(No Model.) 4 Sheets—Sheet 1.

H. W. HILL.

CLUTCH.

No. 476,640. Patented June 7, 1892.

Fig 1.

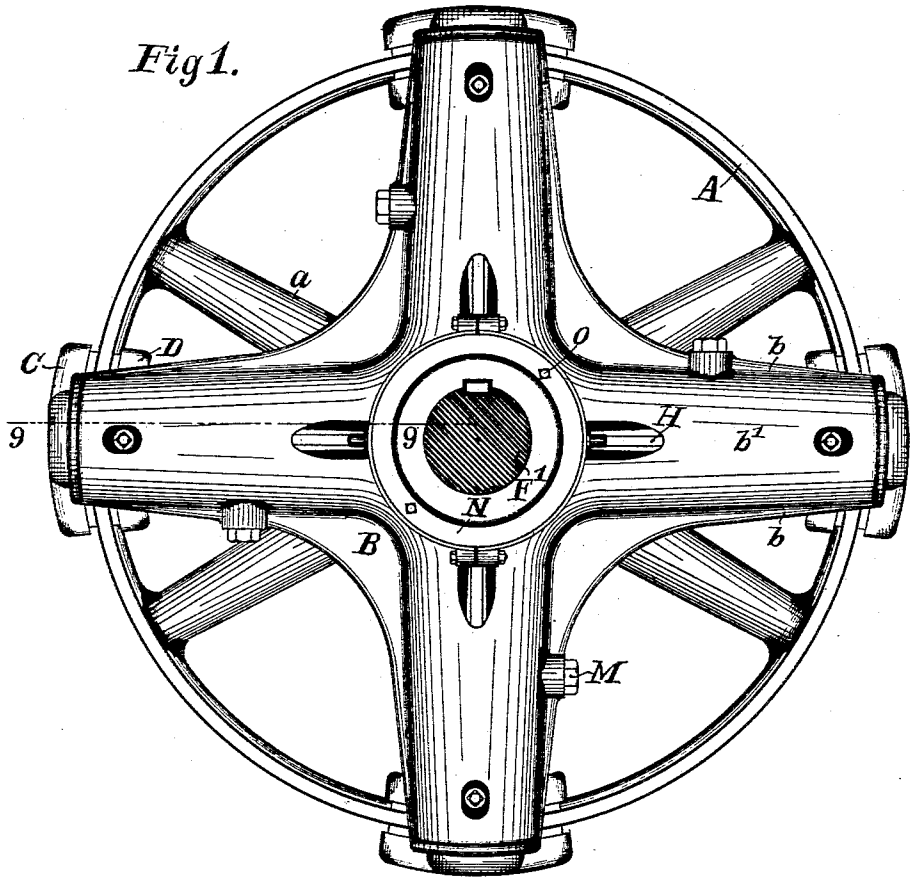
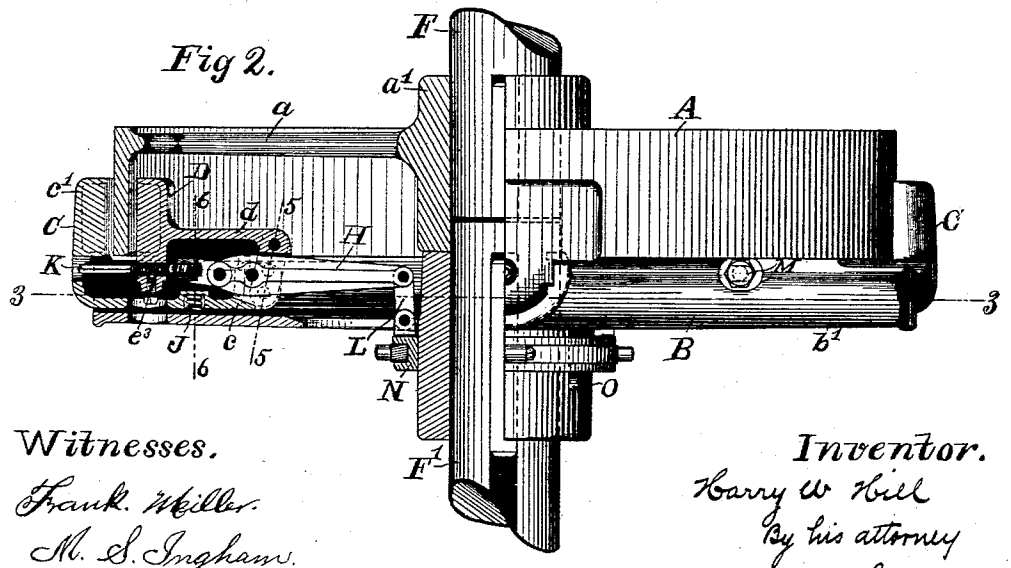


Fig 2.



