

No. 682,267.

Patented Sept. 10, 1901.

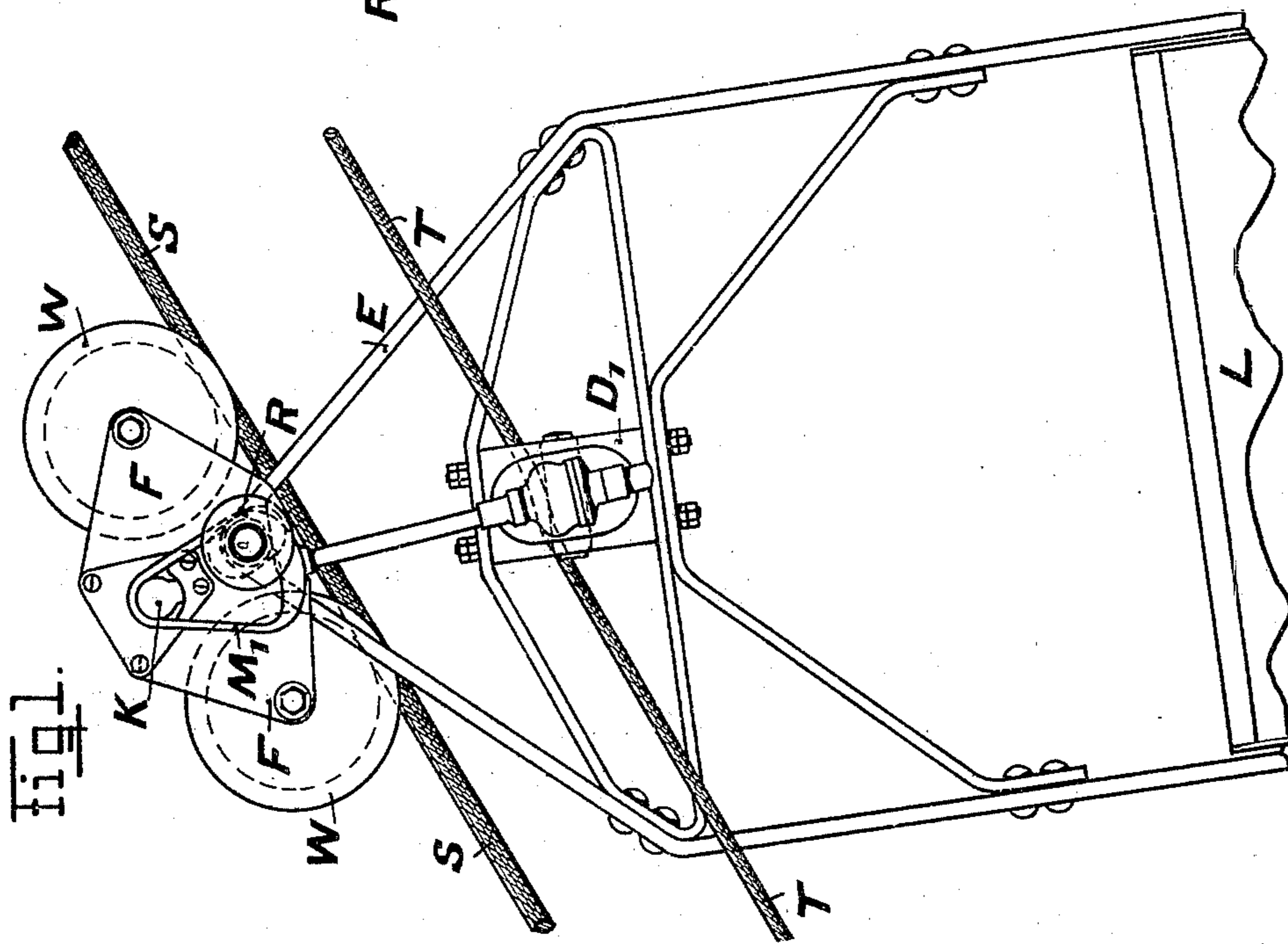
