No. 812,694. PATENTED FEB. 13, 1906.

I. H. SPENCER.

CLUTCH.

APPLICATION FILED FEB. 29, 1904.

Fig. I.

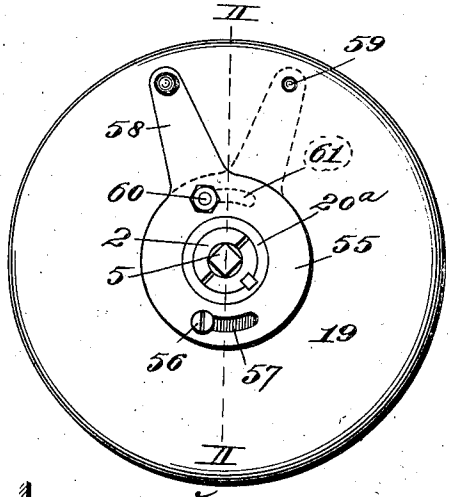


Fig. III.

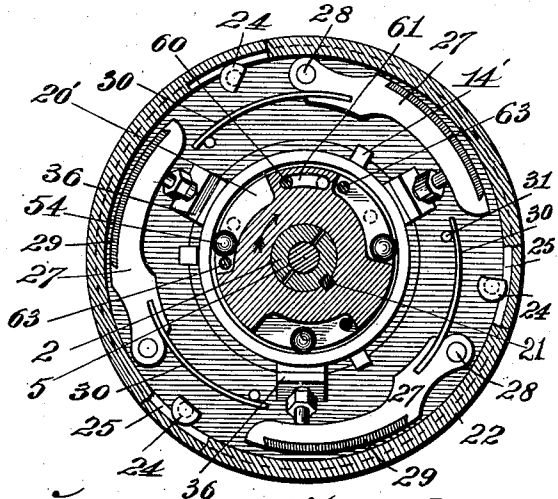


Fig. II.

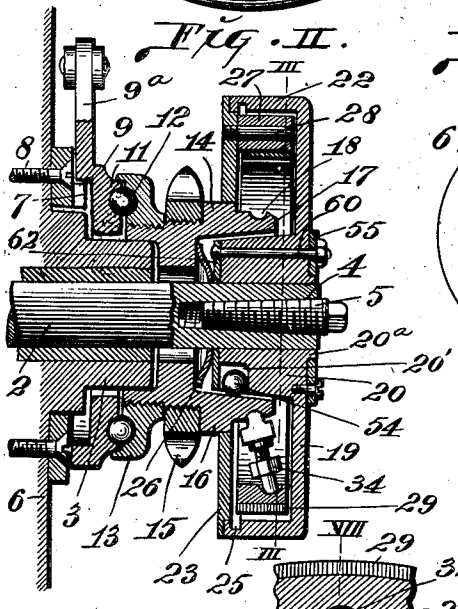


Fig. IV.

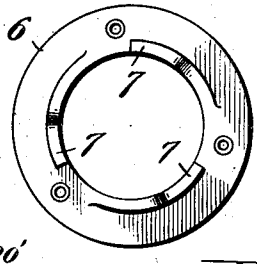


Fig. V.

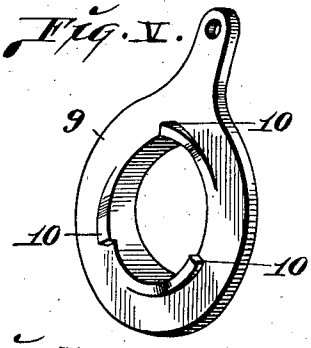


Fig. VI.

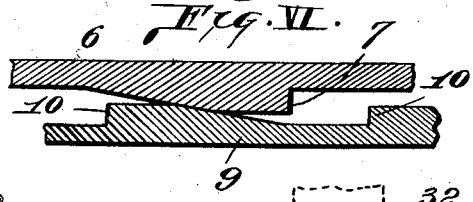


Fig. VII.

