(No Model.)

4 Sheets—Sheet 1.

T. OTTO.

CABLE GRIP.

No. 474,185.

Patented May 3, 1892.

Fig: 1.

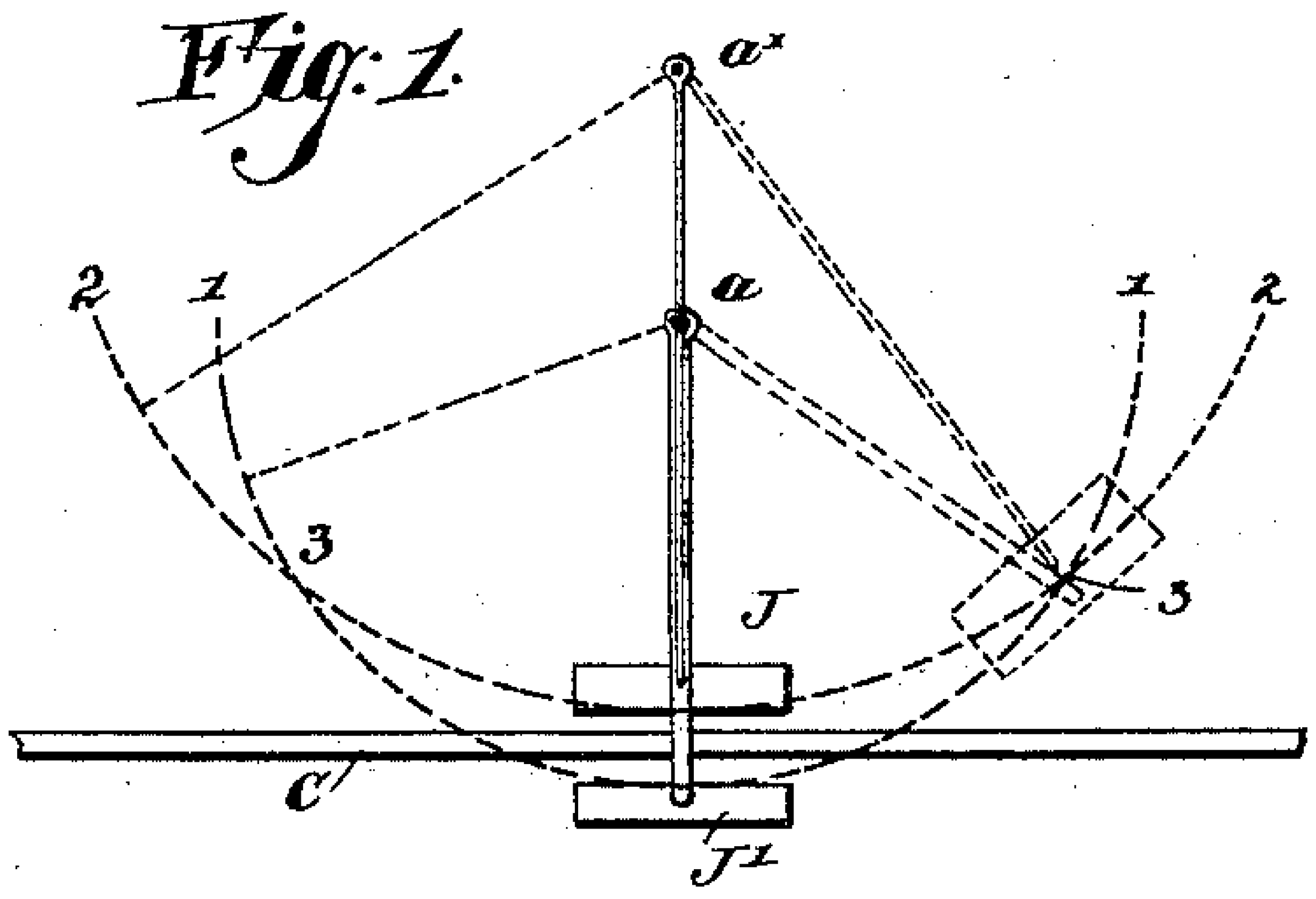


Fig: 2.

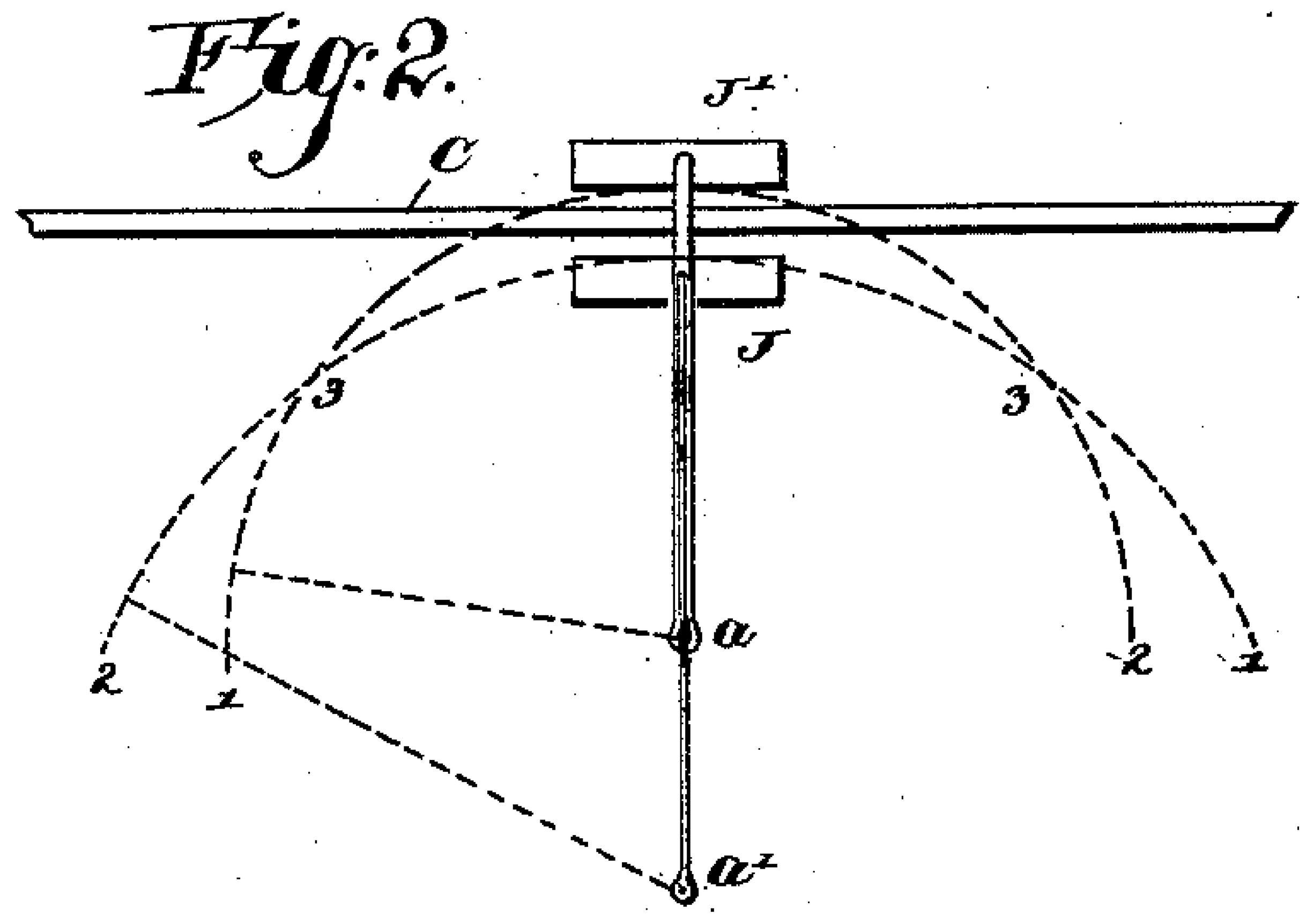


Fig: 3.

