C. H. McCOMBS.

SHOCK ABSORBER.

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1,019,504.

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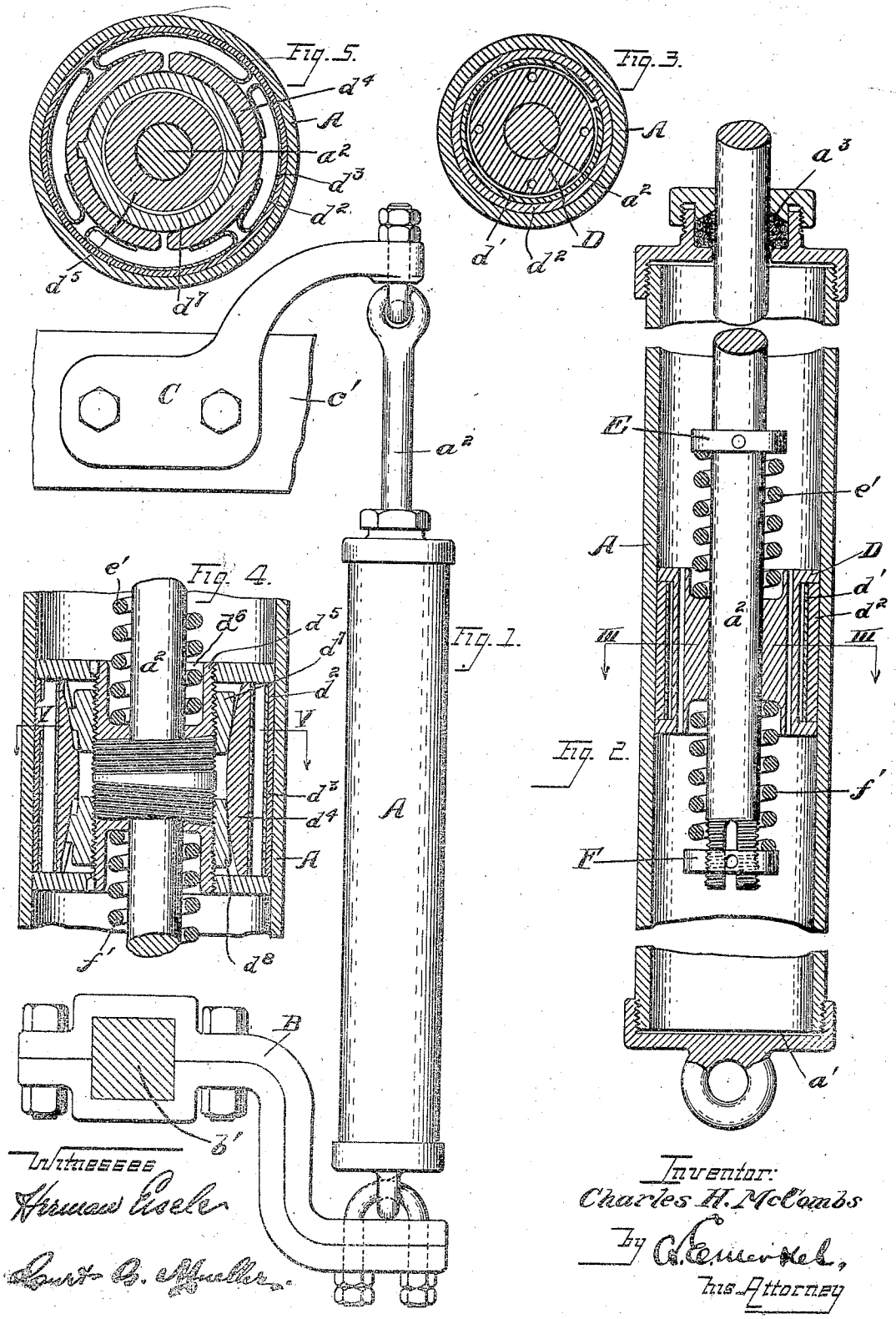

UNITED STATES PATENT OFFICE.