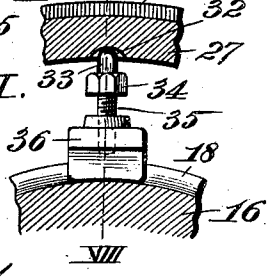
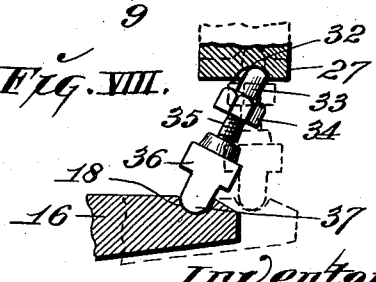


Fig. VIII.



Attest:

M. P. Smith,

Blanche Hogan

Inventor:—

I. H. Spencer:—

By Wright Bros

Attys.

UNITED STATES PATENT OFFICE.

ISRAEL H. SPENCER, OF ST. LOUIS, MISSOURI.

CLUTCH.

No. 812,694. Specification of Letters Patent. Patented Feb. 13, 1906.

Application filed February 29, 1904. Serial No. 195,912.

To all whom it may concern:

Be it known that I, ISRAEL H. SPENCER, a citizen of the United States, residing in the city of St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Clutches, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to a clutch more particularly for use in connection with the engines of motor-bicycles.

Figure I is a side view of the outer face of my clutch. Fig. II is a vertical section taken on line II II, Fig. I, through the clutch. Fig. III is an enlarged vertical section taken through the clutch on line III III, Fig. II. Fig. IV is a face view of the engine-carried stationary cam-ring of the clutch. Fig. V is a perspective view of the rocking cam-ring that engages the ring shown in Fig. IV. Fig. VI is an enlarged section taken through parts of the cam-rings shown in Figs. IV and V in facing positions. Fig. VII is an enlarged section taken through portions of the hub of the clutch and one of the friction-shoes with one of the rocking spreaders shown between said members. Fig. VIII is a cross-section taken on line VIII VIII, Fig. VII.

2 designates a shaft (see Fig. II) that extends through a hub extension 3, projecting from a casing. The outer end of the engine-shaft is split, as seen in Fig. III, and is provided with a tapering threaded bore 4, that receives a taper screw 5, by which said end of the shaft is spread to hold the clutch members thereon, as will hereinafter appear.

6 designates a stationary cam-ring (see Figs. II, IV, and VI) that is provided with a series of cams 7, preferably three in number. This cam-ring is secured to the engine-casing around the hub extension 3 by any suitable means, such as the screws 8. (See Fig. II.)

9 designates a rocking cam-ring that encircles the hub extension 3 in opposition to the fixed cam-ring 6 and is free of any connection to said hub extension, so that it may be oscillated with respect to said fixed ring. On the face of the cam-ring 9 opposite the cam-ring 6 are a series of cams 10, corresponding in number to the number of cams on the fixed ring and adapted for engagement with said fixed ring-cams. At the opposite side of the rocking cam-ring from that occupied by the cams 10 is a circular bearing-ball raceway 11, that receives bearing-balls 12.

13 is a race-ring that is positioned in opposition to the rocking cam-ring 9 and is provided with a raceway in which the bearing-balls 12 move in common with their travel in the raceway 11.

14 designates a hub that encircles the engine-shaft 2 and is screw-threaded exteriorly to receive a sprocket or other drive-wheel 15, from which power is transmitted. The drive-wheel 15 is confined by the race-ring 13, which is also screwed onto the hub and bears against the drive-wheel, as seen in Fig. II. The hub 14 has an outer friction-head 16, that is provided with a cavity 17, preferably conical, as shown in Fig. II. In the outer face of the friction-head is an annular groove 18.