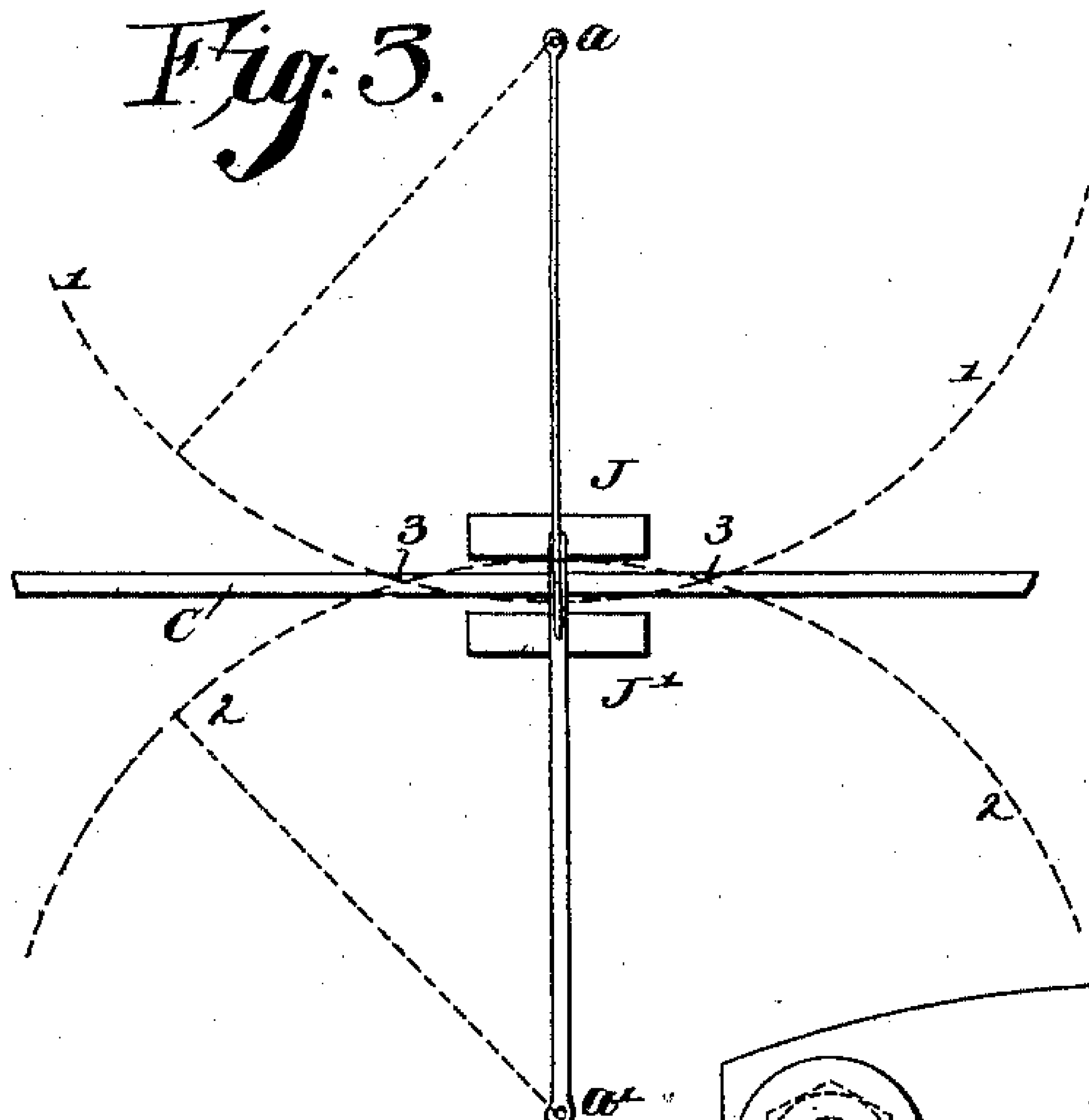


Fig: 4.