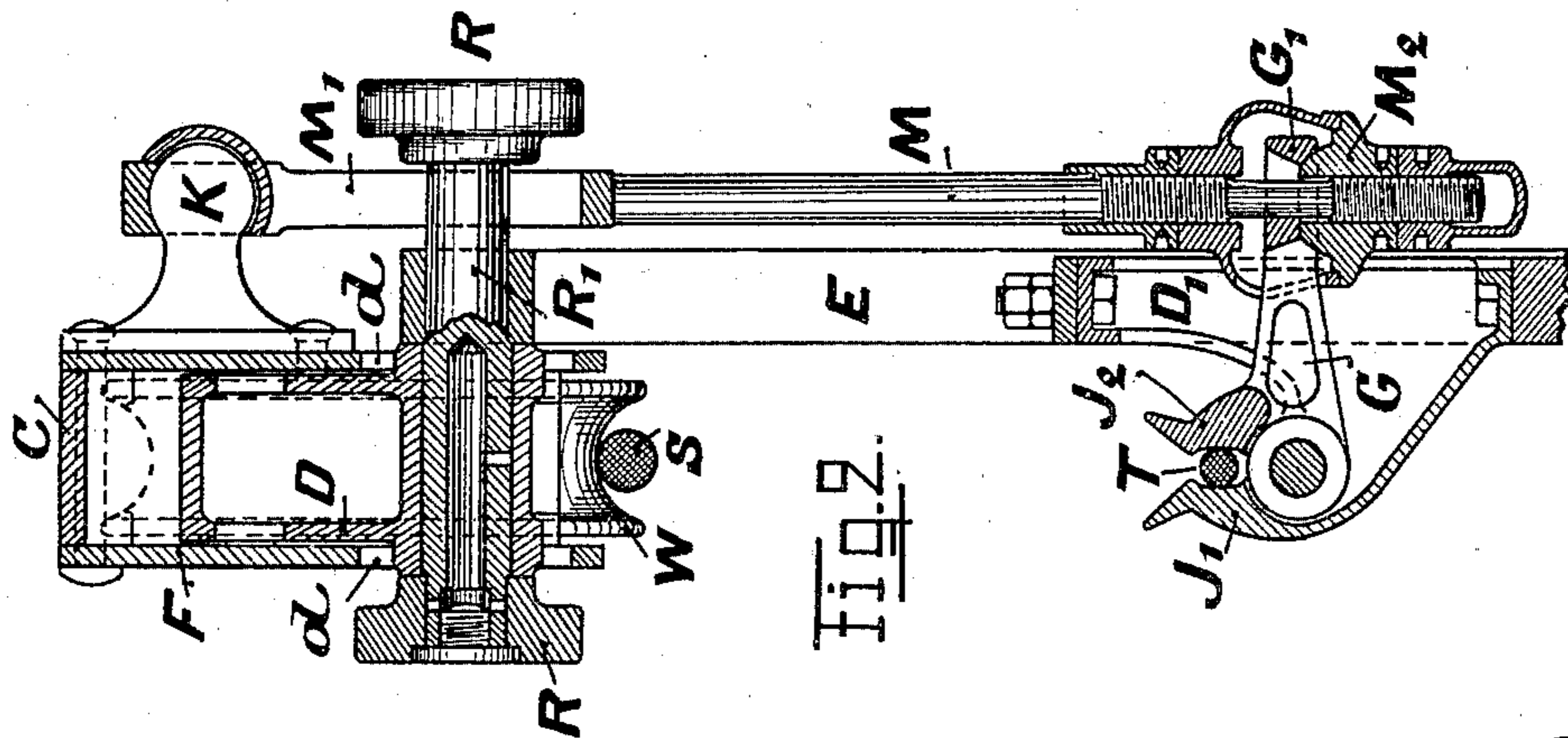
R. PFAFFENBACH.