Witnesses.

Frank. Miller.

M. S. Ingham.

Inventor.

Harry W Hill

By his attorney

E. L. Thurston

(No Model.) 4 Sheets—Sheet 2.

H. W. HILL.

CLUTCH.

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Fig 3.

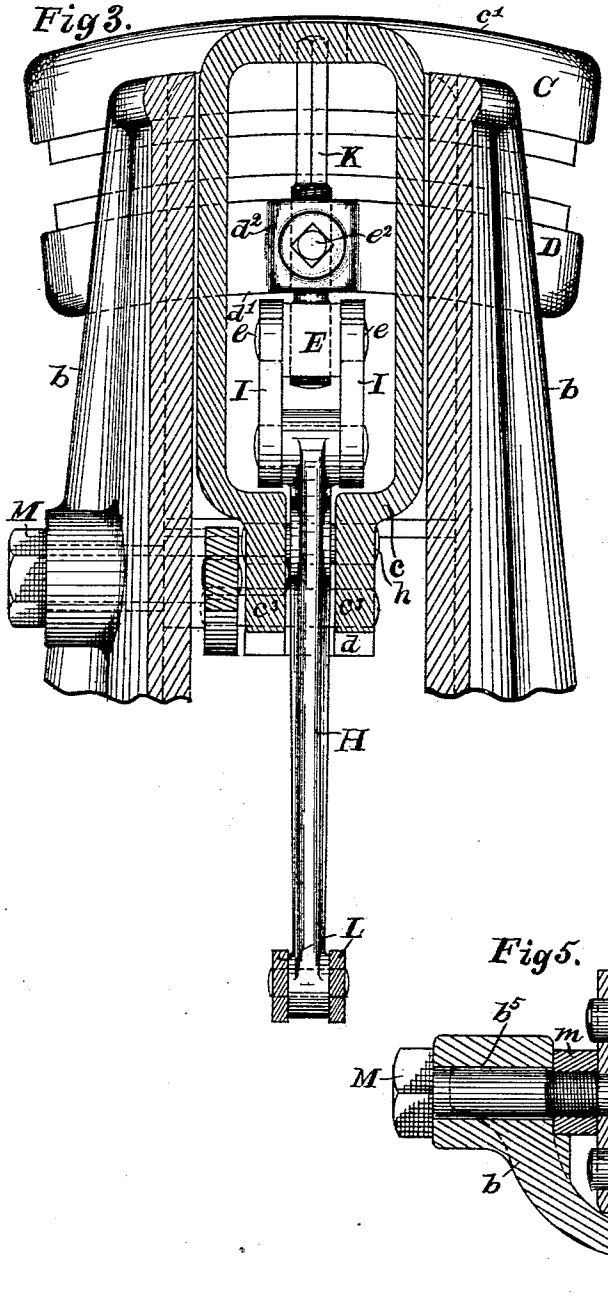


Fig 4.