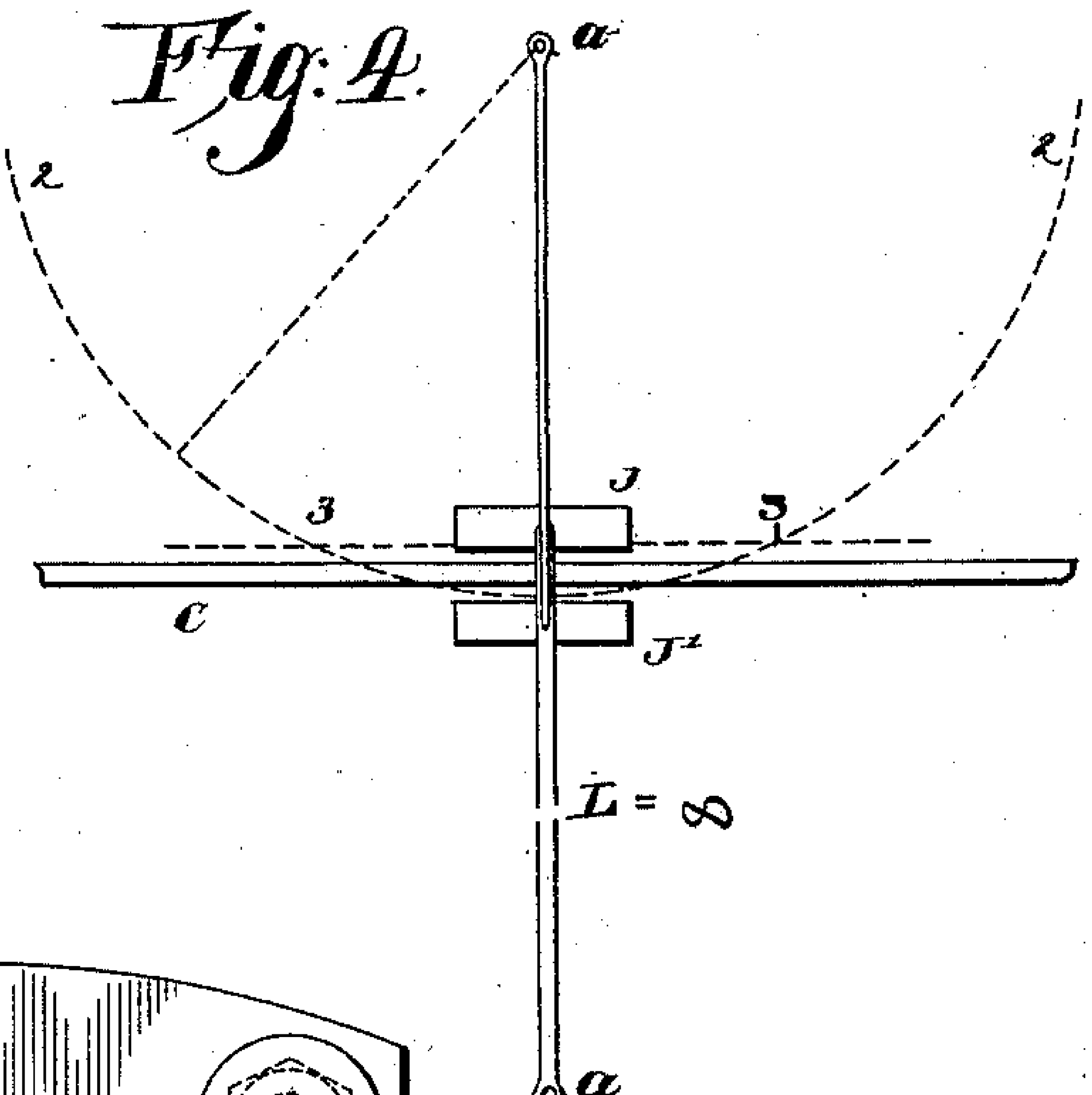
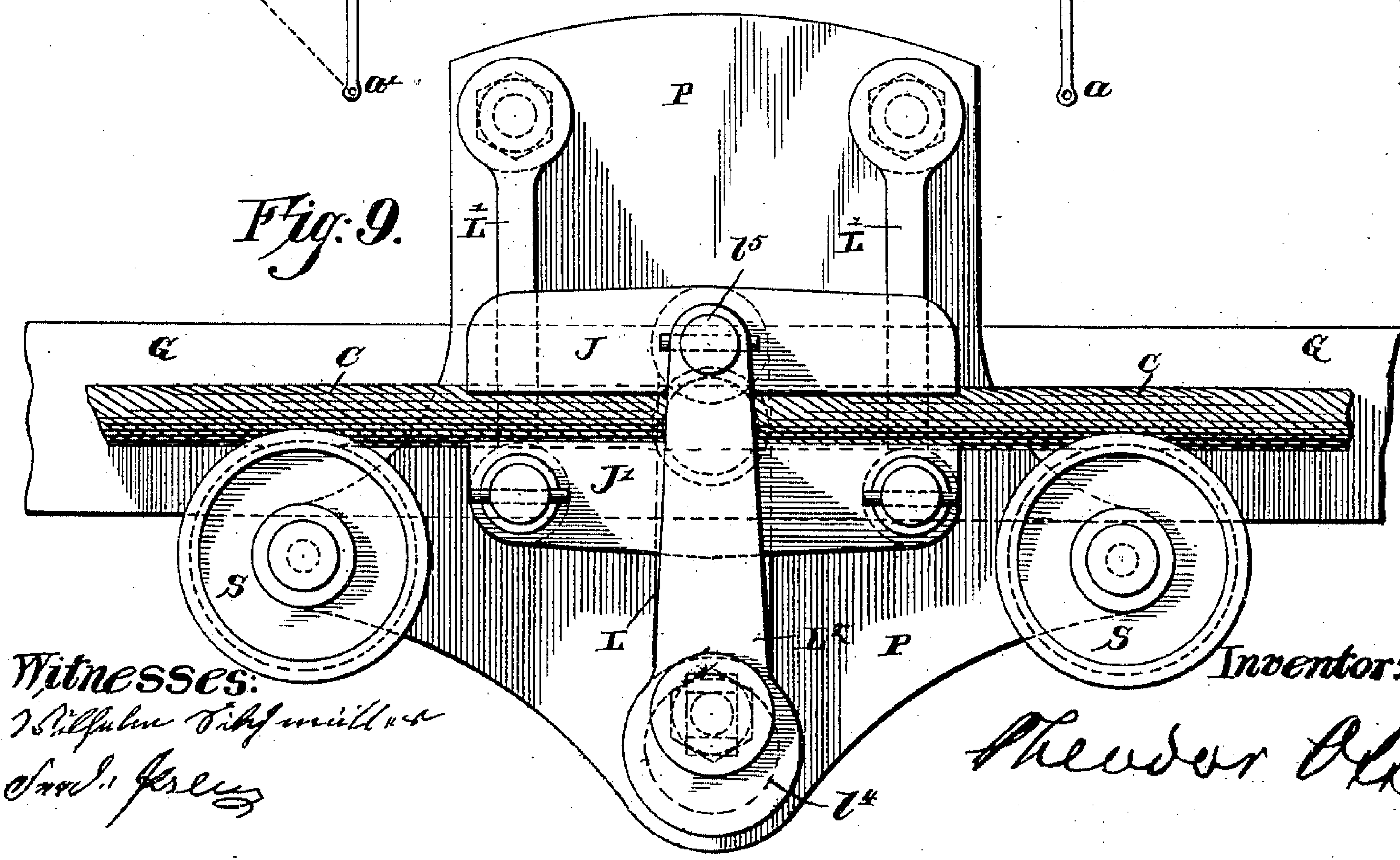


Fig: 9.



Witnesses:

Inventor:
Theodor Otto

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 4 Sheets—Sheet 2.

T. OTTO.

CABLE GRIP.

No. 474,185. Patented May 3, 1892.

Fig: 5.

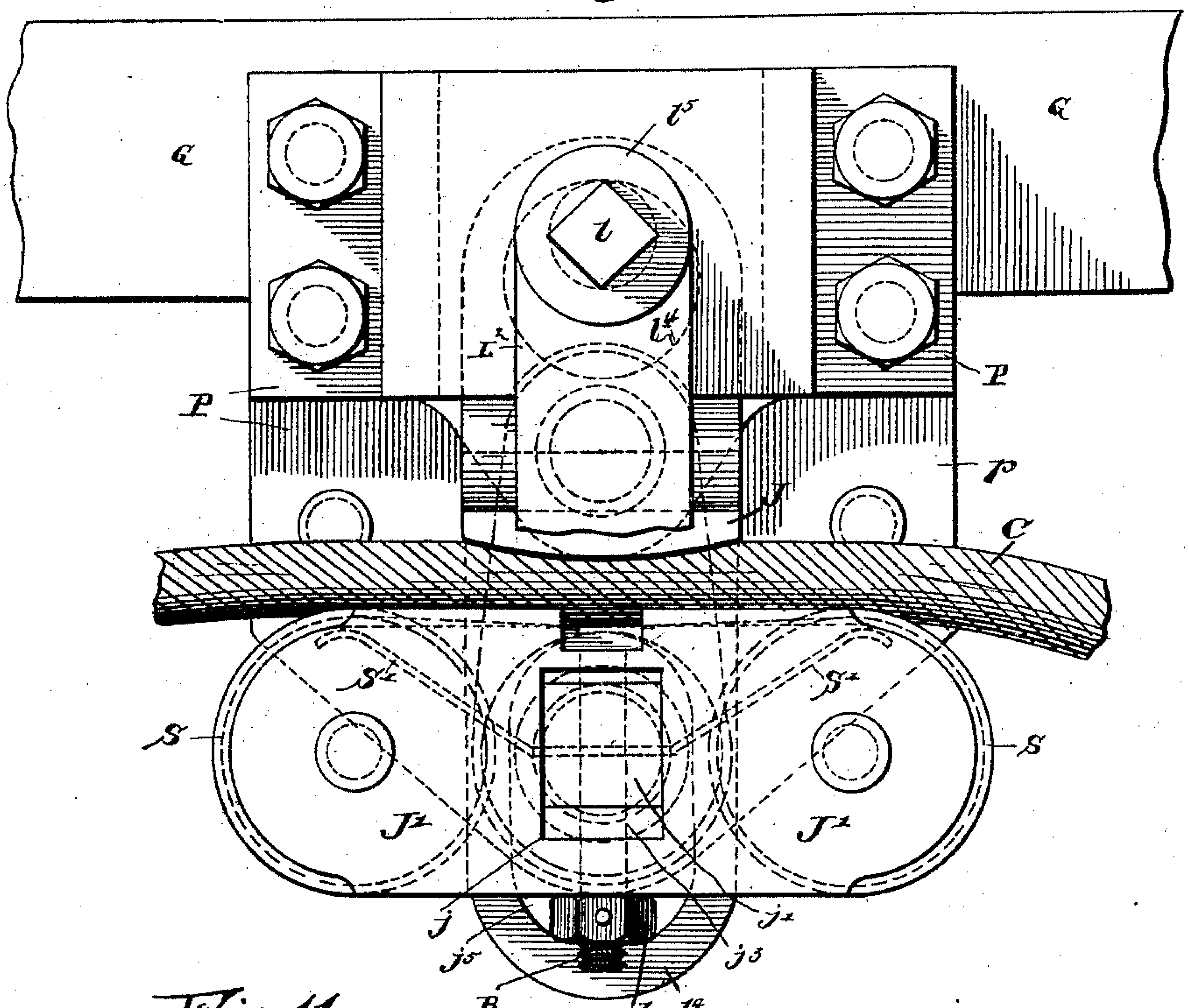


Fig: 11.

