4 Sheets--Sheet 1.

J. HEBERLEIN.

Car-Brakes.

No. 152,490. Patented June 30, 1874.

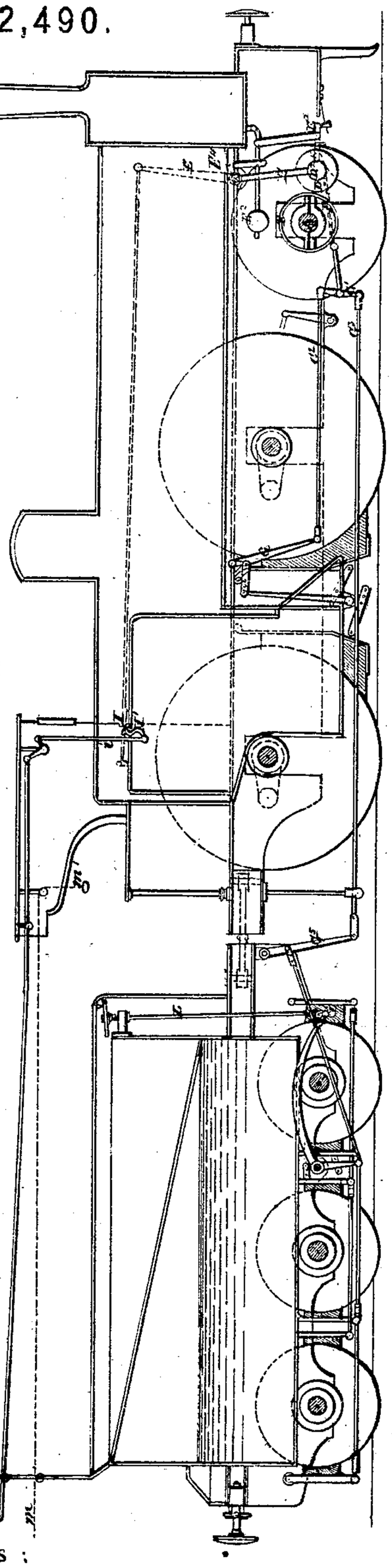

Fig. 1.

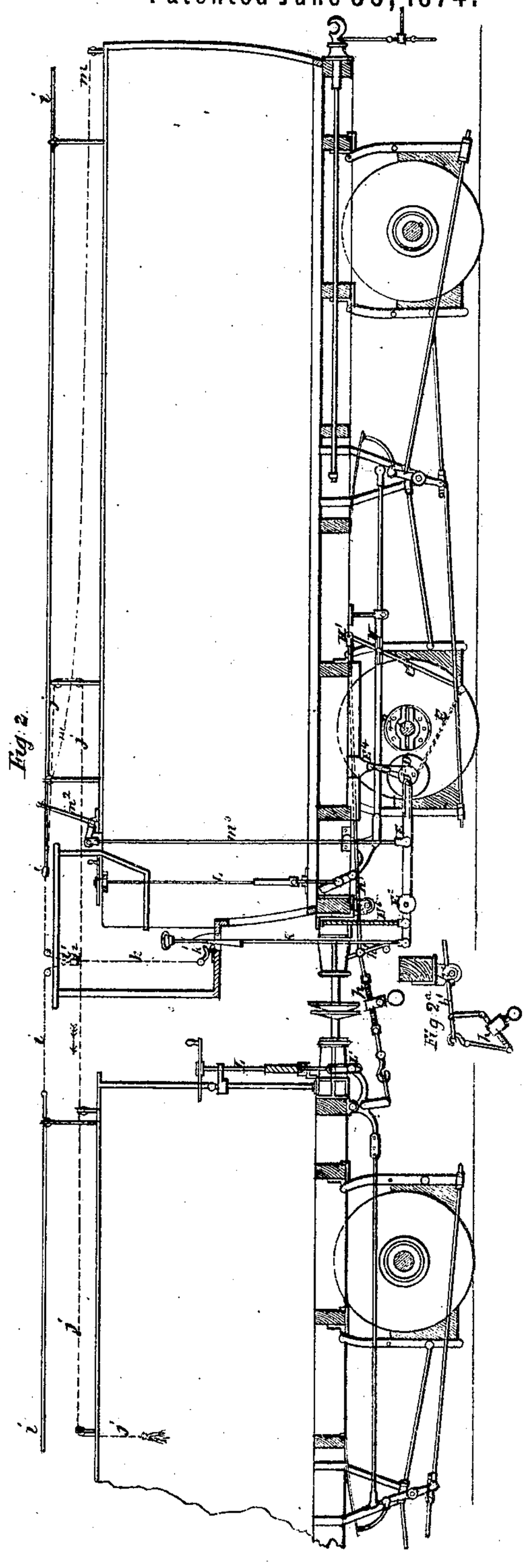

Fig. 2.

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4 Sheets--Sheet 2.

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Car-Brakes.

No. 152,490. Patented June 30, 1874.

Fig. 3.

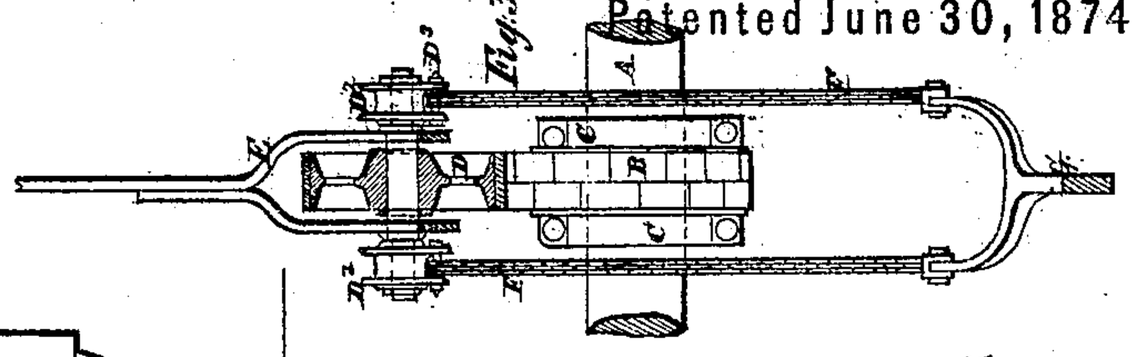


Fig. 9.