GRIPPING DEVICE FOR SUSPENDED CABLE OR ROPE RAILWAYS.

(Application filed May 11, 1901.)

(No Model.)

3 Sheets—Sheet 1.



WITNESSES

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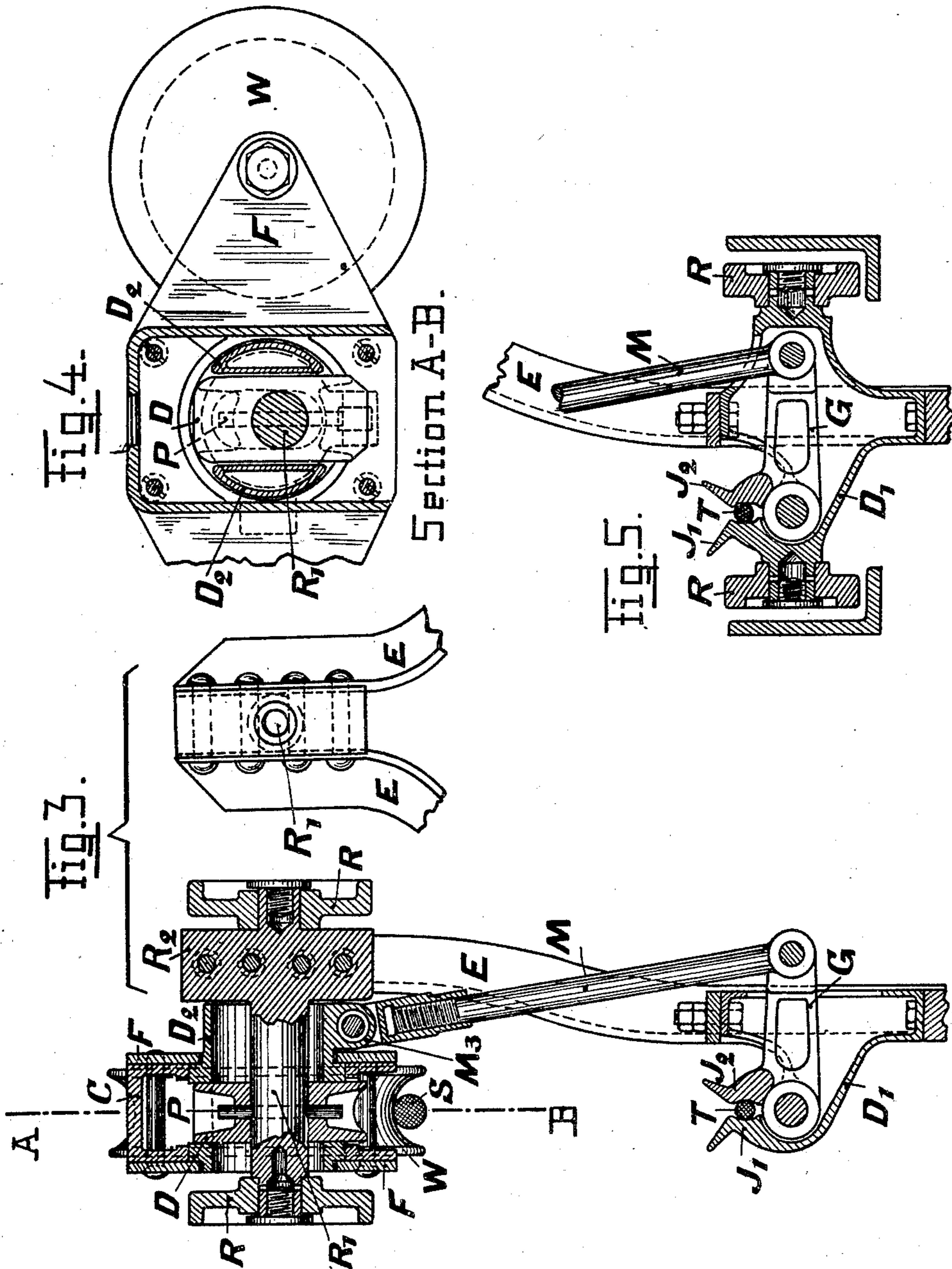
