(No Model.) 9 Sheets—Sheet 1.

J. S. COPELAND.

VELOCIPEDE.

No. 385,847. Patented July 10, 1888.

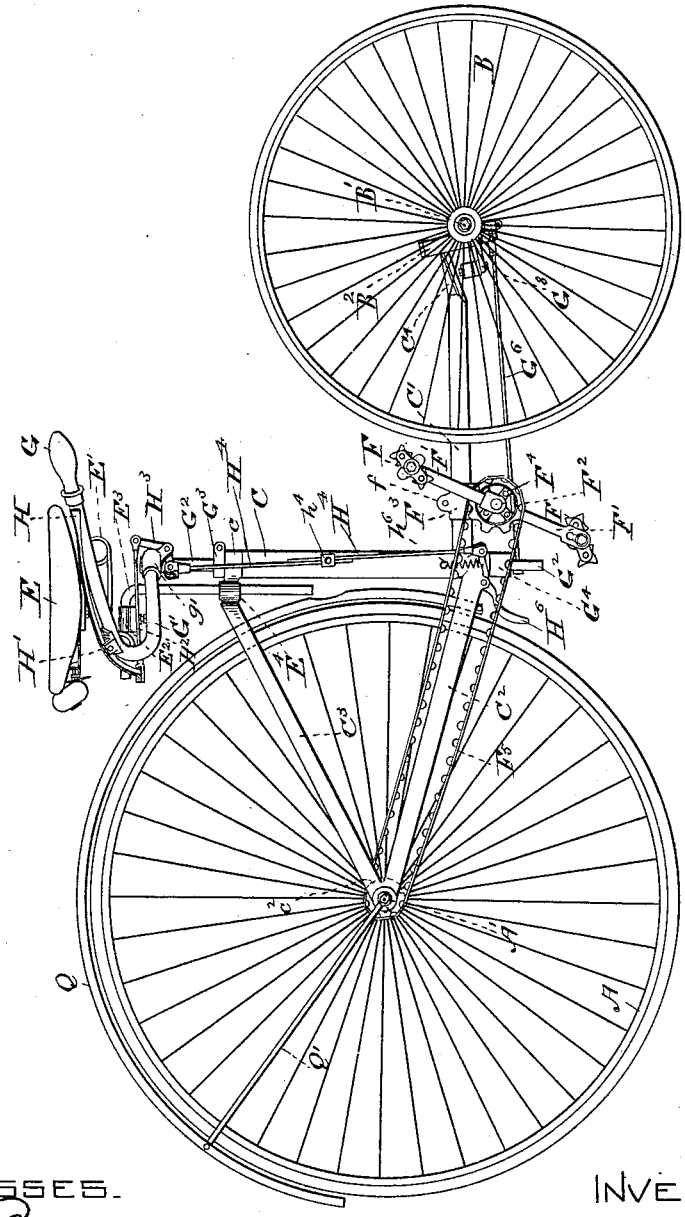

Fig. 1.

WITNESSES.
E. L. Benson.
G. F. Kehew.

INVENTOR.
James S. Copeland.
By Charles E. Hall.
Atty.

(No Model.) 9 Sheets—Sheet 2.

J. S. COPELAND.

VELOCIPEDE.

No. 385,847. Patented July 10, 1888.