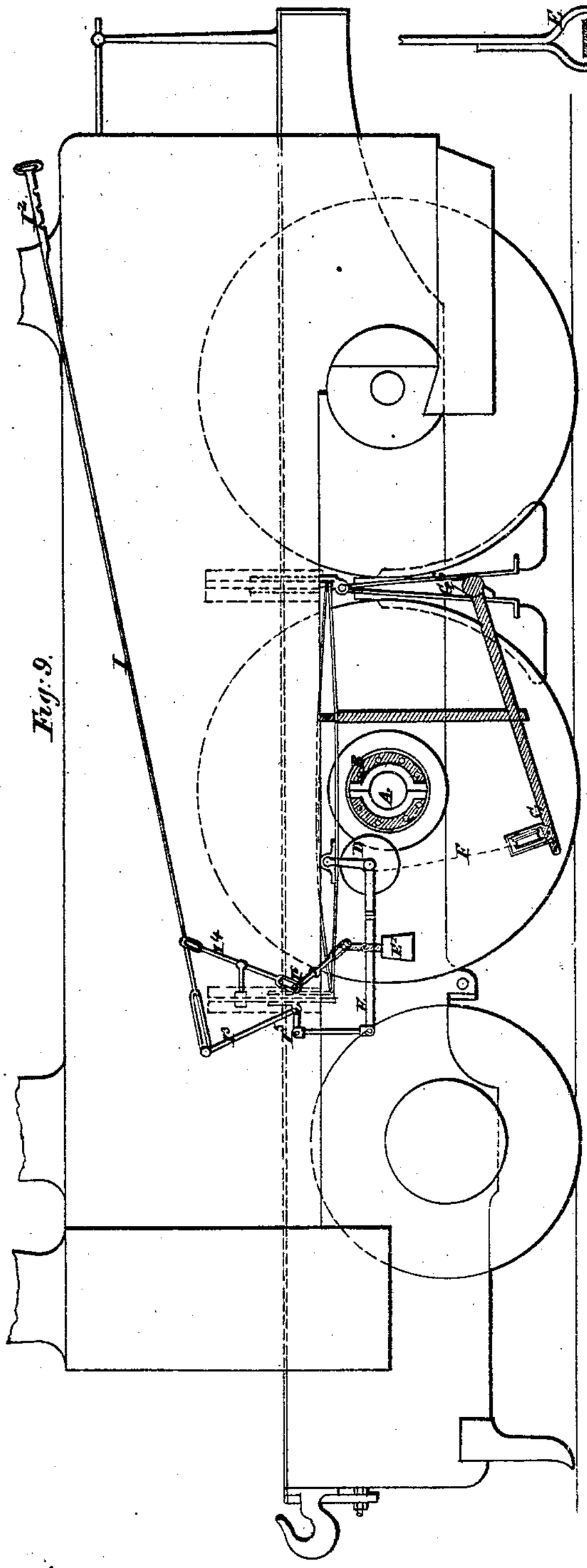


Fig. 12.

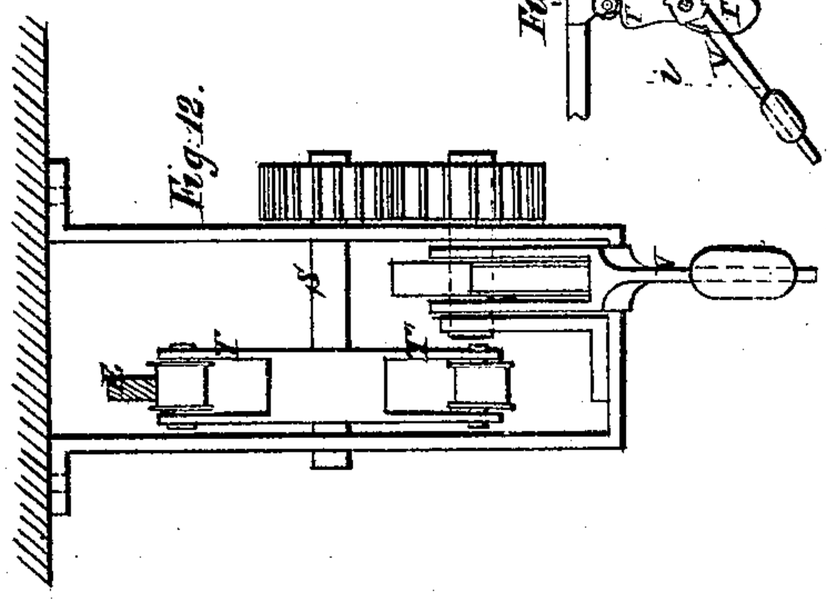


Fig. 13.

Fig. 11.

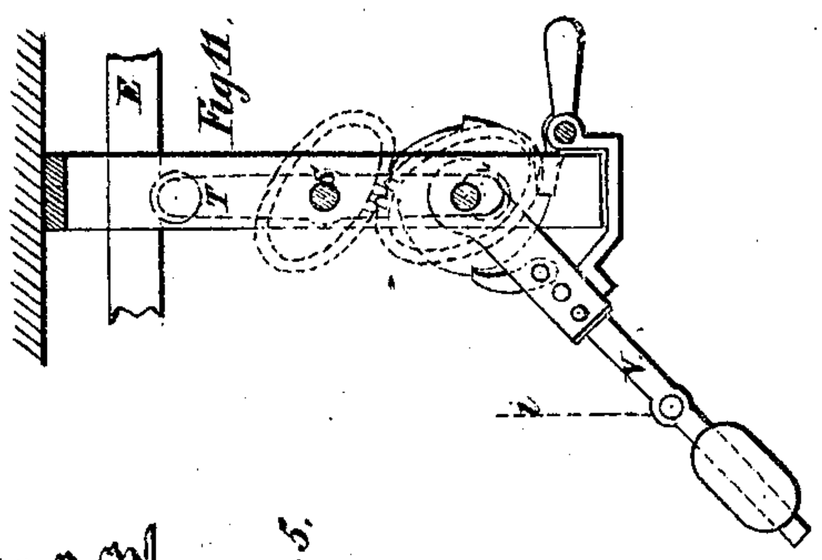


Fig. 5.