CHARLES H. McCOMBS, OF CLEVELAND, OHIO, ASSIGNOR OF ONE-HALF TO CHARLES S. BRITTON, OF BRATENAHL, OHIO.

SHOCK-ABSORBER.

1,019,504. Specification of Letters Patent. Patented Mar. 5, 1912.

Application filed April 7, 1911. Serial No. 619,548.

To all whom it may concern:

Be it known that I, CHARLES H. McCOMBS, a citizen of the United States, resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Shock-Absorbers, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

My invention has reference broadly to shock absorbers, and more particularly to such as are intended to alleviate the vibratory movement of vehicle springs.

One object sought is the provision of a device of this character in which the application of resistance may at first be of increasing and then constant degree following the inception of the spring's recovery, as well as during its initial flexure.

Another object is the provision of interdependent and hence more precise adjusting means.

A further object is the attainment of a more uniform reliability assured through an avoidance of the inefficiency attributable to rapidly worn elements of construction.

The said invention consists of means which are hereinafter fully described and particularly pointed out in the claims.

The annexed drawings and the following description set forth in detail certain means embodying my invention, the disclosed means, however, constituting but one of various mechanical forms in which the principle of the invention may be applied.

In said annexed drawings:—Figure 1 is an elevation of a shock absorber embodying my invention as operatively interposed, by way of example, between the frame and axle of a vehicle. Fig. 2 is a vertical section of the device proper. Fig. 3 is a section on line III—III of Fig. 2. Fig. 4 is an enlarged modified form of one feature. Fig. 5 is a section on line V—V of Fig. 4.

My inventive construction comprises a cylinder A closed at one end a' save for vent-openings, not shown, and a piston rod a^2 extending centrally through any approved type of stuffing-box a^3 at the other end. The end a' is movably secured to the bracket B attached to the axle b' of the vehicle, while the piston rod a^2 is similarly secured to a bracket C attached to the vehicle frame c'. As thus positioned, the device itself affords the operative connection generally adopted to check excessive tendencies on the part of the frame and axle to move relatively to each other.

Interiorly, a friction piston D provided with the usual type of ring d' and fiber covering d^2 is slidably mounted upon the rod a^2. Fixed to the piston rod a^2 and positioned on either, though in the drawing the upper, side of the piston D, is a collar E. The extremity a^3 of the rod is shown threaded and slotted to receive a spanner nut F. A pair of reactive buffer springs e' and f' are interposed between the piston D and respectively the collar E above and the nut F below. These springs are preferably, though not necessarily, of strong and also equal tension, according to the type of vehicle to which the device is to be applied and the character of the road upon which it will likely travel. In practice, the stiffness or tension of the springs would probably be such that a safe margin over and above the severity of jolts occasioned during ordinary usage would just fail of moving the piston. The amount of play on the part of the springs during such ordinary usage being actually very small, these springs should compress only a little more than half the amount of play of the ordinary usage, previously ascertained.

It is here evidenced that the amount of free movement made possible by my construction eventually adjusts itself automatically; and hence is not restricted, as in the case of devices at present on the market; whenever the vehicle springs are subjected to unusual load. Specifically, while the upper spring e^2 will be partially compressed under unusual load, and so for a time restrict the amount of free movement; that is, the movement prior to the movement of the piston; eventually, or after the first appreciable shock which thus moves the piston, the two springs e' and f' reacting will contrive to practically restore the piston to its arbitrarily chosen normal position midway of the collar E and the nut F, though slightly lower than its first position of rest with respect to the cylinder. The extent to which the range of free movement was in the first instance restricted because of such unusual load is consequently in almost complete measure restored auto-

matically. However, as will now be apparent, the mere turning of the spanner nut F may alter the tension of these reactively disposed springs e' and f', and hence constitute one possible mode of adjustment.