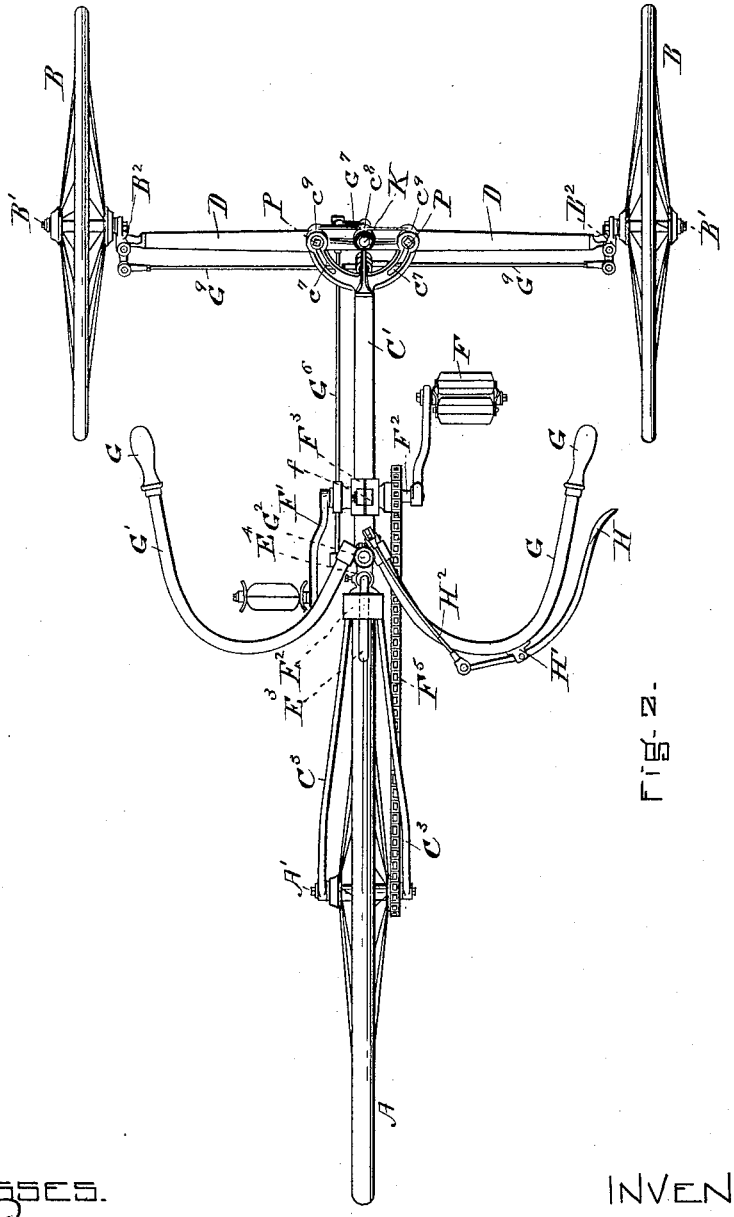

Fig. 2.

WITNESSES.
E. L. Benson.
G. F. Kehew.

INVENTOR.
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Atty.

(No Model.) 9 Sheets—Sheet 3.

J. S. COPELAND.

VELOCIPEDE.

No. 385,847. Patented July 10, 1888.