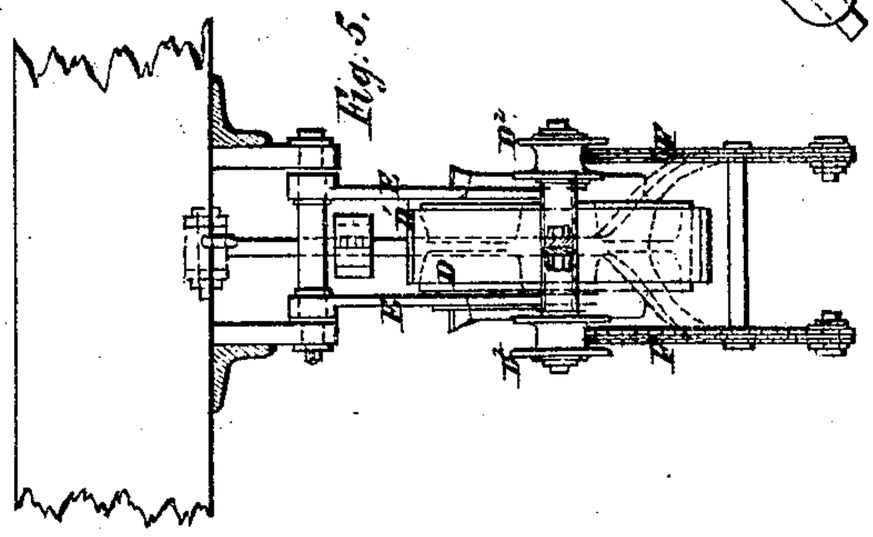
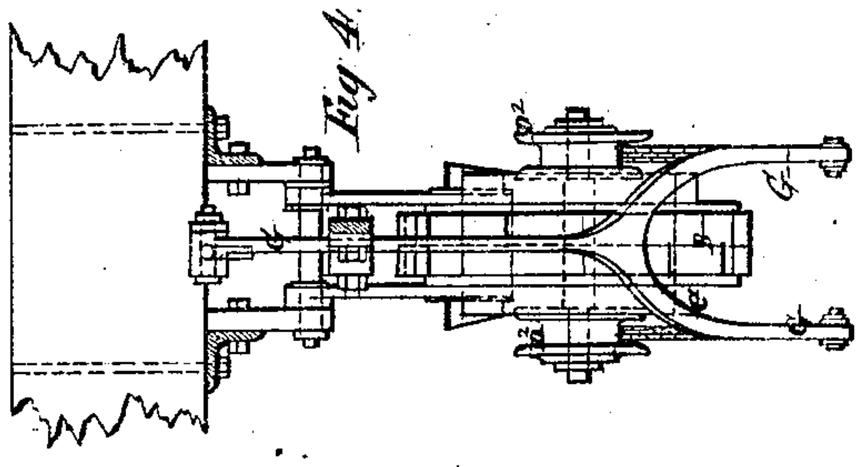


Fig. 4.



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4 Sheets--Sheet 3.

J. HEBERLEIN.
Car-Brakes.

No. 152,490. Patented June 30, 1874.

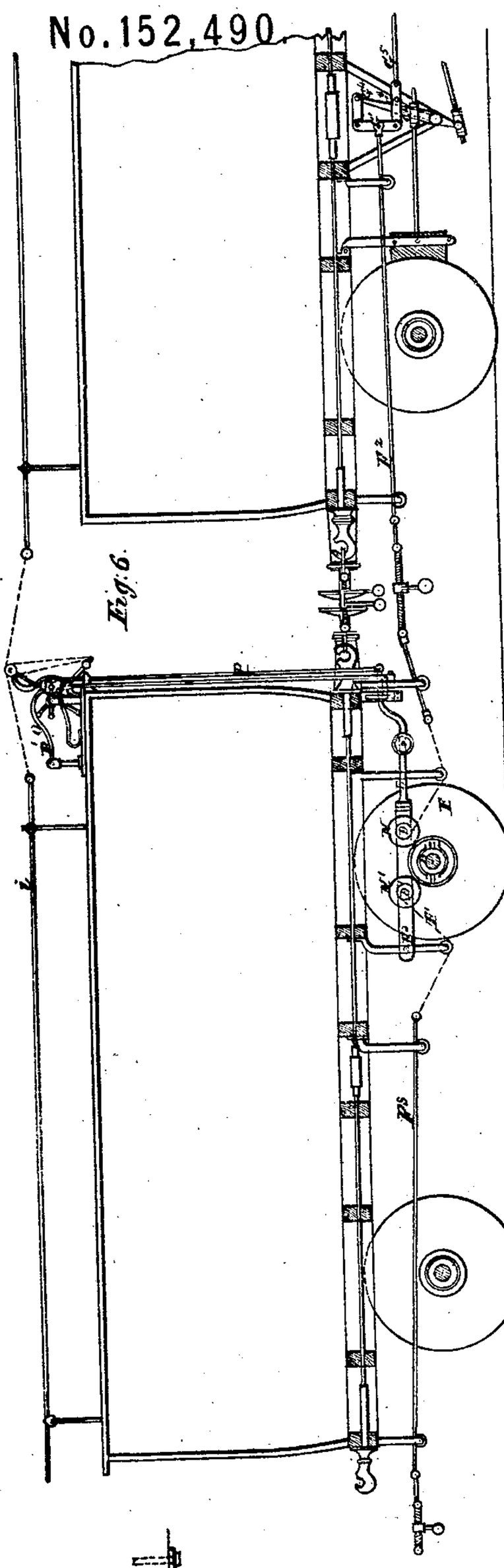

Fig: 6.