19 designates a barrel that is provided with a central hub 20, which is secured to the engine-shaft 2 through the medium of the taper screw 5, that fits in the split outer end of said shaft. The barrel-hub is additionally secured to the shaft by a key 21. (See Fig. III.) The barrel 19 is provided with an annular rim 22, to which is fitted an inner face-plate 23, that is secured to the barrel-rim by bolts 24, adapted to be turned into a groove 25 interior of the barrel-rim. The face-plate 23 has loose engagement with the drive-wheel hub 14 through the medium of splines 14′, that are carried by said hub. (See Fig. VIII.) 26 is a spring interposed between the inner end of the barrel-hub 20 and the central portion of the drive-wheel-carrying hub 14. This spring serves to project the drive-wheel hub inwardly to carry the rocking cam-ring 9 toward the fixed cam-ring 6.

27 designates a series of friction-shoes, each having one end mounted on a pivot-pin 28, carried by the barrel face-plate 23, so that said friction-shoes may be moved to the inner face of the barrel-rim 22 to bear thereagainst. Each of these shoes is provided with a wear-block 29, that may be of fiber or any other suitable material. The friction-shoes are normally held out of frictional contact with the barrel-rim by springs 30, secured thereto and resting against pins 31, projecting from the barrel face-plate. (See Fig. III.) In the rear of each friction-shoe is a recess 32. (See Figs. VII and VIII.) Interposed between the shoes and the friction-head of the hub 16 are shoe-spreaders that consist of the

following parts: 33 represents stems having rounded ends that seat in the shoe-recesses 32 and each of which is provided with a wrench-head 34. Each of these stems has a screw-threaded shank 35, that is screwed into a rocking block 36, the round end 37 of which seats in the annular groove 18 in the outer end of the hub 14. When the hub 14 is projected inwardly under the action of the spring 26, interposed between said hub and the barrel-hub 20, the rocking blocks 36 are carried into the position seen in full lines, Fig. VIII, thereby positioning the spreaders just described at angles to a perpendicular line, so that the friction-shoes 27 may be held projected away from the barrel-rim 22 to avoid frictional contact therewith. When the rocking cam 9 is oscillated to bring the higher portions of its cams 10 on the higher portions of the cams 7 of the fixed cam-ring 6, the hub 14 is moved outwardly and the spreaders between the hub and friction-shoes are carried into vertical alinement, as seen in dotted lines, Fig. VIII, thereby forcing the friction-shoes outwardly into frictional contact with the barrel-rim 22 to transmit motion from the engine-shaft through the barrel 19 to the friction-shoes and from the friction-shoes to the drive-wheel hub 14 and the drive-wheel thereon through the medium of the spreaders positioned between the shoes and the friction-head of said hub.

It will be seen that the frictional driving engagement that has been set forth is occasioned when the rocking cam-ring 9 is thrown into a position to bring the highest parts of its cams 10 against the highest parts of the cams 7 of the stationary cam-ring 6, thereby forcing the drive-wheel shaft outwardly toward the hub of the barrel 19 against the action of the spring 26, and that when the rocking cam-ring is moved in the opposite direction the cams of the two rings 6 and 9 will face with the highest portions of one opposite the lowest portions of the other, and when they are in this position the spring 26 will cause inward movement of the drive-wheel hub 14 to move the spreaders between the head of said hub and the friction-shoes to positions at angles to a perpendicular line, so that the friction-shoes will be freed from the barrel-rim 22. The rocking cam-ring 9 is operated by suitable leverage mechanism connected to its arm 9^a.

No invention *per se* is herein claimed for the constructions hereinbefore described, they being set forth for the purpose of affording an understanding of the parts to which my invention relates and which works therewith.