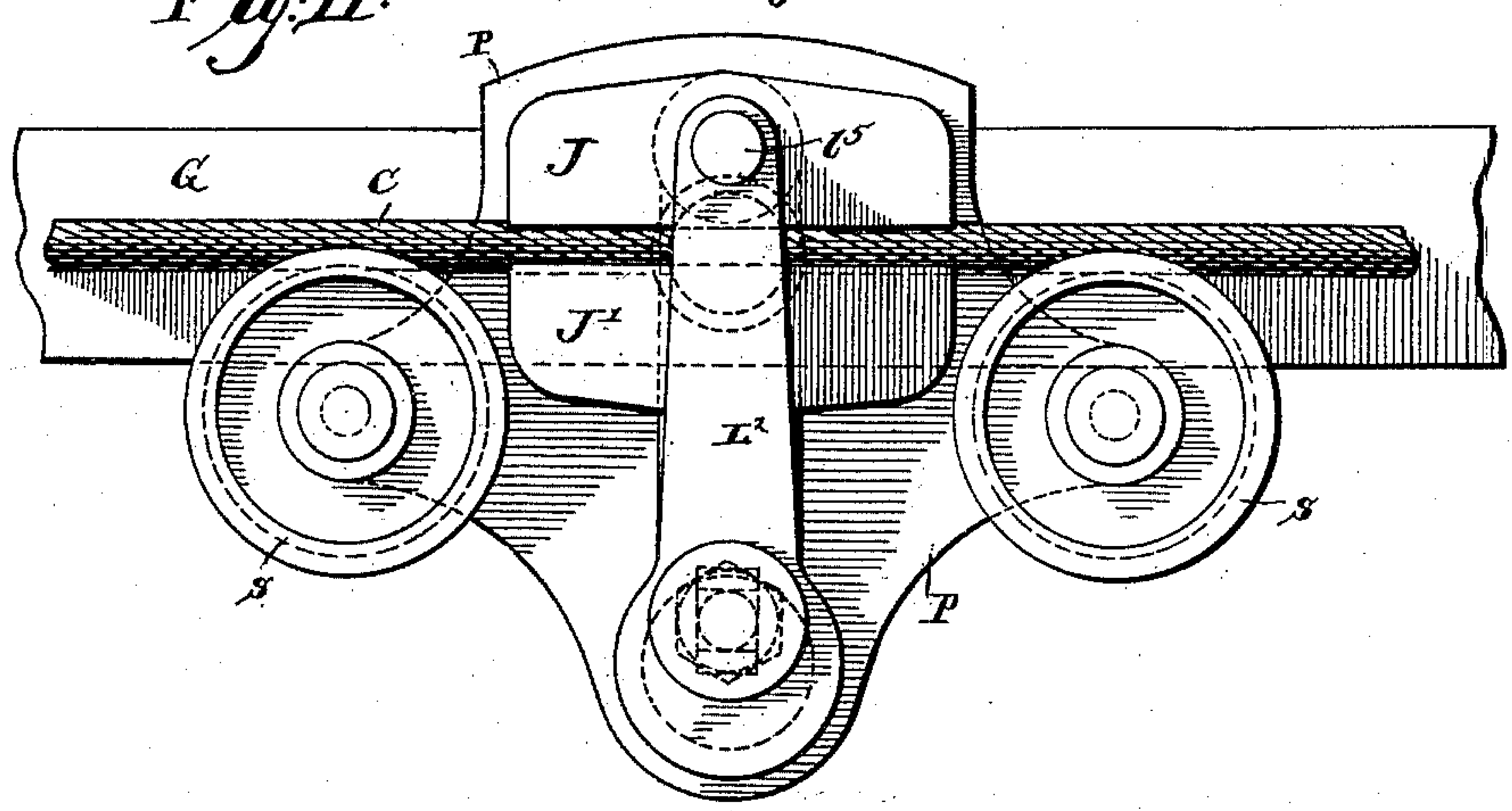
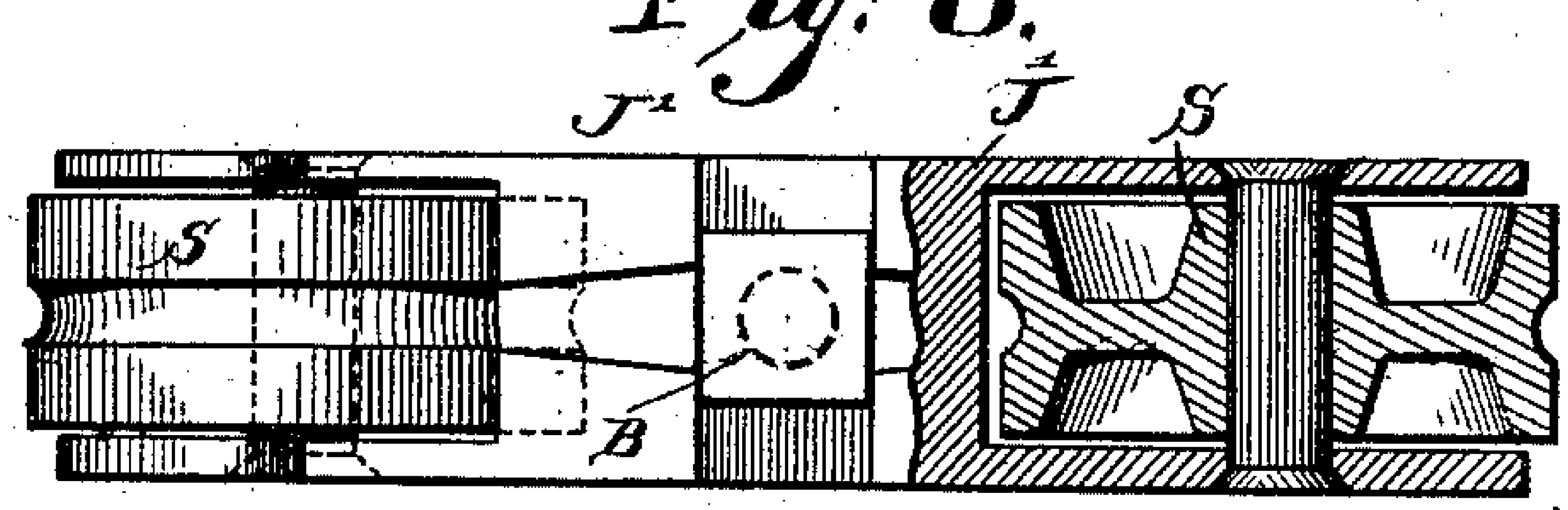


Fig: 8.



Witnesses:

Inventor:

Theodor Otto

(No Model.) 4 Sheets—Sheet 3.

T. OTTO.

CABLE GRIP.

No. 474,185. Patented May 3, 1892.