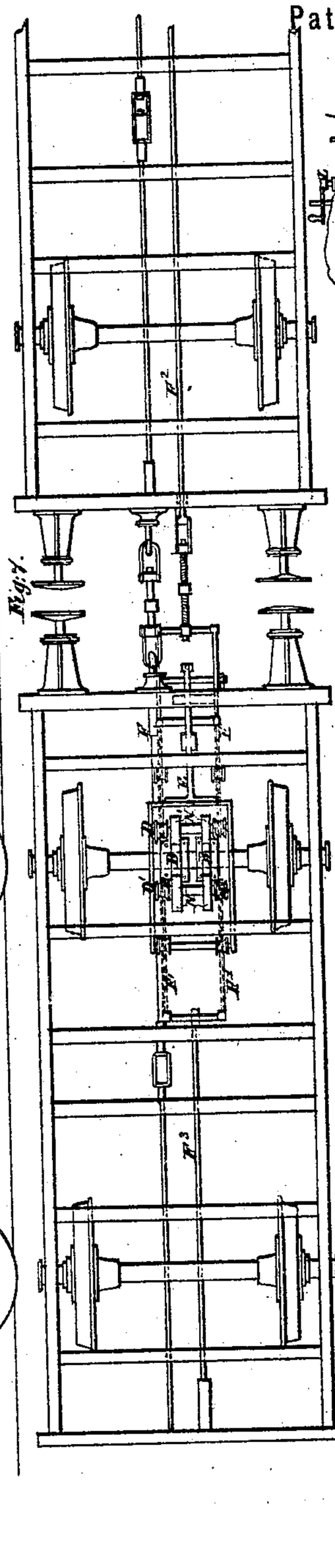

Fig: 9.

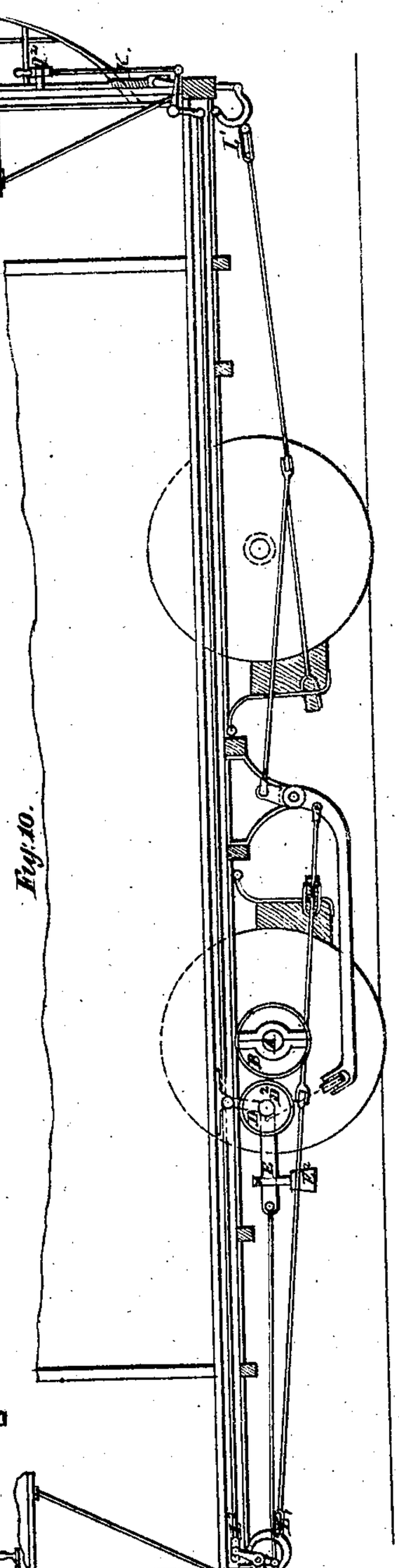

Fig: 10.

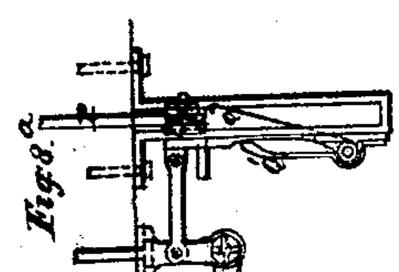

Fig: 8.a

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4 Sheets--Sheet 4.