I next come to the description of the portion of my clutch through the medium of which its initial operation in starting the drive-wheel 15 is obtained. It is in this construction that my present invention lies. In the hub 20 of the barrel 19 are a plurality of tapering runways 20′. (See Figs. VI and VII.) These runways gradually decrease in depth from their forward ends to their rear ends, as seen in Fig. VII, and in each runway is a clutch-ball 54, that is adapted to ride therein. When the engine-shaft 2 is first rotated on the starting of the engine 1, rotation is imparted to the barrel 19, which moves in the direction indicated by the arrow, Fig. VII, and as a consequence the high parts of the bases of the runways 20′ are moved forwardly, and as each clutch-ball is brought to the lower side of the clutch it is caused to be gripped between the barrel-hub 20 at the high point of the corresponding runway 20′ and the opposing face of the friction-head 16 within the cavity 17. Therefore as the clutch-ball is carried upwardly, as seen at the left of Fig. VII, it acts as a driving medium for the drive-wheel hub 14 to impart rotation thereto, and as the ball is carried over to the left it falls back into the wider portion of the runway 20′, as seen at the right of Fig. VII, and its driving engagement is discontinued. The same action takes place with respect to each of the clutch-balls, they being alternately brought into action and released from action in an intermittent manner to avoid sudden strain on the parts of the clutch and the driving mechanism connected thereto, as will be apparent.

For the purpose of preventing action of the clutch-balls 54 in their runways 20′ whenever it may be desired to throw them out of action I provide retaining means that will now be described.

55 is a throw-plate loosely seated against the outer face of the clutch-barrel 19. (See Figs. I and II.) This throw-plate is adapted to be rocked on an extension 20^a, projecting from the barrel-hub 20, and its rocking movement is limited by a stop-screw 56, that is seated in the barrel-hub and passes through a slot 57 in the throw-plate. (See Fig. I.)

58 is the handle of said throw-plate, that is provided at its rear side with a projection that is adapted to enter recesses 59 in the outer face of the barrel 19 to retain the throw-plate in a set position.

60 is a throw-pin seated in the throw-plate 55 and passing through a slot 61 in the barrel-hub 20, in which it operates when the throw-plate handle is thrown from side to side. The inner end of the throw-pin 60 is secured to a shift-plate 52, see Figs. II and III,) that loosely surrounds the engine-shaft 2 and forms the inner walls of the clutch-ball runways 20′.

63 represents shift-pins carried by the shift-plate 62 and entering into the clutch-ball runways.

When it is desired to hold the clutch-balls 54 in inactive positions, the throw-plate 55 is rotated in a direction that will cause corre-

sponding rotation of the shift-plate 62 through the medium of the throw-pin 60 to carry the shift-pins 63 from the reduced ends of the clutch-ball runways, at which they are shown in Fig. III, forwardly toward the deep ends of the runways into the positions seen in dotted lines. While the shift-pins are in such position the clutch-balls are maintained in the deeper ends of their runways in which it is impossible for them to become gripped between the barrel-shaft 20 and the driving-wheel-hub head 16, and they therefore remain inactive, and the drive-wheel hub may be rotated with the drive-wheel thereon independently of the remainder of the clutch mechanism, as is desirable in an instance where the engine to which my clutch is applied becomes out of order, and it is necessary to propel the bicycle by foot-power.

I claim as my invention—

1. In a clutch, the combination of a shaft, a hub fixed to said shaft and having tapering runways, a drive-wheel hub having a head fitting over said shaft-carried hub, clutch-balls in said runways, and means for retaining said clutch-balls at the deepest ends of said runways; said means consisting of a rocking shift-plate, pins carried by said shift-plate extending into said runways, and a throw-plate having connection with said shift-plate, substantially as set forth.

2. In a clutch, the combination of a shaft, a hub fixed to said shaft and having tapering runways, a drive-wheel hub having a head fitting over said shaft-carried hub, clutch-balls in said runways, and means for retaining said clutch-balls at the deepest ends of said runways; said means consisting of a rocking shift-plate, pins carried by said shift-plate extending into said runways, and a rocking throw-plate having connection with said shift-plate, substantially as set forth.

ISRAEL H. SPENCER.

In presence of—
E. S. KNIGHT,
NELLIE V. ALEXANDER.