in Fig. 8 may be substituted as a modification, where found practicable.

Our continuous conveyor (illustrated in Fig. 4) may be arranged by being properly deflected in its passage around and over the drums D, to serve the purpose of presenting its corrugated face alternately to the action of the shoes traversing each track, so that the lower face of the endless conveyor C, in its passage around the drum, will become the upper face on the adjoining track. By this arrangement it will be seen that the corrugated face of one endless conveyor is utilized to carry the cars on both tracks in opposite directions.

Small friction-rollers *d'*, rotating on the bolts *d'*, may be employed to support the endless conveyor on the tramway F, and to guide its movement along the ways *c'*, and to lessen friction.

Fig. 13 illustrates friction-rollers *c'*, applied to the plates *c''*, which plates form the groove for the shoe-arm A to traverse in. This feature is especially adapted to turning curves where there is liability of the shoe-arm binding.



The corrugated spring-clamp G, attached to the shoe-arm A', is operated by means of depressing or raising the shoe-arm, which is within the control of the person who applies the crank-arm e, for operating the brakes, as shown in Figs. 1 and 14, and by the direct action of the screw H for operating the corrugated shoe or clamp and applying the brakes, as shown in Fig. 15.

The tramway F is provided with plates c' and c<sup>3</sup>, to serve as guides and ways for the traverse of the endless conveyer. These plates may be constructed plain on their upper and lower faces, as shown in Fig. 3, or flanged and grooved, as shown in Fig. 12.

What we claim as our invention, and desire to secure by Letters Patent is—

1. The corrugated adjustable shoe A, for the propulsion of vehicles, substantially as described.

2. The corrugated shoe A, in combination with an endless corrugated conveyer, C, traveling in a sewerage-excavation, for the propulsion of vehicles, substantially as described.

3. The corrugated motor-drums D, in combination with the corrugated shoe A and corrugated endless conveyer C, substantially as described.

4. In the endless conveyer C, the combination of the pivoted links d, pivot-bolts d', lugs d<sup>2</sup>, rounds or bolts d<sup>3</sup>, and friction-rollers d<sup>4</sup>, adapted to the said conveyer, substantially as described.

5. The endless conveyer C, in combination with the shoe-arm A', plates c', c<sup>2</sup>, and c<sup>3</sup>, friction-rollers c<sup>4</sup>, and tramway E, substantially as set forth.

6. The combination, with the corrugated endless conveyer C, of a device upon the car to engage therewith, having a correspondingly corrugated engaging surface or face, as and for the purpose set forth.

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