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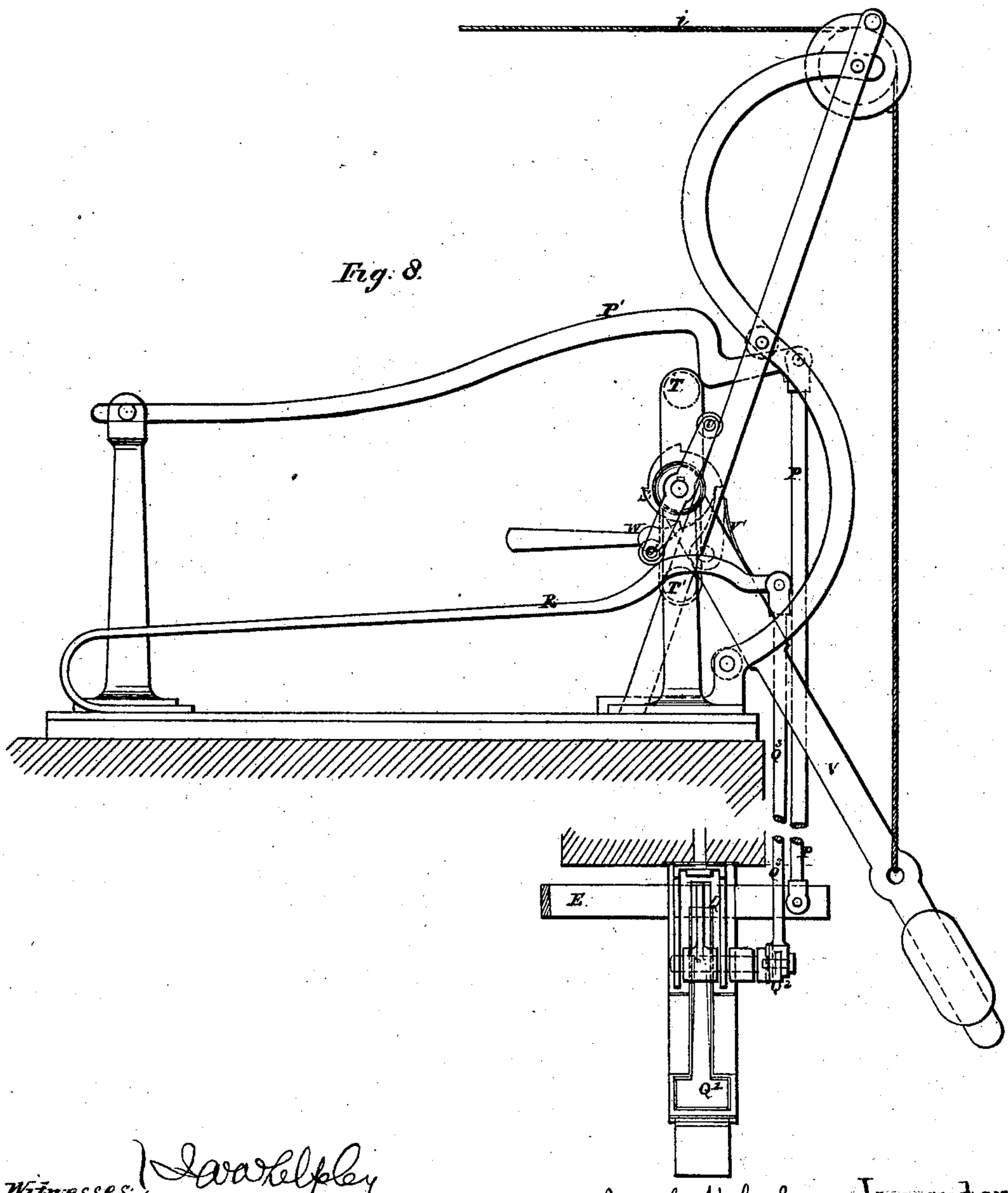
Car-Brakes.

No. 152,490. Patented June 30, 1874.

Fig. 8.



Witnesses: Sara Kelpley, H. A. Daniels

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UNITED STATES PATENT OFFICE.

JACOB HEBERLEIN, OF MUNICH, BAVARIA.

IMPROVEMENT IN CAR-BRAKES.

Specification forming part of Letters Patent No. **152,490**, dated June 30, 1874; application filed September 25, 1872.

To all whom it may concern:

Be it known that I, JACOB HEBERLEIN, of Munich, in the Kingdom of Bavaria, have invented an Improved Apparatus for Working Brakes for Railway and other Carriages; and do hereby declare that the following description, taken in connection with the accompanying sheets of drawings hereinafter referred to, forms a full and exact specification of the same, wherein I have set forth the nature and principles of my said improvement, by which my invention may be distinguished from others of a similar class, together with such parts as I claim and desire to secure by Letters Patent—that is to say:

This invention applies to that kind of brakes which are worked by the frictional contact of drums fixed on the axle-shafts, with drums which are brought into contact with them, and which are thereby caused to revolve and to wind up chains attached to the brake-levers, and so to press the brake-blocks against the wheels.

Certain brakes of this kind are already known, but they are some respects defective. The object of my improved apparatus is to remedy these defects, and to secure simplicity and efficiency in its working and control of its action.

The accompanying drawings represent brake apparatus constructed so as to embody my improved arrangement, and show the application and method of working the improved apparatus on railway-trains and tramway-cars.

Figure 1, Sheet I, represents a side view of the brake apparatus applied to a locomotive and tender. Fig. 2, Sheet I, represents it applied to two carriages of a train. Fig. 3, Sheet II, represents a plan, and Figs. 4 and 5, Sheet II, represent, respectively, back and front views of the frictional parts of the apparatus, the three last-named figures being drawn on an enlarged scale, in order to show details of construction more clearly. Fig. 6, Sheet III, represents a side view of brake apparatus with duplicate brake-drums, and means of engaging and disengaging the brake apparatus applied to a carriage of a railway-train. Fig. 7, Sheet III, represents a plan of the brake-drums and lever, arranged as in Fig. 6, Sheet III. Fig. 8, Sheet IV, and Fig. 8ª, Sheet III, represent enlarged details of the engaging and disengaging apparatus shown Fig. 6, Sheet III. Fig. 9, Sheet II, represents the brake apparatus applied to a locomotive, with means of adjusting the brake-power, and Fig. 10, Sheet III, represents the brake apparatus applied to a tramway-car.

In Figs. 1 and 2, Sheet I, and Figs. 3, 4, and 5, Sheet II, A is one of the running axles, on which is fixed a friction-drum, B. The periphery of this drum consists of numerous wedge-shaped pieces of wood with the fibers of the wood radial, or nearly so, and held between two metal rings, C C, by means of bolts, which pass through the rings and the wooden segments. These rings are made in halves, bolted together, so that they can be put onto the axle in its place without taking off the wheels. By preference, the wooden pieces are made in two widths, with the joints of the one width crossing those of the other width, as shown at B in Fig. 3, Sheet II. D is a friction-drum, which may be of cast-iron, surrounded by a wrought-iron hoop, D^1. This drum is fixed on an axle, which is mounted so that it can revolve in bearings in a bent forked lever, E, turning on a fulcrum at E^4. Upon each end of the axle of the drum D is fixed a pulley, D^2, to which pulleys are attached the ends of chains F by means of pins D^3 passing through the flanges of the pulleys, as shown at Fig. 3, Sheet II, so that whichever way the pulleys are turned they will effect the winding up the chains F. The other end of each of these chains is attached to the brake-lever G, which is forked so as to receive the ends of the two chains. For the brakes of the locomotive and tender, as represented in Fig. 1, Sheet I, the chains F, instead of being attached to the end of a lever, are attached by rods to the middle of a lever, G^1, from the ends of which two rods, G^2 and G^3, are connected respectively to the brake-levers G^4 and G^5, which work the brakes of the locomotive and tender respectively. By means of this connection through the equal-armed lever G^1, an equal strain is applied to each of the two brake-levers G^4 and G^5.