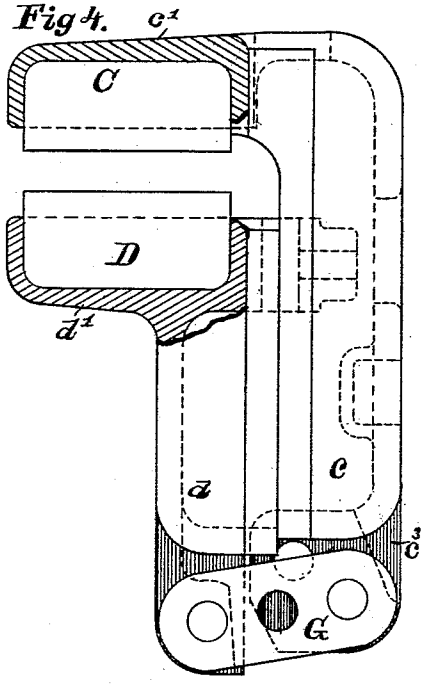
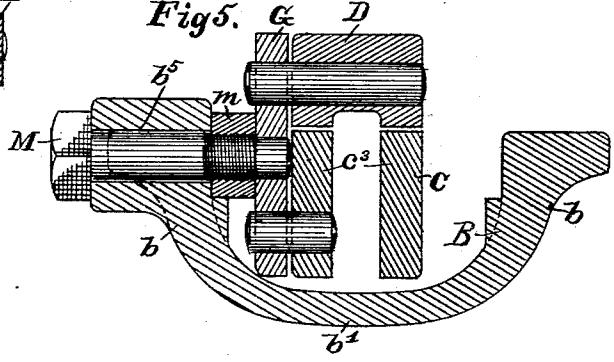


Fig 5.



Witnesses.

Frank. Mueller.

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(No Model.) 4 Sheets—Sheet 3.

H. W. HILL.

CLUTCH.

No. 476,640. Patented June 7, 1892.

Fig 7.

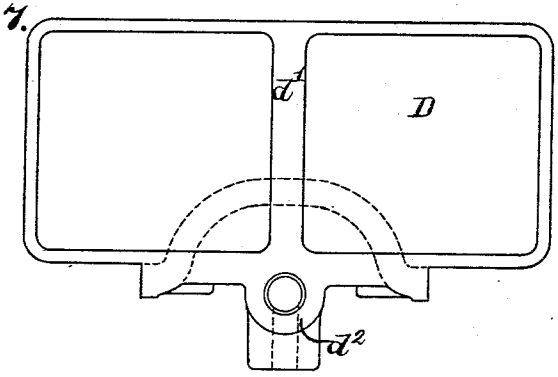


Fig 8.

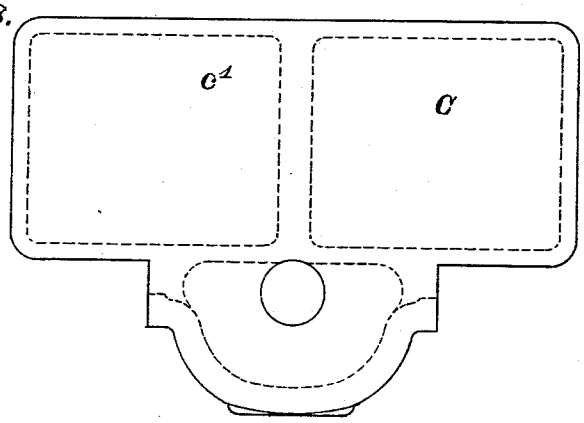
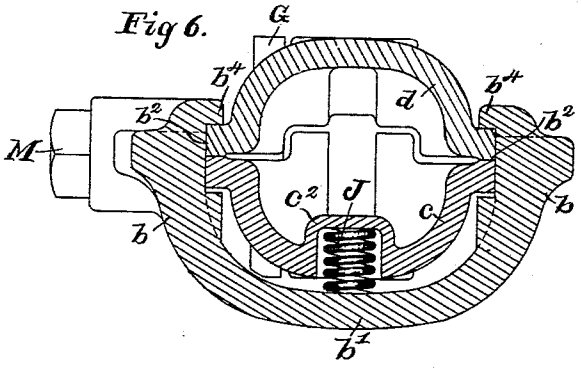


Fig 6.



Witnesses.
Frank. Weiller.
M. S. Ingham.

Inventor.
Harry W. Hill
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E. L. Thurston

(No Model.)

4 Sheets—Sheet 4.

H. W. HILL.

CLUTCH.

No. 476,640. Patented June 7, 1892.

Fig 9.