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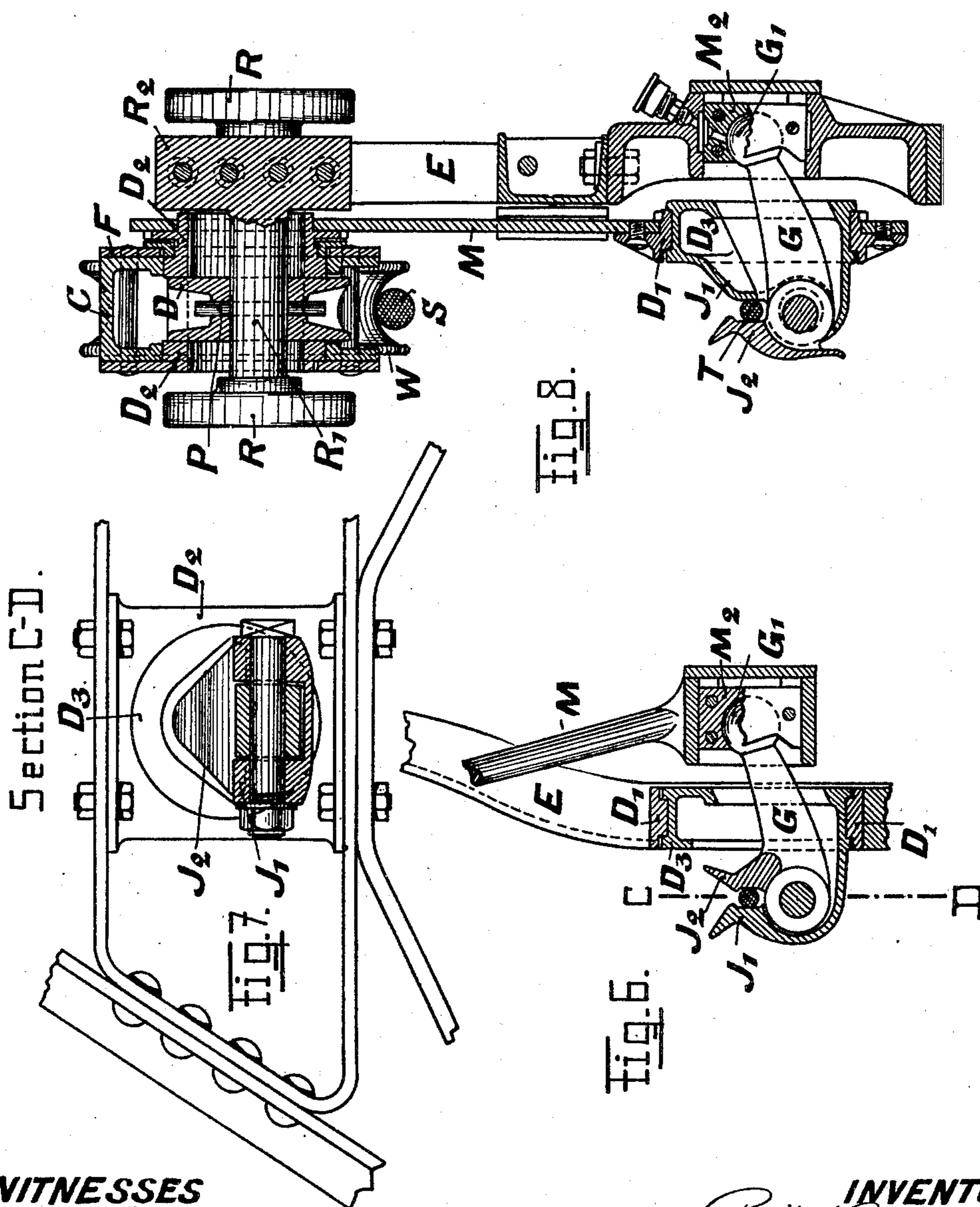
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UNITED STATES PATENT OFFICE.