For working the brakes of two carriages of a train, the connections of the brake-lever G, as represented in Fig. 2, Sheet I, are as follows:

This lever is connected by pins to two rods, H and H′. The rod H works the brakes of the carriage on which the apparatus is mounted, and the rod H′ is coupled to the brake-rods of the next carriage. When it is so coupled the lever G acts on both sets of brakes. When, however, the next carriage is detached, the coupling *h* of the brake-rods is hooked up to the position indicated on Fig. 2ª, Sheet I, by catching the hook into the one end of a lever, *h*, and thereby causing the other end of that lever to butt against the guide-bracket *h′*. In this condition the rod H′ becomes fixed, so that the lever G acts only on the rod H to work the brakes of the one carriage. The lever G may also be applied in other ways to work the brakes, as, for example, by turning cams G^6, shown in Fig. 9, Sheet II. The lever E, on which the brake drum D is mounted, stands in a vertical position for the locomotive, as shown in Fig. 1, Sheet I, and a rod, I, is carried along the boiler to a convenient position for being worked by the hand of the engine-driver. It is made with a catch by which it can be held on a tumbler at I^1. When it is so held the brake-drum D is kept out of contact with the axle-drum B. But when the rod I is released from the tumbler at I^1, either by being lifted off from it by the hand of the driver, or by the tumbler itself being turned by a cord, *i*, so as to be disengaged from the catch on the rod I, the lever E, acted on by its own weight and a back-weight, E^1 E^2, brings the brake-drum D against the periphery of the axle-drum B, by frictional contact with which it is caused to rotate. The pulleys D^2, whichever way they may be turned, wind up the chains F, and thereby draw the rods G^2 and G^3 so as to put on the brakes on the locomotive and tender wheels. The lever E for the carriage, as shown in Fig. 2, Sheet I, stands in a horizontal position, and is loaded with a weight, E^2, which may be shifted along it and fixed wherever required to give the necessary frictional pressure. The lever is also connected to a spiral spring, E^5, which tends to prevent any up-and-down vibration of the lever while the friction-drum D is in action. The lever E is held up by a rod, K, secured by a catch upon a tumbler at K′, and while it is so held up the brake-drum D is not in contact with the axle-drum B. But when the rod K is released, either by the hand of the guard pushing its catch off from the tumbler K′, or by the tumbler itself being turned by a cord or chain, *k*, the lever E descends and brings the drum D against the periphery of the drum B, by frictional contact with which it is caused to rotate. The chains F, are thus wound on the pulleys D^2, and they draw the lever G so as to apply the brakes by means of the rods H and H′. The weight E^2 may be adjusted on the lever E by an arrangement such as is shown in Fig. 9, Sheet II. Here, he rod I, by which the brake apparatus is put into action or taken out of action by the hand of the driver, has several notches at I^2, any one of which can be engaged on a fixed stud or stop. The other end of the rod is connected to a bent lever, I^3, the pin of which works in a slotted hole in the rod I. The bent lever I^3 is connected to the lever E. There are two levers, I^4 and I^5, forming a connection from the rod I to the sliding weight E^2, with holes slotted for their connecting-pins so as to allow freedom of motion. When the rod I is released from the stud at I^2, the lever E descends and brings the brake-drum D into contact with the axle-drum B, thereby causing the chain F to be wound up and the brakes to be applied by the action of the lever G. But should the driver desire to increase the brake-power, he pushes the rod I farther forward, (the slot at its end permitting this movement.) He thereby, through the levers I^4 and I^5, causes the weight E^2 to slide along the lever E toward its outer end, and so to press the drum D against B with greater force, and thereby to increase the frictional power with which the chain F is wound up, and the brakes are applied. By these means the driver can adjust the brake-power to suit gradients of different degrees of steepness.

In Fig. 10, Sheet III, which represents the brake apparatus applied to a tramway-car, the construction and action of the apparatus are similar to that described above. The rods K K, at either end of the car, serve to bring the brakes into action or take them out of action at the will of the driver or the conductor, who can pull up or let down these rods, securing them up or down by means of a set-screw, k^2. In this case, as in those represented in Figs. 1 and 2, Sheet I, it will be observed that the ordinary screw-gear L can be employed to put on or take off the brakes, the holes at L^1 in the rods or levers on which the screw-gear acts being slotted so as to allow either the friction apparatus or the screw-gear to act freely, and the holes L^2 at one end being slotted so as to allow the friction apparatus to be applied from either end. Means of applying or taking off the brakes from any part of a railway-train by means of cords, chains, or rods communicating throughout the train are represented in Figs. 1 and 2, Sheet I. One such line of communication, *i*, is attached to the tumbler I^1 in Fig. 1. It is carried back over suitable guide-rollers and passes around a pulley, i^1, Fig. 2, which is mounted on a handle, i^2, attached to the chain *k*, and it may be continued backward along the train to be similarly connected to disengaging-tumblers, such as k^1, on other carriages behind. Also, other lines of communication, as *j*, Fig. 2, can be led by suitable guide-pulleys from any compartment to join the line *i*. It will be seen that when the handle i^2 is pulled upward, either by the guard's hand applied to it or by the pull of the line *i* raising the pulley i^1, such pull being given by the tension of the line *j* in the direction of the arrow, Fig. 2, or by a pull on the line *i* from any part of the train behind, the tumbler K′ pushes away the rod K in op-

position to a spring, and releases it from its catch, so that it can descend and permit the lever E to bring the brake-drums D into action. Also, the line *i* being pulled from any back part of the train moves the tumbler I¹, Fig. 1, so as to release the rod I, and thereby bring the brake apparatus of the locomotive and tender into action. Again, by the line *m*, which can be pulled by the hand of the driver, applied at *m'*, Fig. 1, the bent lever m^2, Fig. 2, is moved, and the rod m^3 attached to it raises the lever E and takes the brake apparatus out of action; and, further, a guard, sitting by K', Fig. 2, can by hand release the rod K by pulling it away from the tumbler K', and so put on the brakes of his own carriage. He can also, by pulling down the handle i^2, draw the line *i* both ways, and so put on the brakes of the locomotive in front and of other carriages behind.