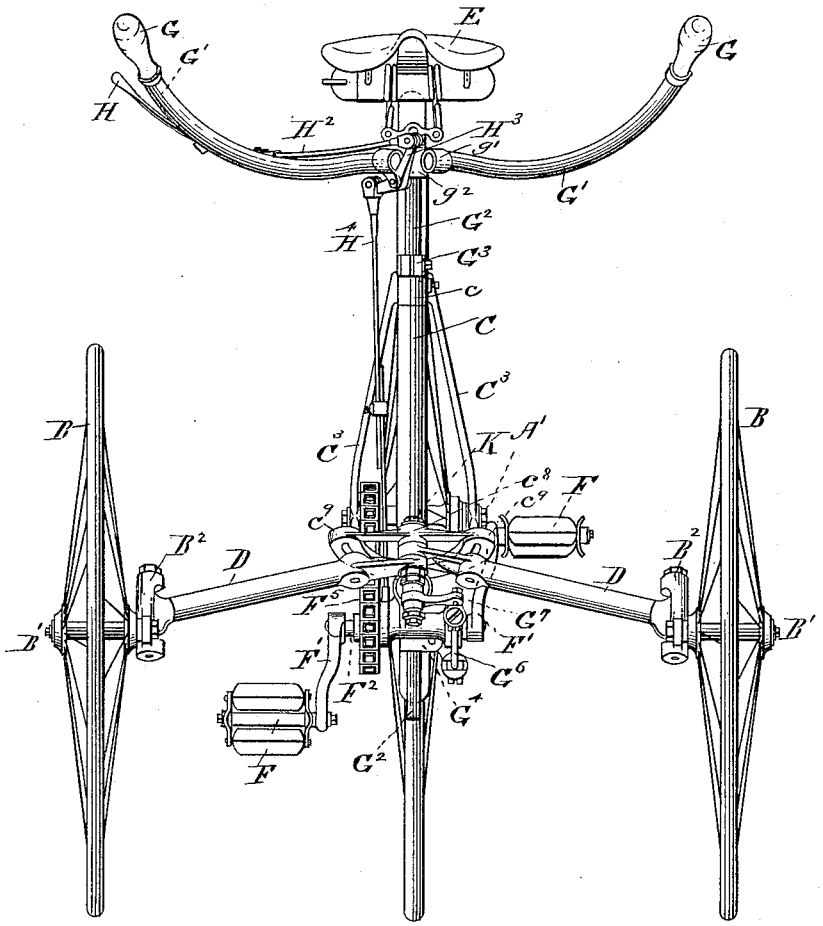

Fig. 3.

WITNESSES.
E. L. Benson.
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INVENTOR.
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(No Model.) 9 Sheets—Sheet 4.

J. S. COPELAND.

VELOCIPEDE.

No. 385,847. Patented July 10, 1888.

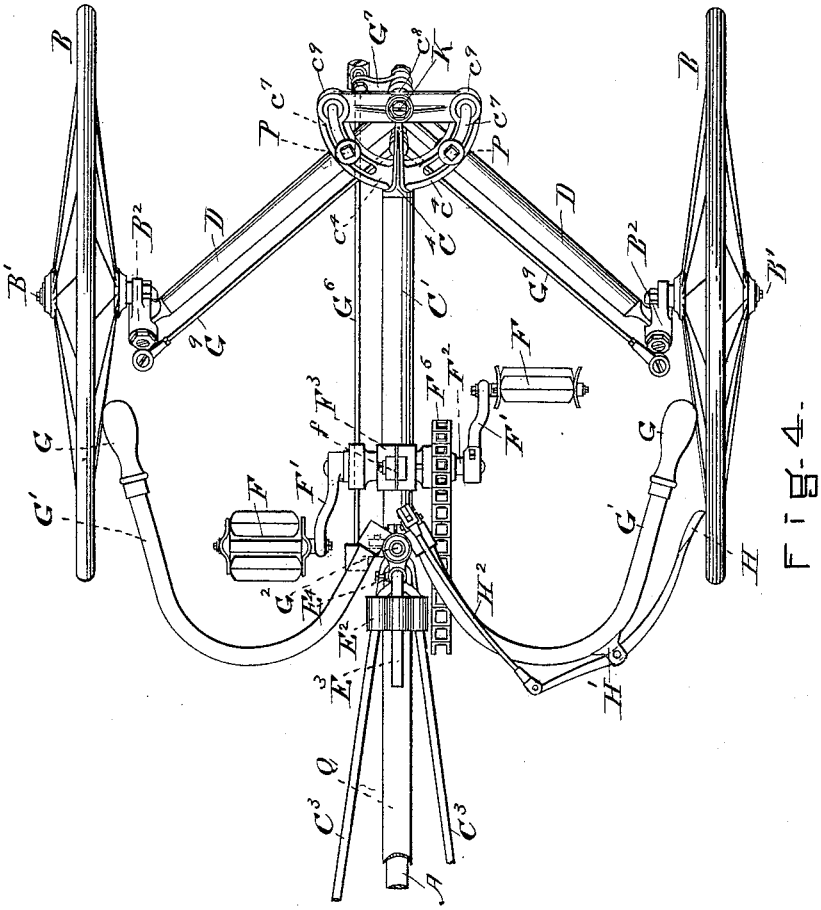

Fig. 4.

WITNESSES.

E. L. Benson.

G. F. Rehen.

INVENTOR.

James S. Copeland,

By Charles E. Foss,

Atty

(No Model.) 9 Sheets—Sheet 5.

J. S. COPELAND.

VELOCIPEDE.

No. 385,847. Patented July 10, 1888.