RUDOLF PFAFFENBACH, OF LEIPSIC, GERMANY, ASSIGNOR TO ADOLF BLEICHERT & CO., OF SAME PLACE.

GRIPPING DEVICE FOR SUSPENDED CABLE OR ROPE RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 682,267, dated September 10, 1901.

Application filed May 11, 1901. Serial No. 59,806. (No model.)

To all whom it may concern:

Be it known that I, RUDOLF PFAFFENBACH, technical manager of the firm Adolf Bleichert & Co., Leipsic-Gohlis, a subject of the Emperor of Germany, residing at Leipsic, Pfaffendorferstrasse 34, have invented a certain new and useful Gripping Device for Suspended Cable or Rope Railways; 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.

This invention relates to an improvement of the gripping device described in the United States of America Patent No. 590,957. The characteristic feature of this arrangement is a sliding block vertically guided in the frame connecting the two driving-wheels of the car, from which block the whole weight of the load is suspended, and a clamp or gripping device, one jaw of which is attached to the said frame and the other jaw of which is connected by a lever mechanism to the said sliding block. The object of this arrangement is that by means of the weight of the load itself the sliding block is lowered in its guides in the frame, and thus by transferring its movement to the jaws of the clamp the latter is closed and powerfully grips the traction-cable. Moreover, in the aforementioned patent a number of modifications of this general inventive idea are embodied, in which the traction-cable is either arranged above or below the suspension-cable. The present invention exclusively refers to the latter modification, and by reference to Figures 15 and 16 of the above-mentioned patent the object of the present improvement will be now explained. In these figures the clamp or grip is attached to an arm or extension stretching downward from the frame of the car, and, as will be seen from Fig. 16, the position of this arm will follow the inclination of the car when the latter is passing over gradients, and will therefore assume a position considerably diverging from the vertical, whereas the pressure exercised by the load upon the car acts in a purely-vertical direction at the point designated, *d* in the drawings, Fig. 16. The result of this action will be to distribute the load unequally upon the two wheels of the car, one wheel be-

ing eased and the other one being additionally weighted as soon as a pull is exercised upon the traction-cable. It has been found in some cases that this inequality of the load sustained by the two wheels can increase so much as to cause considerable danger of derailment to the vehicle.

The present invention has for its object to avoid this danger and to arrange the automatic grip in such a way that the pressure on both wheels is practically the same in any position the car can assume.

My invention consists in attaching one of the jaws constituting the gripping device to the framework of the hanger carrying the load instead of the frame connecting the driving-wheels and correspondingly arranging the other parts so as to retain the automatic action of the grip in all other respects.

A selection of preferred practical embodiments of this invention is illustrated in the accompanying drawings, of which—

Fig. 1 is a side view of a complete vehicle placed on an inclined portion of the suspension-cable; Fig. 2, a vertical section showing details of construction; Fig. 3, a similar vertical section showing a partly-modified improved form of the present invention; Fig. 4, a section on line A B in Fig. 3; Fig. 5, a vertical section of the grip arrangement, showing a modification; Figs. 6 and 7, two different vertical sections showing further modifications of the grip mechanism, and Fig. 8 another modification.

The same letters of reference apply to the same parts in all the figures.

Referring first to Fig. 1, S is the suspension-cable, and T the traction-cable.