The operation of my shock absorber is as follows: Upon a shock being transmitted to the springs and having flexed these by compression, the piston rod a^2 will move into the cylinder against the action of the upper spring e'. The downward movement of the frame coincident with the compression of the vehicle springs under only a light shock, will depress this upper spring without, however, being sufficient to overcome the frictional resistance of the piston. Upon the recovery of the vehicle spring with its attendant rebound on the part of the frame, the piston rod on its return stroke will be pulled upwardly through the piston to compress, in turn, the lower spring f'. This simple reactive buffer movement on the part of the springs e' and f', as occasioned by light shocks, will accordingly have no appreciable damping effect upon the vehicle springs other than to assist in a measure their normal centering. Consonantly, the maximum range of the free movement which is always desirable is made possible, and is not only absolutely assured automatically, but accurately controlled through the medium of the mode of adjustment already mentioned.

In the event that the shock incurred is sufficiently severe to warrant a restraint of the vibratory movement on the part of the springs and especially the uncomfortable if not damaging rebound on the part of the vehicle frame, the proportionately greater compression of the vehicle springs again first depresses in similar degree the upper spring e' until its tension is sufficient to overcome the frictional resistance of the piston. This causes the latter to slide down continuously, adding its uniform resistance until the initial vibration is checked. During this first movement on the part of the piston, the nut F will have moved even further and partially reduced the tension of the spring f'. Following the recovery of the vehicle spring and during the ensuing tendency on the part of the frame to rebound, the resistance is again gradually applied while compressing this lower spring f' and then uniformly maintained by the constant friction afforded during the return of the piston. At this point, attention is directed to a highly advantageous feature which my invention assures. Of the alternate spring flexures resulting from sudden shock, the one most requiring restraint is the first excessive expansion following recovery, and throughout this entire tendency to so excessively expand my construction applies the same gradually increasing and finally constant resistance, as in the case of the first compression flexure. Consequently, there is no omission of restraint at any time throughout those alternate flexures properly requiring restraint, and hence the too sudden application thereof is positively avoided. It is further noted that although the need of shock absorption exists, the agency calculated to effect it must be no more rigorous than necessary, and hence no longer cumulative directly the excessive resiliency of the vehicle springs has begun to be checked. The frictional resistance offered by the piston in my construction during its reciprocation is substantially constant, and accordingly presents the merits suggested as contradistinguished in theory from previous efforts of which I am aware.

The modified form of piston construction shown in Figs. 4 and 5 represents another mode of adjusting my shock absorber, in this case by altering the degree of friction offered by the piston. Such adjustment will necessarily be interdependent with that established for the springs e' and f'. It consists of a plurality of diametrically disposed springs d^3 positioned between the fiber covering d^2 and an expansion sleeve d^4. The collar d^5 assumes in this modification the sliding engagement with the rod a^2, and while designed to inclose the extremities of the springs e' and f' in its end depressions d^6 d^6, is exteriorly screw-threaded with right and left hand threads, as clearly appearing in Fig. 4. Two conical nuts d^7 and d^8 are interposed between the sleeve d^4 and collar d^5, for the now obvious purpose of being moved toward and away from each other to increase or diminish the tension of the springs d^3. In this manner, the desired degree of frictional engagement may be maintained regardless of frictional depreciation.

Having fully described my invention, what I claim and desire to secure by Letters Patent is:

1. A shock absorber comprising the combination of a cylinder, a hollow piston, a piston ring provided with a frictional covering, a piston rod, and adjustable means within said piston adapted to expand said ring.

2. A shock absorber comprising the combination of a cylinder, a hollow piston, an expansible piston ring, a piston rod, a plurality of diametrically disposed springs within said ring, and means for adjusting the tension of such springs.

3. A shock absorber comprising the combination of a cylinder, piston in said cylinder, a friction ring upon said piston, a piston rod movable through said piston, projections upon said rod and positioned on opposite sides of said piston, and springs interposed between said piston and projec-

tions adapted to establish an operative relationship between said rod and piston.

4. A shock absorber comprising the combination of a cylinder and piston-rod movable relatively to each other; a piston movable upon said rod; an expansible piston-ring provided with a frictional covering; adjusting means associated with said piston for effecting such expansion; a plurality of reacting resistance members adapted to establish an operative relationship between said rod and piston; and adjusting means for one such resistance member.

Signed by me, this 6th day of April, 1911.

CHARLES H. McCOMBS.

Attested by—

KARL B. BRITTON,
CURT B. MUELLER.