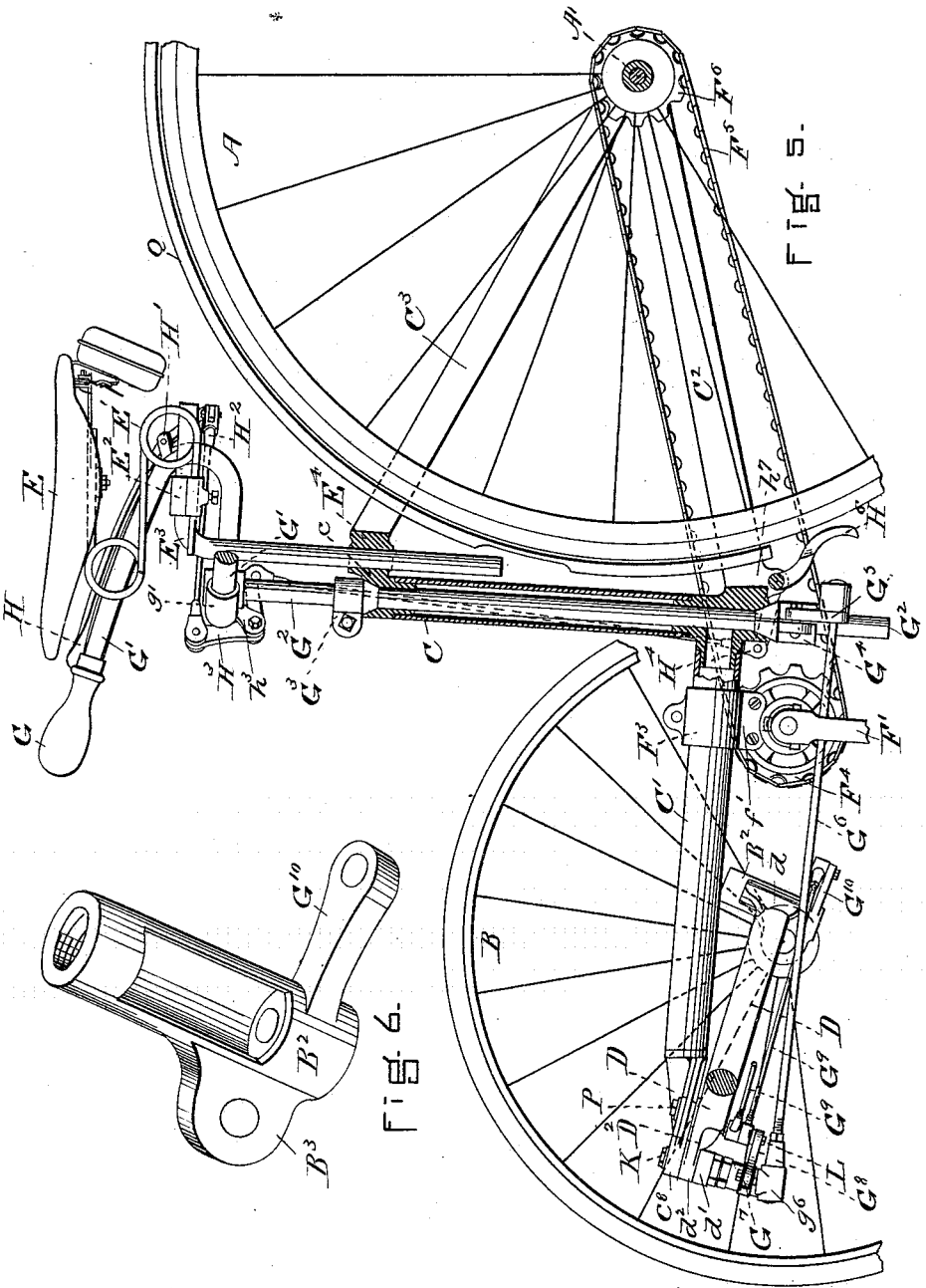

FIG. 5.

FIG. 6.

WITNESSES.

E. L. Benson.

G. F. Kehew.

INVENTOR.

James S. Copeland.

By Charles E. Pratt,

Atty

(No Model.) 9 Sheets—Sheet 6.

J. S. COPELAND.

VELOCIPEDE.

No. 385,847. Patented July 10, 1888.