W W are the driving-wheels that carry the car and are connected by the frame F, the latter being substantially composed of two side plates firmly united by suitable connecting pieces and bolts, so as to form one integral part. Between the two side plates of the frame F suitable guides are formed, in which the block D can freely slide up and down. Opposite the block D vertical slots *d d* are cut out in the side plates of the frame F, and projecting outward through the slots *d d* are the ends of a bearing fashioned in the sliding block D. This bearing contains the shaft of a

pair of rollers R R. The one projecting end of the bearing is longer than the other and carries the hanger E, from which the load L is suspended. The framework of this hanger carries a second fixed block D', preferably made of one casting with the fixed jaw J' of the gripping device. The projecting arm, ending in the fixed jaw J', is also arranged so as to make a bearing or pivot for the movable jaw J², and integral with this movable jaw J² the lever G extends backward from the gripping device. Immediately above the slot *d* in the side plate of the frame F a button or knob K is firmly attached to the latter by rivets or other suitable means, and from this knob a link M is suspended, which connects the frame F with the rear end of the lever G. In the drawings the preferred form of construction is illustrated, in which the knob K is located above the slot in the side plate of the frame F and in which the upper end of the link is provided with a loop in order to allow it to swing free of the projecting end of the sliding block D. However, it will be understood that practically the same effect in all respects would be obtained if the knob K were fastened to the frame below the slot. The link M is provided with means for adjusting its length, and the connection between its lower end and the rear end of the lever G is of the nature of a universal or ball-and-socket joint, the ball being formed by the spherically-shaped head of a block M², adjustably fixed onto the lower end of the link M, and the socket by a corresponding cup G', fashioned in the lower side of the rear end of the lever G. The object of this latter arrangement will appear hereinafter.

It will be readily seen that this device acts in the same way as the similar arrangement described in Patent No. 590,957. As has been fully explained in that patent, the rollers R R are supported on fixed rails as long as the car is at a station, and therefore the load which is carried by the bearings of these rollers will be raised to a certain extent relatively to the frame F of the car. In this position of the vehicle, therefore, the link M will depress the rear end of the lever G and will open the grip; but as soon as the car is pushed onto a portion of the line having no rails supporting the rollers R R the load will sink down, carrying with it the sliding block D; but the frame F, being supported on the driving-wheels, cannot follow this downward motion, and the relative movement between the sliding block D and the fixed block D' thus caused will result in a closing of the jaws J' and J² of the grip. In the oblique position which the vehicle assumes when running up or down a gradient, as will be seen in Fig. 1, the link M does not exactly coincide with a line connecting the joint between this link and the lever G and the center of the rollers R. This slight lateral deflection of the link M is, however, allowed for by making the said joint a ball-and-socket joint, as has been de-

scribed above. By this arrangement inequality of pressure on the driving-wheels is practically prevented, because the force acting upon the vehicle is the resultant of the force of gravity and the pull exercised by the traction-cable T, and this resultant practically passes through the center of the car, and therefore affects both driving-wheels equally. However, since the points of attachment of the link M and the hanger E—namely, the knob K and the bearing of the rollers R R—do not quite coincide, which would be theoretically the condition that ought to be complied with to obtain an equal pressure on both wheels in all positions of the car, and to avoid all up-and-down movement of the block D when the car is passing over gradients of varying degree I in most cases prefer the modification shown in Fig. 3. In this modification a circular opening is provided in each of the side plates of the frame F, and a substantially cylindrical block D² is placed in these openings in such a way that it can turn freely around its axis. In this block D² a vertical slit is formed, (clearly shown in Fig. 4,) and the block D is loosely guided in this slit, so that it can freely move up and down. A hole is bored in the center of the sliding block D, and a cylindrical bar R' is passed through it and is held in position by the pin P. Formed, preferably, of one piece with the bar R' is a block R², which serves to connect it firmly with the hanger E. The ends of the bar R' are provided with journals for the rollers R R. The cylindrical block D² projects beyond the side plate of the frame F, and the projecting part is provided with an eye M³, to which the link M is pivotally connected by means of a forked head and pin. As in this case, there is no relative lateral movement between the link M and the hanger, the ball-and-socket joint connecting the latter with the rear end of the lever G is omitted, and an ordinary joint takes its place. In all other respects the arrangement of the block D' and the grip is the same as that shown in Fig. 1.