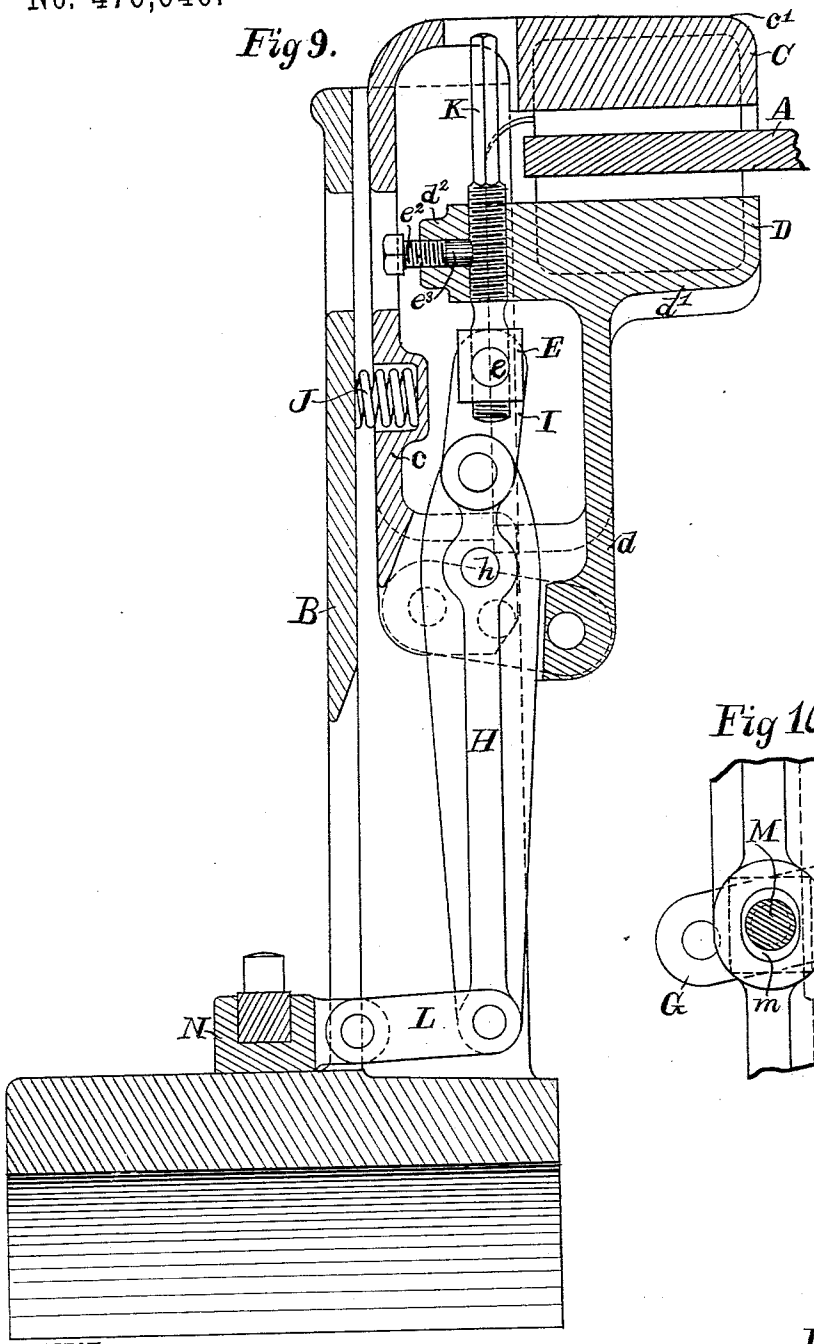

Fig 10.

Witnesses.

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UNITED STATES PATENT OFFICE.

HARRY W. HILL, OF CLEVELAND, OHIO.

CLUTCH.

SPECIFICATION forming part of Letters Patent No. 476,640, dated June 7, 1892.

Application filed January 29, 1892. Serial No. 419,693. (No model.)

To all whom it may concern:

Be it known that I, HARRY W. HILL, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Friction-Clutches, of which the following is a specification.

My invention relates to the class of friction-clutches in which a pair of radially-movable jaws are mounted on each clutch-arm and are moved simultaneously toward or from each other and an interposed cylindrical flange for the purpose of grasping or releasing the same.

My improvements relate to the mechanism for operating the jaws, to the form of the jaws, and of the clutch-arm; to the combination and relative arrangement of the jaws, clutch-arm, and operating mechanism; to the means for adjusting the throw of the jaws and of regulating their movement relative to each other and to the flange.