It will be observed that in the arrangements of the brake-drums above described the chains F are led in such a direction that the more they are pulled in putting on the brakes the more forcibly do they press the brake-drums D against the axle-drums B, thereby increasing the power of their frictional contact as the strain on the brakes becomes increased.

I will now describe an arrangement, represented in Figs. 6 and 7, Sheet III, where the brake-drums are in duplicate, the one serving to put on brakes in front of the apparatus, and the other serving to put on brakes behind, and where in a similar manner the frictional pressure is increased by the strain on the chains. In this case, two brake-drums, N N', are mounted on one lever, E, which works on a pin having a slotted hole at E³, so that the two drums N N' can accommodate themselves to their proper positions when brought in contact with the axle-drum B. Each drum has its pulleys D¹ D¹ and its chains F¹ F¹, which are carried, respectively, forward and downward and backward and downward over guide-rollers. When the lever E is let down the drums N N' are brought in contact with the periphery of B and are caused to rotate. The chains F F¹ are thereby made to put on the brakes before and behind, and the greater the strain on these brakes the more forcibly are the drums N N' brought to bear on the drum B. The drums N N' may be single, or each in duplicate, as shown in the plan, Fig. 7, Sheet III. The chains F F¹ each apply the brakes to two carriages by means of the rods F² F³. These are, for this purpose, connected to the middle of a lever, G¹, one end of which is connected to the brake-lever G⁴, while the other end is connected to the rod G⁵, which is coupled to the brake-gear of the next carriage. Should G⁵ be uncoupled from the next carriage, a pin in the double link G⁶ bears against the lever G⁴, and enables the rod F² to act on this lever for applying the brakes. The lever E, which carries the drums N N', may be lowered in the manner already described. It may also be acted on by apparatus which serves both for putting on the brakes and for taking them off by alternate pulls of one and the same cord, chain, or rod communicating along the train, which apparatus, shown in its place at O, Fig. 6, Sheet III, I will now describe, referring to Fig. 8, Sheet IV, showing an enlarged side view of the apparatus, and Fig. 8ª, Sheet III, which represents an end view of the parts connected with the lever E. The lever E is suspended by a rod, P, to a lever, P', mounted at the top of the carriage. Also, when the lever E is raised so as to take off the brake-drums from contact with the axle drum it rests upon a catch, Q, which is pressed under it by a spring, Q¹, and which is connected, by a rod and bell-crank, Q², with a rod, Q³, attached to a spring-lever, R, at the top of the carriage. Between the two levers P' and R is mounted a shaft, S, on which is fixed a ratchet-wheel with four teeth, S'. On the same shaft S, at one end of it, are fixed two arms or wipers, T T', each provided with a roller which can act on the lever P' so as to raise it when the shaft is turned. At the other end of the same shaft S are fixed other two wipers, U U', which, when the shaft is turned, act on the spring-lever R so as depress it. A weighted lever, V, is mounted loose on the shaft S, and is provided with a spring-pawl, V', which gears with the ratchet-teeth of the wheel S'. Another pawl, W, catches into the teeth of S' to prevent it from turning backward. The lever V has attached to it cords or chains, forming part of the line of communication throughout the train. The apparatus, as shown in the figure, is in the condition which is that when the lever E is raised and when the brakes are off, the lever E then resting on the catch Q. When by the pull of the line *i* the lever V is raised, its pawl V', being engaged against a tooth of the ratchet-wheel S', causes that wheel to turn one tooth round. During this movement the arm or wiper U, acting on the spring-lever, R, depresses it and pushes down the rod Q³, which causes the catch Q to be withdrawn. The lever E, thus left free, descends and brings the brake-drums into contact with the axle-drums, so that the brakes are applied. The line *i* being now slackened, the lever V descends so that its pawl engages under the next tooth of the wheel S', that wheel being prevented from turning back by the pawl W. When it is desired to take off the brakes, the line *i* is again pulled, and the lever V is again raised. This turns the ratchet-wheel S' another tooth, during which movement the arm or wiper T', passing under the projecting part of the lever P', lifts that lever. The rod P is thus raised, and it lifts the lever E so as to take off the brake-power. The lever E having thus been lifted is caught and held up by the catch Q coming under it. A third pull on the line *i* again puts on the brakes by the action of the arm or wiper U' on the spring-lever R releasing the catch Q; and a fourth pull on the line *i* again raises the lever E and takes off the brakes by the action of the arm or

wiper T′ upon the lever P′. Thus every alternate pull of the line *i* serves to put on the brakes, and every other alternate pull serves to take them off. Fig. 11, Sheet II, shows a side view, and Fig. 12, Sheet II, an end view, of an engaging and disengaging apparatus of somewhat different construction, arranged so as to act directly on the lever E carrying the friction-drum, so that successive pulls of the line of communication serve alternately to put on and to take off the brake-power. In these figures the line of communication *i* is attached to a loaded lever, V, which acts by a pawl on a ratchet-wheel of four teeth, in the manner already described. On the axis of this ratchet-wheel is fixed an oval toothed wheel, which gears with another oval wheel on an axis, S. On this axis are fixed two arms, T and T′, each provided with a roller which can act upon the lever E, so as to raise or lower it as the shaft S is turned. On the under side of the lever E is formed a slight hollow, in which either of these rollers T or T′ rests when the lever E is raised, thus holding the lever steadily. When, by a slight pull of the line *i*, the lever V is raised a little, the shaft S, geared with its ratchet-wheel, is turned a little round, and the roller T or T′ is moved out of the hollow on the lever E. A further pull of the line *i*, sufficient to move the lever V through an arc of ninety degrees or more, causes the roller T or T′ to move away from under the lever E, which thereupon descends, and so brings the friction-brake drums into operation. The next pull of the line *i*, causing the axis S to turn one-quarter of a revolution, brings one of the rollers T or T′ under the lever E, and raises it so as to take the brake-drums out of action.