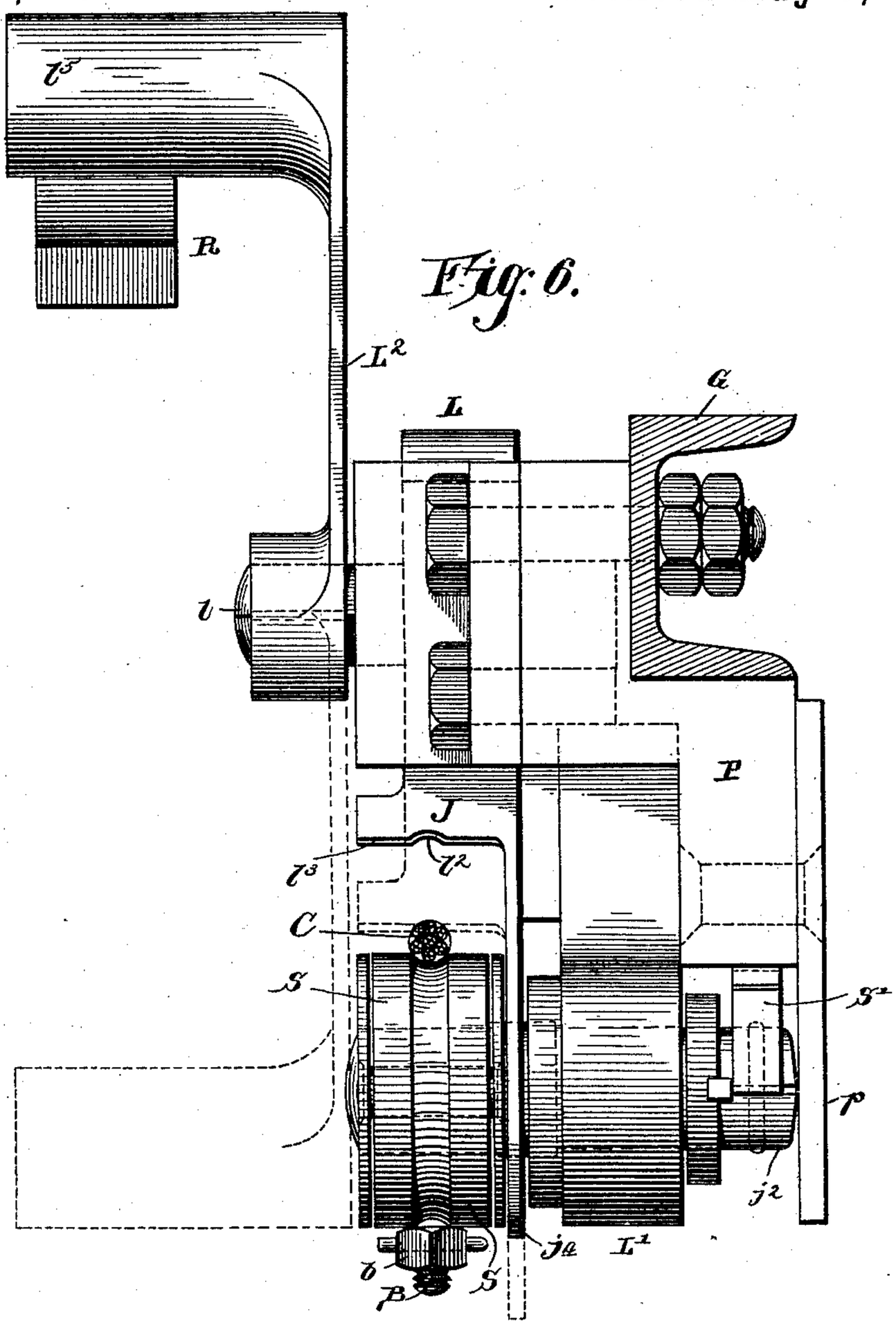


Fig. 6.

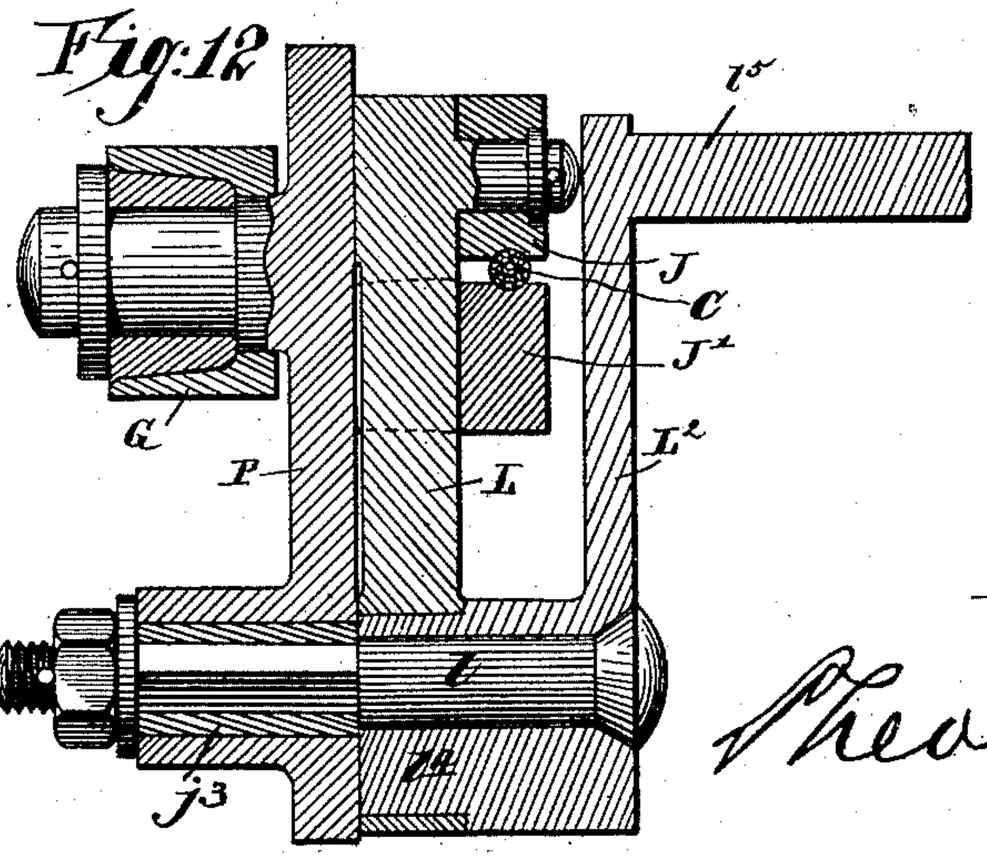


Fig. 12.

Witnesses:

Inventor:

Theodor Otto

(No Model.) 4 Sheets—Sheet 4.

T. OTTO.

CABLE GRIP.

No. 474,185. Patented May 3, 1892.

Fig: 7.