The chief objects I have sought to attain are to simplify the mechanism of this class of clutches, to cheapen their first cost, and to render them less liable to accidental injury without in any manner impairing their efficiency.

It is well understood in this art that this class of mechanism may be employed to connect a shaft and a pulley or gear loosely mounted thereon or to couple together two shafts arranged in the same axial line. In the former case the cylindrical flange is secured to the pulley or gear and in the latter case the flange is supported by suitable arms on one shaft while the jaws and their operating mechanism are connected to the other shaft in proper relation to said flange. I have illustrated the latter construction in the drawings, in which—

Figure 1 is a plan view of a four-arm clutch. Fig. 2 is a side view, of which one-half is in section. Fig. 3 is a sectional view on the line 3 3 of Fig. 2 of the clutch-jaws, their operating mechanism, and the outer end of the clutch-arm. Fig. 4 is a side view of the jaws, disconnected from all of the operating mechanism except the lever G. Fig. 5 is a sectional view through the arm and the parts mounted thereon at the point indicated by the line 5 5 of Fig. 2. Fig. 6 is a sectional view through the arm and the parts mounted thereon, at a point indicated by the line 6 6 of Fig. 2. Fig. 7 is an end view of the inner jaw. Fig. 8 is an end view of the outer jaw. Fig. 9 is an enlarged section through one of the clutch-arms and the clutch mechanism on line 9 9 of Fig. 1, and Fig. 10 is a side view of a part of one clutch-arm at the point of connection between it and lever G.

Referring to the parts by letters, A represents a cylindrical flange supported by arms a, which radiate from a hub a', fast upon the shaft F.

Fixed upon the shaft F' is the clutch-frame having as many radial clutch-arms B as it is desired to employ pairs of jaws and associated mechanisms. Each of these arms and the mechanism supported thereon is like every other arm and the mechanism which it supports. Therefore a description of one will answer for all.

The arm B consists of two side bars b b and an integral web b', which is substantially crescent-shaped in transverse section, the jaws being mounted on the arm facing its concave side. This web adds strength to the arm and at the same time it hides and protects from injury from the outside the mechanism supported by said arm. The proximate faces of the side bars b b are grooved longitudinally in a part of their length, as shown in Fig. 6, and the side edges of the jaws lie in these grooves b^2 b^2, whereby they are guided in radial paths. The outer jaw C is provided with a shank c and a concave flange c', which is adapted to engage with the outer periphery of the flange A. The inner jaw D is provided with a shank d and a convex flange d', which is adapted to engage with the inner periphery of the said flange. The side edges of the shanks c and d lie against and move in contact with each other when they are mounted on the arm. The parts of said shanks between the edges so in contact are curved away from each other, whereby a longitudinal recess is formed between them, substantially as shown in the drawings, and in this recess the greater part of the operating mechanism is placed. The grooves b^2 are somewhat wider than the combined thickness of the edges of the jaws which operate therein, whereby the jaws are permitted to rock slightly, and thus the flanges c' and d' are permitted to automatically adjust them-

selves upon the cylindrical flange A if it should get out of true without any strain on the shanks of the jaws. In the shank of the outer jaw a socket c^2 is formed, in which one end of a spring-coil J is placed. The other end of the coil rests against the web b'. The coil exerts an end-thrust whereby both jaws are normally held against the farther shoulder b^4 of the grooves b^2. The normal movement of the jaws are therefore in straight radial paths.

The lower end of the outer jaw-shank is provided with the ears c^3, and a toggle-lever H passes between said ears into the recess between the jaws. A pin h pivotally connects the said ears with said lever at a suitable distance from its outer end. The inner end of the lever H extends to a point near the shaft, and it is connected by means of the links L (which passes through a slot in the web of the clutch-arm) to the usual sliding sleeve N. The outer end of the lever H is pivoted to the inner end of the double link I, and the outer end of the link I is pivotally connected with the inner jaw. The toggle-lever H and link I constitute a toggle which, in operation, as hereinafter explained, moves the jaw-flanges toward and from each other.

The means shown for connecting the link with the inner jaw provides for adjusting the throw of the jaws relative to each other to compensate for wear or for any other purpose. A boss d^2 projects from the inner jaw into the recess between the jaws.