As will be readily seen, this mechanism will automatically adjust itself to any inclination of the road. The weight of the load will tend to give the hanger a purely-vertical position and block R², bar R', and block D will follow, giving the block D² a corresponding turn in its bearings in the side plate of the car. As long as the rollers R R are supported, the frame F will be free to sink downward, allowing the block D to slide upward in its guides correspondingly, and thereby keeping the jaws of the grip open, as has been fully explained above; but as soon as the vehicle is pushed onto a portion of the line not provided with rails for supporting the rollers R R the block D, bar R', block R², and hanger E will sink down, following the weight of the load, and will carry with them the block D'. Block D², however, remains stationary, because it is supported by the frame F of the car, and by means of the link M the rear end

of the lever G is therefore raised with relation to the block D' and the grip is closed upon the traction-cable. The pull of the traction-cable now coming into play will somewhat deflect the hanger and load out of the vertical position; but the parts by which it is sustained will be perfectly free to follow this deflection, and the resulting force acting upon the driving-wheels will pass through the center of the bar R', which being located centrally between the two driving-wheels will distribute the load equally on both. At the same time another advantage is gained by this arrangement as compared with the arrangement shown in Figs. 1 and 2. As has been explained with reference to Fig. 1, the block D slides in a direction at right angles to the inclination of the line, and therefore the pressing force acting upon the hauling-rope will decrease with the cosine of the angle of inclination, while the friction opposed to the up-and-down movement of the block will increase with the sine of this angle. With the arrangement shown in Fig. 3 and the following the movement of the block D takes place in the direction of the inclination of the hanger without loss by friction and without perceptible loss by inclination. Since the grip of the jaws J' and J² ought to be more powerful in steep than in light gradients or on horizontal portions of the line, an appreciable advantage is thus introduced by the arrangement described above with reference to Figs. 3 and 4. The journals carrying the rollers R R need not be attached to the bar R', since evidently the nature of the whole mechanism and its essential action will remain unchanged as long as they are attached to any portion of the hanger or other parts rigidly connected to the same. Thus, for instance, in certain cases I prefer to attach these journals to the block D'. This modification is shown in Fig. 5 and will be understood therefrom without further explanation.

Referring now once more to Fig. 1, it will be seen that though the hanger will take a slightly-oblique position under the influence of the pull of the traction-cable it will in most cases not hang at right angles to the direction of the latter. The result will be that a slight bend will be introduced into the traction-cable immediately in front and in the rear of the grip, as clearly illustrated in Fig. 1. Though this circumstance is almost of no importance in practice, I have found it useful to devise a further modification of the arrangement already described, by which the grip is mounted in such a way as to be at liberty to adapt itself automatically to the direction of the traction-cable in any position of the hanger. This modification is shown in Figs. 6 and 7.

The construction of the car, turning block D², sliding block D, and the other parts co-operating with them is the same as above described with reference to Figs. 3 to 5. The

modification merely applies to the stationary block D', fastened to the hanger. This stationary block D' in the modification shown in Figs. 6 and 7 is provided with a circular opening, forming a bearing for a second block D³, loosely fitted into it in such a way as to turn freely around its geometrical axis. This second block D³ is provided with an extension on one side ending in the fixed jaw J' of the grip. The second or movable jaw J² forms one piece with the lever G, as in the above-described forms; but the joint connecting the link M with the lever in this case is again a universal joint, the preferred construction of which is shown in Fig. 6. The rear end of the lever G is formed by a spherical head G', movably held in a case M², containing a corresponding spherical cavity. By this means it will be understood that the whole gripping mechanism, comprising the parts D³, J', and J², can freely turn around the geometrical axis of the block D³, and will therefore automatically adapt itself to any angle the hanger may assume with relation to the traction-cable.