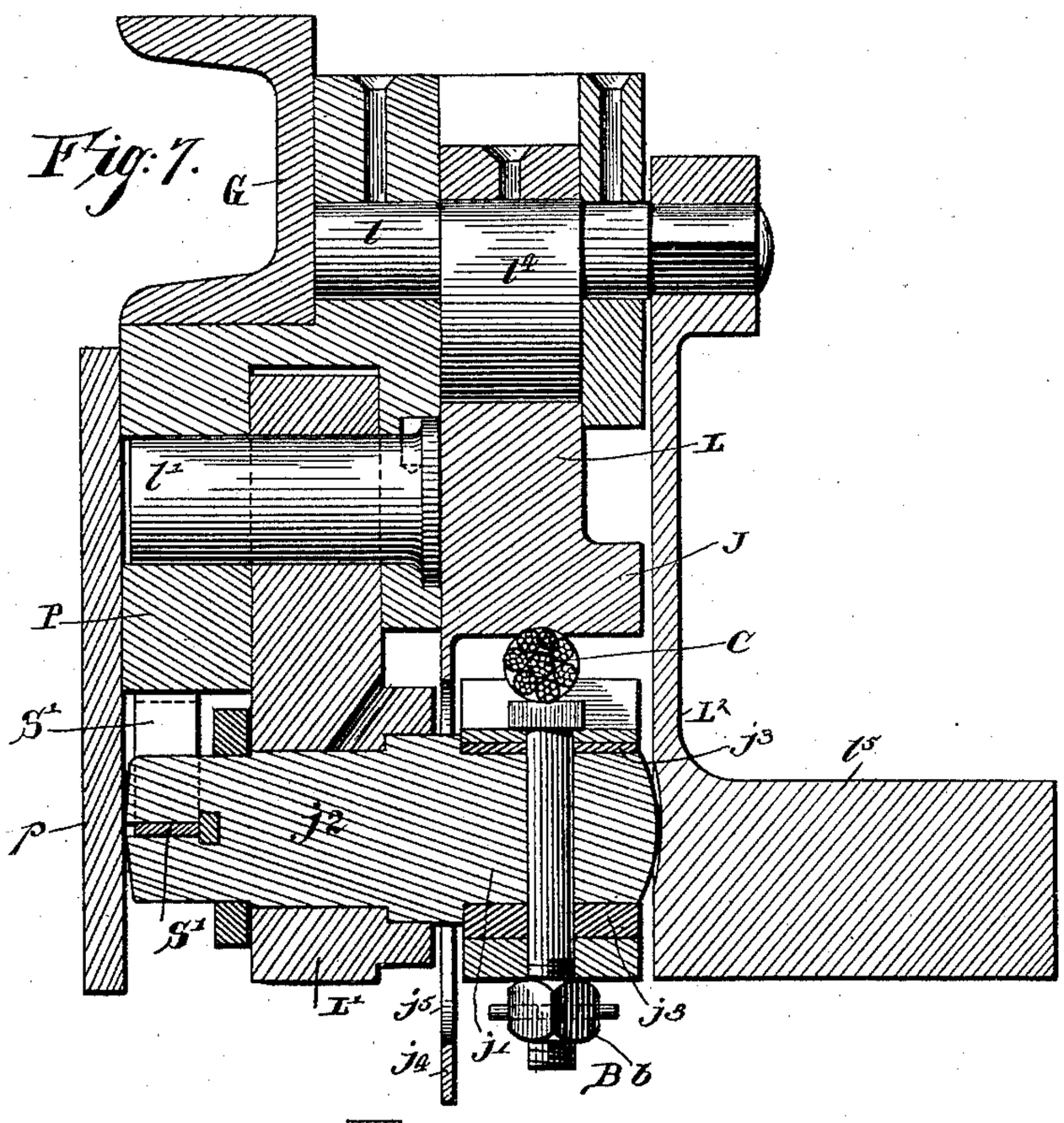
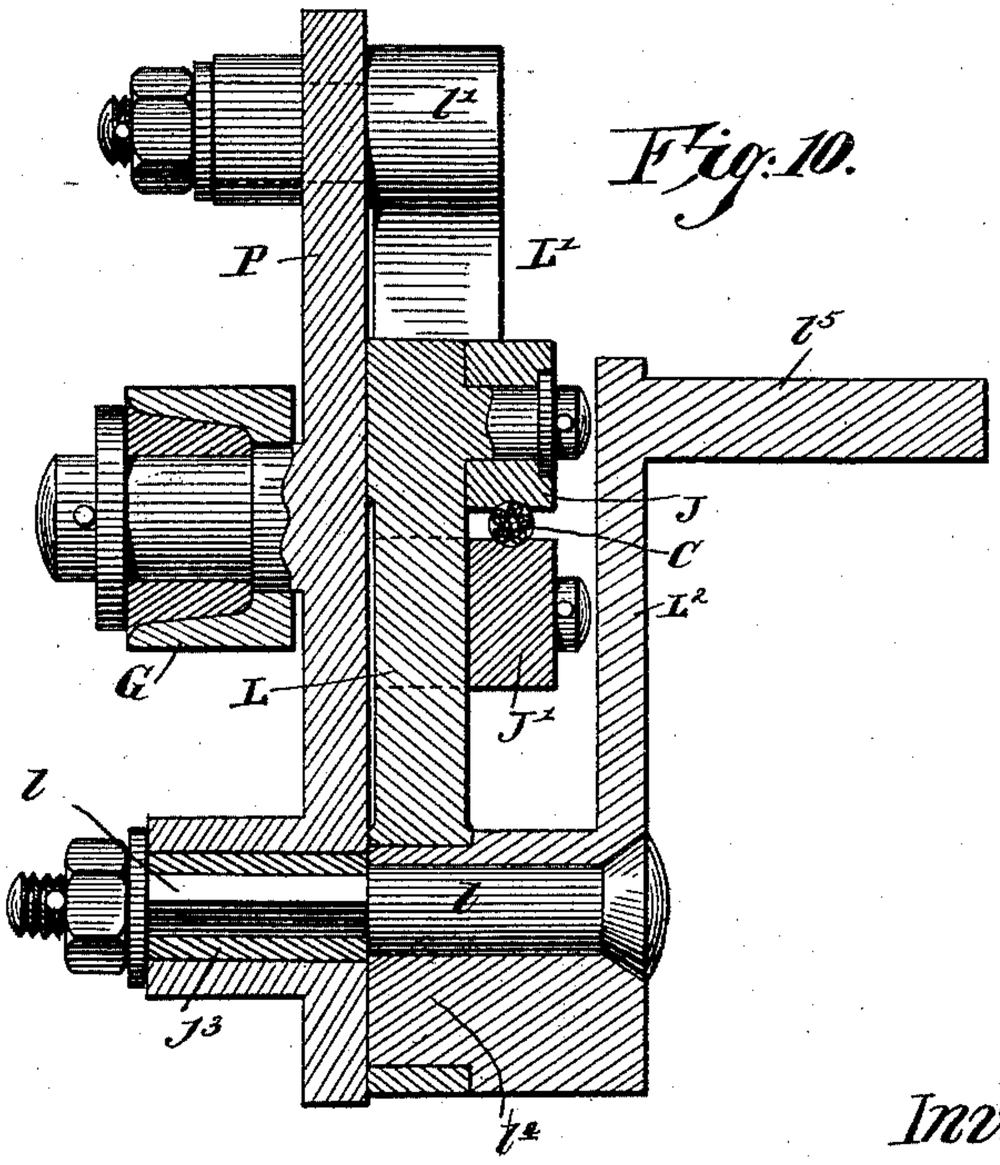


Fig: 10.



Witnesses:

Inventor:

Theodor Otto

UNITED STATES PATENT OFFICE.

THEODOR OTTO, OF SCHKEUDITZ, ASSIGNOR TO JULIUS POHLIG, OF COLOGNE, GERMANY.

CABLE-GRIP.

SPECIFICATION forming part of Letters Patent No. 474,185, dated May 3, 1892.

Application filed August 12, 1891. Serial No. 402,473. (No model.) Patented in Germany September 27, 1887, No. 44,876, and in England July 23, 1890, No. 11,549.

To all whom it may concern:

Be it known that I, THEODOR OTTO, civil engineer, a subject of the King of Prussia, residing at Schkeuditz, in the Kingdom of Prussia and Empire of Germany, have invented certain new and useful Improvements in Cable-Grips, (for which I have obtained Letters Patent in Germany, dated September 27, 1887, No. 44,876, and in England, dated July 23, 1890, No. 11,549;) and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to cable-grips for overhead-cable roads, and has for its object to provide a grip of simple construction, automatic in its operation, and so arranged that the gripping action or frictional contact between the rope and gripping devices will increase in proportion to the tractional power exerted by said rope, or, in other words, in proportion to the load thereon.

The invention consists in the combination of two gripping-jaws, one or both of which are arranged to vibrate in the plane of the haulage rope or cable and in circles intersecting each other, as well as the line of travel of the cable, and in structural features and combinations of co-operative elements, as will now be fully described, reference being had to the accompanying drawings, in which—

Figures 1, 2, 3, and 4 are schematic views illustrating various arrangements of the gripping-jaws. Fig. 5 is a front elevation, Fig. 6 a side elevation, and Fig. 7 a vertical central section, of a cable-grip constructed on the principle illustrated by Fig. 1. Fig. 8 is a sectional top plan view of one of the gripping-jaws. Fig. 9 is a front elevation, and Fig. 10 a vertical central section, of a cable-grip constructed on the principle illustrated in Fig. 3. Fig. 11 is a front view, and Fig. 12 a vertical central section, of a cable-grip constructed on the principle illustrated in Fig. 4.