E represents an adjustable block, having trunnions e e on its side, on which the outer ends of the double link I are pivoted. This block E is adjustably connected with the boss d^2, by means of the rod K, having right screw-threads in one part of its length and left screw-threads in another part. One threaded portion engages with the block E and the other part engages with the boss d^2. The rod extends from this point outward to a point where its end may be engaged by a wrench passed through a hole in the outer jaw. A set-screw e^2 screws endwise into the boss d^2 against a soft-metal block e^3, which bears against the rod K, whereby when the parts are properly adjusted they may be fixed in said relative position.

The parts hereinabove described provide for moving the jaws toward and from each other, because as the sleeve N is moved toward the clutch-frame, the lever H is swung in such manner that the pivot connecting its outer end with the link I is brought into line with the two pivots which connect said link and lever with the inner and outer jaws, respectively. This results in a movement of the jaw-flanges toward each other, and a contrary movement of the sleeve N causes the jaw-flanges to move away from each other; but unless some means to prevent such action are provided, both jaws will, under the action of centrifugal force when the clutch-arm is revolving or of gravity when not revolving, move together outward or inward, as the case may be, so that although the jaw-flanges are as widely separated as possible, either the outer or inner jaw (generally the latter) will remain in engagement with the flange. Numerous devices may be employed to prevent this dragging of either jaw, as above explained. The mechanism which I have devised and which the drawing shows, not only prevents the dragging of either jaw, but it also compels the jaws to simultaneously approach and engage with and disengage and recede from the flange. It also serves to so connect the jaws that the effect of centrifugal force or gravity on one jaw is balanced by the effect of the same force on the other jaw, and it serves to effect these results whether the flange A be accurately turned to the intended diameter or not. The means consist of the lever G, pivoted to the clutch-arm on an adjustable fulcrum and pivotally connected on opposite sides of said fulcrum with the jaws.

M represents a bolt, the unthreaded end of which serves as the middle pivot or fulcrum of the lever G. This bolt passes through a radial slot b^5 in one of the side bars b of the clutch-arm.

m represents a nut, into which the bolt may be screwed, which lies on the inside of the clutch-arm between it and the lever G. When this nut is loosened, the bolt is free to move radially outward or inward in the slot b^5.

To set the lever G at the proper position to perform its prescribed functions, the jaws are closed upon the flange A, the nut m being loose during this operation. The lever G will be automatically moved to the proper position relative to the clutch-arm. Then by turning the bolt the nut m is tightened and the bolt is rigidly fixed to said clutch-arm. When the jaws are opened, they not only move apart, but they move simultaneously and equally away from the flange A, and when they are again closed they simultaneously approach and engage with said flange.

In closing the jaws the pivot between the end of the lever H and the link I moves slightly past the line connecting the pivots which connect said parts with the jaws, whereby the jaws are locked. The engagement of the sleeve N with the clutch-frame serves as a stop to limit the extent of this movement past the center, and this stop I make adjustable by means of set-screws O, which screw into the sleeve and strike the clutch-frame when the jaws are locked.

I have as I have described the construction of the clutch shown pointed out many of the advantages arising therefrom. There are, however, other advantages not hereinbefore specifically referred to. For example, by the arrangement of the jaw-closing mechanism almost wholly behind the clutch-arm and between the jaws there are no projecting parts which may be struck to the injury of the clutch. Moreover, the entire clutch and slid-

ing sleeve can be made to occupy a very small space on the shaft and a less space than any other clutch of this class with which I am acquainted.

The entire clutch, as shown and described, is, in my opinion, the most complete embodiment of all the several improvements which it contains; but certain parts of the invention may be used in connection with clutches which may not contain the other parts. Therefore I do not intend to have my claims understood as limited to any greater extent than their terms express.

I am aware of the Patent No. 458,579, granted September 1, 1891, to L. J. Hirt, and I do not intend that any of my claims shall be construed to include any invention shown and described therein.

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

1. In a friction-clutch, in combination, a clutch-arm, a pair of movable jaws mounted thereon, a toggle-lever pivotally connected at its outer end to a link and pivotally connected between its ends to the outer jaw, a link pivotally connected at its outer end to the inner jaw and at its inner end with the outer end of the toggle-lever, and means for actuating said toggle-lever, substantially as set forth.