In the embodiments of my invention hitherto described the rear end of the lever G has invariably been shown connected to the lower end of the link M, and thereby with that part of the car which is directly supported by the driving-wheels. It will, however, readily be understood that the nature of the present invention is not affected when instead the fixed jaw J' of the grip is attached to the link M and the movable jaw J² is connected with the hanger E. This form of construction, combined with the modification described with reference to Figs. 6 and 7, is shown in Fig. 8. The block D', with the circular opening containing the block D³, is in this case attached to the link M, and the socket M², containing the ball G', forming the head of the lever G, is fastened to the hanger E. As will be understood without further explanation, this interchange of parts might be applied to any of the above-described forms without in any way affecting the action of the mechanism.

Having now particularly described and ascertained the nature of my said invention and the manner in which the same is to be performed, I declare that what I claim is—

1. In an automatic gripping mechanism for the vehicles of suspended cable or rope railways such as described the combination with a hanger pivotally suspended from a block adapted to slide up and down in guides in the frame of the car, said hanger being provided with means for carrying the load, of a pair of jaws forming a grip one of which is attached to said hanger and the other of which is connected by a link to the stationary framework of the car, substantially as and for the purpose described.

2. In an automatic gripping mechanism for the vehicles of suspended cable or rope railways such as described the combination with a hanger pivotally suspended from a block sliding in substantially vertical guides in the

frame of the car, said hanger being provided with means for carrying the load, of a pair of jaws forming a grip one of which is attached to said hanger and the other of which is connected by a link to the stationary framework of the car, said link being hinged at both ends by means of universal joints, substantially as and for the purpose described.

3. In an automatic gripping mechanism for the vehicles of suspended cable or rope railways such as described the combination with a substantially cylindrical block placed in corresponding bearings in the frame of the car and containing a second block adapted to slide freely up and down in guides diametrically arranged in said cylindrical block, of a hanger suspended from said sliding block and provided with means for carrying the load and of a pair of jaws forming a grip one of which is attached to said hanger and the other of which is connected by means of a link to the aforesaid cylindrical block, substantially as and for the purpose set forth.

4. In an automatic gripping mechanism for the vehicles of suspended cable or rope railways such as described the combination with a substantially cylindrical block placed in corresponding bearings in the frame of the car and containing a second block adapted to slide freely up and down in guides diametrically arranged in said cylindrical block, of a hanger suspended from said sliding block and provided with means for carrying the load, of one of a pair of gripping-jaws fixedly attached to said hanger, of the second of said pair of jaws pivotally connected to the first and provided with a lever of suitable length and of a link connecting the free end of said lever with said cylindrical block, substantially as and for the purpose described.

5. In an automatic gripping mechanism for the vehicles of suspended cable or rope rail-

ways such as described the combination with a substantially cylindrical block placed in corresponding bearings in the frame of the car and containing a second block adapted to slide freely up and down in guides diametrically arranged in said cylindrical block, of a hanger suspended from said sliding block and provided with means for carrying the load, of one of a pair of gripping-jaws fixedly attached to said hanger, of the second of said pair of jaws pivotally connected to the first and provided with a lever of suitable length the free end of which is connected by a link with said cylindrical block and of means for adjusting the length of said link, substantially as and for the purpose set forth.

6. In an automatic gripping mechanism for the vehicles of suspended cable or rope railways such as described the combination with a substantially cylindrical block placed in corresponding bearings in the frame of the car and containing a second block adapted to slide freely up and down in guides diametrically arranged in said cylindrical block, of a hanger suspended from said sliding block and provided with means for carrying the load and of a pair of jaws forming a grip one of which is attached to said hanger and the other of which is connected by means of a link to the aforementioned cylindrical block, the fixed jaw being placed in a bearing and the free end of the lever controlling the movable jaw being provided with a universal joint, substantially as and for the the purpose set forth.

In witness whereof I have hereunto set my hand in presence of two witnesses.

RUDOLF PFAFFENBACH.

Witnesses:

RUDOLPH FRICKE,
J. W. RICHTER.