The cable-grip forming the subject-matter of this invention comprises two gripping-jaws, one or both of which are adapted to vibrate in the plane of the haulage rope or cable in arcs of circles that intersect each other as well as the cable plane, and if one or both of said jaws are arranged so as to gravitate on their pivots the operation of the grip will be automatic. In order that both jaws may swing or vibrate in circles that intersect each other, as well as the plane of the cable, and cooperate to grip said cable, it is necessary that their pivotal axes should lie at different points in one and the same plane, so that in whatever direction the jaws may vibrate they will grip the cable between them, and the greater the pull of the cable—that is to say, the greater the resistance to the motion thereof—the greater will be the gripping action of the jaws, the tendency of the cable being to draw the jaws along and cause them to revolve on their respective axes.

The arrangement of the jaws relatively to the cable may be varied—for instance, as shown in Fig. 1. Both gripping-jaws J J′ have their pivotal axes above the cable C in a plane perpendicular thereto, and, as is readily seen, when said jaws are constructed so as to gravitate on their axes *a a′* they will always lie in a vertical plane with their operative faces on opposite sides of the cable, in which position of the jaws their said operative faces will be farthest from each other. If motion is imparted to the jaws in one or the other direction, their operative faces will describe arcs of circles 1 1 and 2 2, respectively, that intersect each other at 3, and if said jaws are pivotally connected with their vibrating support every point of their operative faces will move in the respective arcs of circles of their support, so that at the point of intersection the entire operating or gripping surface of the jaws will be in contact. Inasmuch as the gripping-faces of the jaws also intersect the plane of the cable—namely, the cable C—itself, they will contact therewith sooner and grip the same with a force corresponding to the resistance of the load to its motion. By arranging the jaws on their supports so as to contact with the cable when in

a normal position the operation of coupling will be automatic, since said cable will draw the jaws along.

To uncouple, it is simply necessary to provide means for shifting one of the gripping-jaws, and this may be done by arranging the support thereof so as to have motion in a plane at right-angles to the cable.

In Fig. 2 the jaws have their pivotal axes below the cable, and in order to support them in a normal vertical plane any suitable means—such as counterweights, a spring or springs, or other suitable devices—may be employed. In Fig. 3 the jaws have their pivots on opposite sides of the cable C, the same results being obtained. It is, however, not necessary that both jaws should describe circles that intersect each other and the cable, and this will be readily understood from a description of Fig. 4. If we imagine a vibratory gripping-jaw support of infinite length—as, for instance, the lever L for the upper jaw J—said jaw will move in a substantially straight line or in the plane of the cable C, while the lower jaw J′ will describe a circle that will intersect said plane, and consequently the cable, so that in practice one of the jaws may have a fixed relation to the other.

In Figs. 5 to 8, inclusive, I have shown a cable-grip embodying the principle referred to in respect to Fig. 1. A supporting frame or plate P, bolted to the carriage or carrier at any convenient point—as, for instance, to one of the longitudinal girts G—is provided with two bearings in the same vertical plane—one above the other—for the pivots or journals l and l' of two levers L and L′, respectively. The lower end of lever L constitutes the upper gripping-jaw, and has or may have its operative face corrugated transversely, as shown at l^3, and provided with a longitudinal groove l^2 for the cable C. (See Fig. 6.) That part of the pivot or journal l of lever L on which said lever has bearing is constructed in the form of an eccentric, as shown at l^4, Fig. 7, so that the said lever may have motion imparted thereto toward and from the cable C, as shown in full and dotted lines, Fig. 6, for the purpose of coupling the carriage to or uncoupling the same from said cable. This motion is imparted to the lever L by means of a hand-lever L^2, the handle portion L^5 of which is made sufficiently heavy to cause it to automatically return into its normal position by gravitation when moved out of it, thereby rendering the operation of the grip automatic. The uncoupling may be effected by hand or automatically by an inclined rail R at the stations, with which rail the portion l^5 of lever L^2 contacts, so as to turn the lever into the position shown in full lines in said Fig. 6. The lower jaw J′ has its opposite ends forked and provided with bearings for the journals of two sheaves or pulleys S S, that serve to support the cable C when the grip is disconnected therefrom, said jaw having a central rectangular transverse slot j for the reception of a like block j' at one end of a journal j^2, pivoted in the lower end of lever L′, and to which block the jaw J′ is secured by means of a bolt B and nut b, thus forming a balanced jaw adapted to vibrate with its journal in the lever and with said lever on the latter's journal, though, if desired, the journal j^2 may be rigidly connected with the lever L′. When, however, the balanced jaw J′ is adapted to vibrate on or with its journal and with the lever L′, every point of its gripping-face intermediate of the sheaves S will describe the same arc of a circle when vibrated in one or the other direction, thereby bringing the entire gripping-surface in contact with the cable C. As shown in dotted lines in Fig. 5, the diameter of the cable-carrier sheaves is so chosen or said sheaves have their journals so arranged relatively to the gripping-face of the jaw J′ that said face will lie slightly below the periphery of the sheaves, so that when the cable is held between the jaws it is slightly bent, as shown in said Fig. 5, thus preventing all liability of the cable slipping between the jaws. In order that the distance between the operative or gripping faces of the jaws may be adjusted within certain limits, washers j^3 of varying thickness are inserted between the upper and lower ends of the block j' and its bearing-slot j. The outer end of the journal j^2 is split, and in said split is secured a spring S′, the free ends of which have bearing on the support P, as shown in Figs. 5, 6, and 7, so as to maintain the jaw J′ in a normal horizontal position or return the same to said position when moved out of it. In order that both jaws may be made to vibrate synchronously, the upper jaw J has a slotted extension j^4, through the slot j^5 of which passes the journal j^2 of the lower jaw J′, Figs. 5, 6, and 7. The support P has a depending back plate p, that serves to confine the journals j^2 and l' and the free ends of the spring S′, though other means may be provided—as, for instance, the said journals may have their outer ends screw-threaded for the reception of a nut, while the free ends of the spring may be held against accidental displacement by pins or lugs depending from the support P. When both levers L and L′ have their pivotal axis below the haulage-rope, as shown in Fig. 2, any suitable means may be provided to hold the levers in a normally-vertical position. For instance, spring-abutments may be provided for said levers or for the jaws or counter-weights on extensions of the levers L and L′.

Referring now to Figs. 9 and 10, which show a cable-grip embodying the principles illustrated in Fig. 3, in which the jaws J and J′ have their axes of vibration on opposite sides of the cable C, the upper jaw J is pivotally connected with the lever L, whose fulcrum in this case is below said cable C in a frame or support P, that carries the sheaves or pulleys S, said frame being also bolted to one of the longitudinal girts G of the carrier or carriage.

The lower jaw J′, on the contrary, is here suspended from two links or levers L′ L′, journaled to support P, the adjustment of the upper jaw J toward and from the lower one J′ being also effected by washers or bushings j^3 of varying thickness on said journal, while the motion of the upper jaw toward and from the lower jaw in coupling or uncoupling is effected by the lever L^2, which has an eccentric portion l^4, on which said lever L has bearing, the eccentric l^4 being here formed on hand-lever L^2 instead of being formed on the journal of lever L, which may, however, also be the case in this construction, if so desired, said journal being then connected with the support P, so as to revolve in its bearings, while the hand-lever L^2 will be rigidly connected with said journal. In this construction every point of the gripping-faces of both jaws describe arcs of circles corresponding with those of their axes of vibration as said jaws vibrate in one or in the other direction, so that their entire gripping-faces are brought into contact with the cable C.