The oval gearing (shown in Fig 11, Sheet II,) serves to proportion the power with which the lever V acts on the lever E in raising it and letting it descend. This gearing may be dispensed with by adopting the modified apparatus, of which a side view is shown in Fig. 13, Sheet II. Here the lever V, with its pawl, acts on a ratchet-wheel, on the axis of which are fixed two cam-shaped wipers, T and T′, arranged to come immediately under the lever E. On this lever is mounted a roller, which bears on the edge of these wipers.

It will be seen that, when, by pulling the line *i*, the lever V is raised through ninety degrees or more, the ratchet-wheel is turned one-quarter of a revolution, and the wiper T turning with it allows the lever E to descend and to bring the brake-drums into action. The next pull of the line *i*, turning the ratchet-wheel another quarter of a revolution, brings the wiper T′ under the lever E, raising it, and thereby taking the brake-drums out of action.

It will be observed that, near the extreme outer end of each of the wipers T and T′, a small hollow is formed, wherein, when the lever E is raised, its roller rests steadily until the wiper be turned by the action of the lever V.

The cords, chains, or rods *i* and *j*, Figs. 1 and 2, Sheet I, act automatically for applying the brakes when one or more carriages become detached from the rest of the train, as may be readily understood, the drag of the detached carriages pulling the line of communication, and thereby causing the brake apparatus to be brought into action; also, should a carriage run off the rails, or should its axle break, so that the carriage drops down below its ordinary level, the line of communication is in either case strained transversely, so that the pull is conveyed to the several catches, which being released causes the brake apparatus to be brought into action. These effects will be produced whether the disengaging apparatus be constructed and arranged as in Figs. 1 and 2 of Sheet I, or whether the alternately engaging and disengaging apparatus represented in Figs. 6 and 8, Sheets III and IV, and Figs. 11, 12, and 13, Sheet II, be employed. In the latter case, while the train is in motion, the brake apparatus is out of action, and the engaging apparatus is in such a condition that a pull of the line of communication, effected by the detaching of any carriage, by the breaking of an axle, or by a carriage running off the rails, causes the next movement of this apparatus, whereby the brakes are applied.

The communicating cords, chains, or rods may be either arranged at the tops of passenger-carriages, as shown in the figures, or they may be arranged underneath. For goods trains they are most conveniently arranged under the carriages, the connections and modes of operating being similar to those above described.

It will be observed that one of the principal advantages attained by the use of my before-described improved friction-drum brake apparatus is that, with the exception of the arrangement shown in Fig. 9, the degree of pressure with which the friction-drums are applied to the axle-drum, and, consequently, the force with which the brakes are applied, is beyond the control of the person applying the brakes, and thus the weights E^2 have only to be in the first instance adjusted upon the levers E, so that when in action they will not affect the skidding of the wheels, to insure that during the running of the train the brakes shall not be applied to such an extent as to act injuriously upon the rolling-stock.

The requisite variation in the brake-power of the train, according as it may be required to stop the train more or less rapidly, is produced by bringing one or more of the friction-drum apparatuses consecutively into action. Thus the engine-driver can either put the locomotive-brake alone into action, or if he requires greater power, he can, by pulling the cord *i*, put the brake apparatus of the next carriage into action, or by pulling still more at the cord *i*, he can put successively all the other brake apparatuses of the train into action, as it will be seen from Fig. 2 that when the cord *i* has been drawn so as to raise the chain *k* and catch K′ to the extent to which it

will move, then by pulling still more at the cord *i* it will be drawn over the pulley i^1, so as to actuate the brake apparatus of the next brake-carriage, and so on in succesion.

Having thus described the nature of my invention, and in what manner the same is to be performed, I would have it understood that I make no claim, generally, to the working of brakes by means of the frictional contact of a drum or wheel on the axle of a carriage, causing another wheel or drum to revolve, and thereby to move apparatus which applies the brakes; but

What I claim is—

1. The lever E, with adjustable weight E^2, to operate in combination with the friction-drum D, pulley D^2, chains F, lever G, suspending-rod K, and tumbler K′, substantially as described.

2. The rods, cords, or chains *i k*, and pulley i^1, to operate in combination with the rod K and tumbler K′, for bringing the brake apparatus into action from any part of the train, substantially as described.

3. In combination with the lever E, friction-drum D, suspending-rod K, and tumbler K′, the cords or chains *i j k*, and pulley i^1, for bringing the friction-brake apparatus into action from any part of the train, as set forth.

4. The combination of the rod I and levers I^3 I^4 I^5, with the friction-drum lever E and weight E^2, for adjusting the brake-power, substantially as described.

5. The lever *h*′, to operate in combination with the coupling *h*, substantially as and for the purposes set forth.

6. The adjustable weight E^2 on the friction-drum lever E, for adjusting the frictional pressure of the brake-drums, in such manner that their action shall not affect the skidding of the wheels, all combined substantially as set forth.

7. In friction-drum brake apparatus, the combination of the brake-chains F with a balance-lever, G, and rods G^2 G^3, to distribute the pull of the brake-chain equally to the brake-gear of the locomotive and tender, or to two brake-carriages, substantially as described.

8. The combination of two sets of friction-drums, N N′, and pulleys D D′, with the weighted lever E, axle-drum B, and chains F F^1, to actuate the brake-gear of a car or cars, situated at each end of the car carrying the frictional apparatus, substantially as described.

9. The combination of the rod or chain F^2 with the lever G^1, brake-lever G^4, links G^6, and rod or chains G^5, for distributing the power of the friction-drum apparatus equally to the brake-gear of two carriages, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses this 6th day of July, 1872.

J. HEBERLEIN.

Witnesses:

JOHN IMRAY,

JNO. P. M. MILLARD.