2. In a friction-clutch, in combination, a clutch-arm, a pair of movable jaws mounted thereon, a toggle-lever pivotally connected at its outer end to a link and between its ends to the outer jaw, a link pivoted at its inner end to the outer end of said lever, an adjustable pivotal connection between the outer end of said link and the inner jaw, and means for actuating said toggle-lever, substantially as set forth.

3. In a friction-clutch, in combination, a clutch-arm, a pair of radially-movable clutch-jaws mounted thereon, a toggle, of which one member is pivotally connected with the outer jaw and the other is pivotally connected with the inner jaw, means for adjusting the said connection with the inner jaw, and mechanism for actuating the toggle, substantially as set forth.

4. In a friction-clutch, in combination, a clutch-arm, a pair of radially-movable jaws mounted thereon, a block, and means for adjustably connecting the same to the inner jaw, combined with a toggle, suitable connections between the toggle members and the outer jaw and said block, respectively, and means for actuating said toggle, substantially as set forth.

5. In a friction-clutch, in combination, a clutch-arm, a pair of clutch-jaws mounted thereon with a recess between the jaw-shanks, a toggle-lever pivoted between its ends to the outer jaw, the outer end of said lever lying in said recess, a link in said recess pivoted at one end to the toggle-lever and at the other end to the inner jaw, and suitable connections between the inner end of the toggle-lever and the sliding sleeve, substantially as set forth.

6. In a friction-clutch, a clutch-arm, a pair of radially-movable clutch-jaws mounted thereon, said jaws being curved substantially as described, whereby a longitudinal recess is formed between them, a block lying in said recess, and an adjusting-screw-threaded rod connecting said block with the inner jaw, said rod extending outward in said recess to a point where it can be reached through a hole in the outer jaw, combined with a toggle-lever pivoted between its ends to the outer jaw, the outer end of said lever extending into the recess between the jaws, a link lying in said recess and pivoted at one end to the end of the toggle-lever and at the other end to the said block, and a link connecting the inner end of the toggle-lever with the sliding sleeve, substantially as set forth.

7. In a friction-clutch, a clutch-arm having grooved side bars, and a pair of clutch-jaws loosely mounted thereon, whereby they are permitted a limited rocking motion, combined with mechanism for moving said jaws toward and from each other, and an interposed cylindrical flange, substantially as and for the purpose specified.

8. In a friction-clutch, a clutch-arm having grooved side bars and a connecting web, and a pair of clutch-jaws the shanks of which are slidable upon each other and are loosely fitted into the grooves in the side bars, combined with a spring interposed bewteen the said web and the nearest jaw-shank, and mechanism for moving said jaws toward and from each other, and an interposed cylindrical flange, substantially as and for the purpose specified.

9. In a friction-clutch, in combination, a clutch-arm having two parallel grooved side bars and a curved web connecting them, a pair of jaws having curved shanks, the edges of which lie in said grooves, a toggle lying in the recess between said jaws and suitably connected with the jaws, a sliding sleeve, and a link passing through a slot in the web of the clutch-arm and connected at its ends, respectively, with said sleeve and with an inward extension of one of the toggle members, substantially as set forth.

10. In a friction-clutch, a clutch-arm, a pair of radially-movable jaws mounted thereon, and means for moving said jaws toward and from each other, combined with a lever pivotally connected with said two jaws, an automatically-adjustable fulcrum for said lever, and means for rigidly connecting said fulcrum to the clutch-arm, substantially as and for the purpose specified.

11. In a friction-clutch, a cluch-arm having a longitudinal slot, a pair of radially-movable jaws mounted on said arm, a lever pivotally connected with said jaws, respectively, a fulcrum-piece for said lever movable in the slot

in the clutch-arm, and means for rigidly connecting said fulcrum-piece with the clutch-arm, substantially as set forth.

12. In a friction-clutch, a clutch-arm having a radial slot through one side bar, a bolt passing through said slot having its head and its nut on opposite sides of said bar, and a lever pivoted on said bolt, combined with a pair of clutch-jaws mounted on the clutch-arm and pivotally connected with said lever, substantially as set forth.

HARRY W. HILL.

Witnesses:
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FRANK. MILLER.