In Figs. 11 and 12 I have shown a cable-grip constructed according to the principles illustrated in Fig. 4, the lower jaw being in this case rigidly secured to the support P, said support or jaw taking the place of a lever of infinite length. In all other respects the grip is the same as that shown in Figs. 9 and 10.

In a grip constructed as described in reference to Figs. 9 to 12 the hand-lever L^2 is made sufficiently light so as not to overbalance the lever L and its jaw J in order to maintain said lever in its normal perpendicular position.

It will be seen that in all of the modifications in the arrangement of the vibrating or pendulous jaws, or the arrangement of a fixed jaw in combination with a vibrating or pendulous jaw, the coupling is automatic as soon as the lever L^2 is released or turned into proper position to bring the jaws into contact with the cable, while the uncoupling is rendered automatic, as above described, by the engagement of the lever L^2 with the inclined rail R.

The construction of the grip is extremely simple and its operation very effective, as it cannot loose its hold upon the rope except by power applied to the lever L^2.

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

1. A cable-grip comprising two juxtaposited gripping-jaws, one of said jaws vibrating on a pivot perpendicular to the haulage-rope, the gripping-face of said jaw describing an arc of a circle intersecting said rope and an arc of a circle passing through the gripping-face of the other jaw, for the purpose set forth.

2. A cable-grip comprising two juxtaposited gripping-jaws, a pendulous or vibratory support for one of said jaws, and a pivotal connection between the jaw and its support, which latter is arranged so that the gripping-face of the gripping-jaw pivoted thereto will describe an arc of a circle intersecting the plane of the other jaw, for the purpose set forth.

3. A cable-grip comprising two juxtaposited gripping-jaws, one of said jaws vibrating on a pivot perpendicular to the haulage-rope, the gripping-face of said jaw describing an arc of a circle intersecting the haulage-rope and an arc of a circle passing through the gripping-face of the other jaw, in combination with a shifting device for shifting the axis of vibration of the vibrating jaw toward and from the haulage-rope, for the purpose set forth.

4. A cable-grip comprising two juxtaposited gripping-jaws arranged relatively to each other, so that the gripping-face of one of said jaws will vibrate in an arc of a circle intersecting the plane of the operative face of the other jaw, and means for regulating the distance between the operative faces of said jaws, for the purpose set forth.

5. A cable-grip comprising two juxtaposited gripping-jaws vibrating on pivots perpendicular to the haulage-rope, the gripping-faces of said jaws describing arcs of circles intersecting each other and the haulage-rope, for the purpose set forth.

6. A cable-grip comprising two gripping-jaws, a pendulous or vibratory support therefor, and a pivotal connection between said jaws and supports, which latter are arranged so that the gripping-faces of the jaws will describe arcs of circles intersecting each other when said supports are vibrated, for the purpose set forth.

7. A cable-grip comprising two juxtaposited gripping-jaws vibrating on pivots perpendicular to the haulage-rope, the gripping-faces of said jaws describing arcs of circles intersecting each other and the haulage-rope, in combination with a shifting device for shifting the axis of vibration of one of the jaws toward and from the haulage-rope, for the purpose set forth.

8. A cable-grip comprising a fixed support provided with pivots perpendicular to the haulage-rope, and two gripping-jaws loosely mounted on said pivots, the gripping-faces of said jaws describing arcs of circles intersecting each other and the haulage-rope, for the purpose set forth.

9. A cable-grip comprising a fixed support and two juxtaposited gripping-jaws having their pivots on said support in a plane at right angles to and intersecting the plane of motion of the haulage-rope and vibrating in arcs of circles intersecting each other, for the purposes set forth.

10. The combination, with the haulage rope or cable of a cable road and the carriage, of a cable-grip comprising two juxtaposited pendulous or vibratory gripping-jaws arranged relatively to each other, so that their gripping-faces will describe arcs of circles intersecting each other, and a carrier for said cable connected with one of said jaws, for the purpose set forth.

11. A cable-grip comprising two juxtapositioned gripping-jaws, pendulous or vibratory supports therefor arranged relatively to each other, so that the gripping-faces of the jaws will describe arcs of circles intersecting each other, and a revoluble carrier consisting of a sheave or pulley at opposite ends of and journaled in the lower jaw and balancing each other, said jaw being pivotally connected with its pendulous or vibratory support, for the purpose set forth.

12. A cable-grip comprising two juxtapositioned gripping-jaws, pendulous or vibratory supports therefor arranged relatively to each other, so that the gripping-faces of the jaws will describe arcs of circles intersecting each other, a revoluble carrier consisting of a sheave or pulley at opposite ends of and journaled on the lower jaw and balancing each other, said jaw being pivotally connected with its pendulous or vibratory support, and a spring operating to hold the jaw in a normally horizontal position, for the purpose set forth.

13. A cable-grip comprising two juxtapositioned gripping-jaws, pendulous or vibratory supports therefor arranged relatively to each other, so that the gripping-faces of the jaws will describe arcs of circles intersecting each other, and a sheave journaled at each end of the lower jaw and balancing each other, said jaw having its gripping-face between the sheaves in a plane below their periphery, for the purpose set forth.

14. A cable-grip comprising two juxtapositioned gripping-jaws, pendulous or vibratory supports therefor arranged relatively to each other, so that the gripping-faces of the jaws will describe arcs of circles intersecting each other, a sheave journaled at each end of the lower jaw and balancing each other, and a shifting device for shifting the axis of vibration of one of said jaws, for the purpose set forth.

15. A cable-grip comprising two juxtapositioned gripping-jaws, a fixed support with which said jaws are pivotally connected at different points in the same plane, so that their gripping-faces will describe arcs of circles that intersect each other, and a regulating device for regulating the distance between the gripping-faces of the jaws, for the purpose set forth.

16. The combination, with the haulage rope or cable of a cable-road and a carriage, of a cable-grip comprising two jaws adapted to grip the cable from opposite sides, said jaws having a pendulous or vibratory motion on independent axes arranged on one and the same side of the cable either above or below and in a plane intersecting said cable, the gripping-faces of said jaws vibrating in arcs of circles intersecting each other, for the purposes set forth.

17. A cable-grip comprising two juxtapositioned gripping-jaws, pendulous or vibratory supports therefor arranged relatively to each other, so that the gripping-faces of the jaws will describe arcs of circles intersecting each other, a revoluble carrier consisting of a sheave or pulley at opposite ends of and journaled in the lower jaw and balancing each other, said jaw being pivotally connected with its pendulous or vibratory support, and a shifting device for shifting the axis of vibration of one of said jaws, for the purpose set forth.

18. A cable-grip comprising two juxtapositioned gripping-jaws, pendulous or vibratory supports therefor arranged relatively to each other, so that the gripping-faces of the jaws will describe arcs of circles intersecting each other, a revoluble carrier consisting of a sheave or pulley at opposite ends of and journaled in the lower jaw and balancing each other, said jaw being pivotally connected with its pendulous or vibratory support, and a regulating device for regulating the distance between the gripping-faces of the jaws, for the purpose set forth.

19. A cable-grip comprising two juxtapositioned synchronously pendulous or vibratory jaws having their axes of vibration above their gripping-faces and arranged so that said gripping-faces will describe arcs of circles intersecting each other, and a weighted lever connected with the axis of rotation of one of the jaws for maintaining the same in a normal position, for the purpose set forth.

20. A cable-grip comprising two juxtapositioned synchronously pendulous or vibratory jaws having their axes of vibration above their gripping-faces and arranged so that said gripping-faces will describe arcs of circles intersecting each other, a shifting device for shifting the axis of vibration of the upper jaw, and a weighted lever secured to said axis, for the purpose set forth.

THEODOR OTTO.

Witnesses:
WILHELM SCHMULLER,
FERD. PALM.