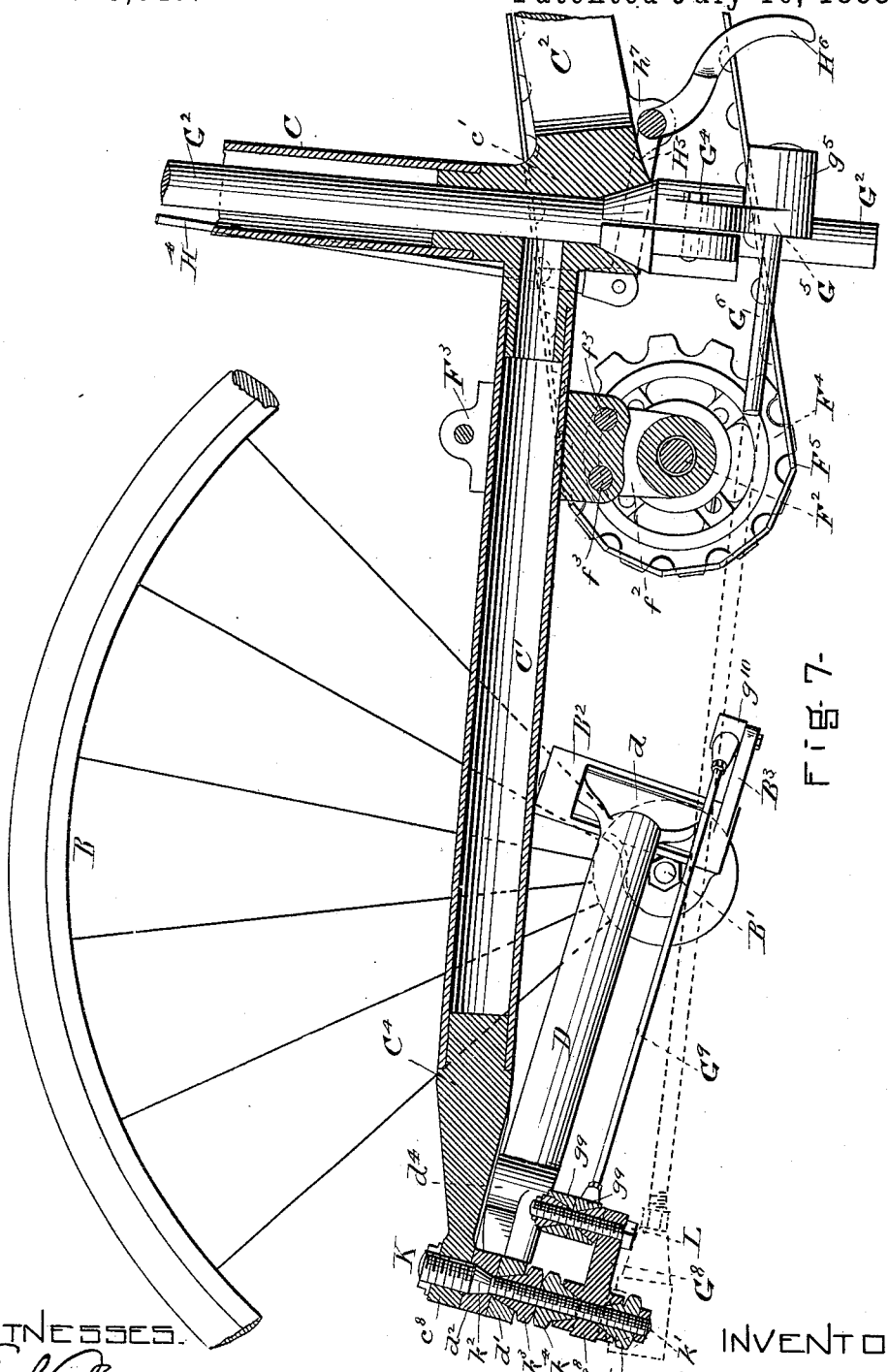

FIG. 7.

WITNESSES.
E. L. Simpson.
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(No Model.) 9 Sheets—Sheet 7.

J. S. COPELAND.

VELOCIPEDE.

No. 385,847. Patented July 10, 1888.

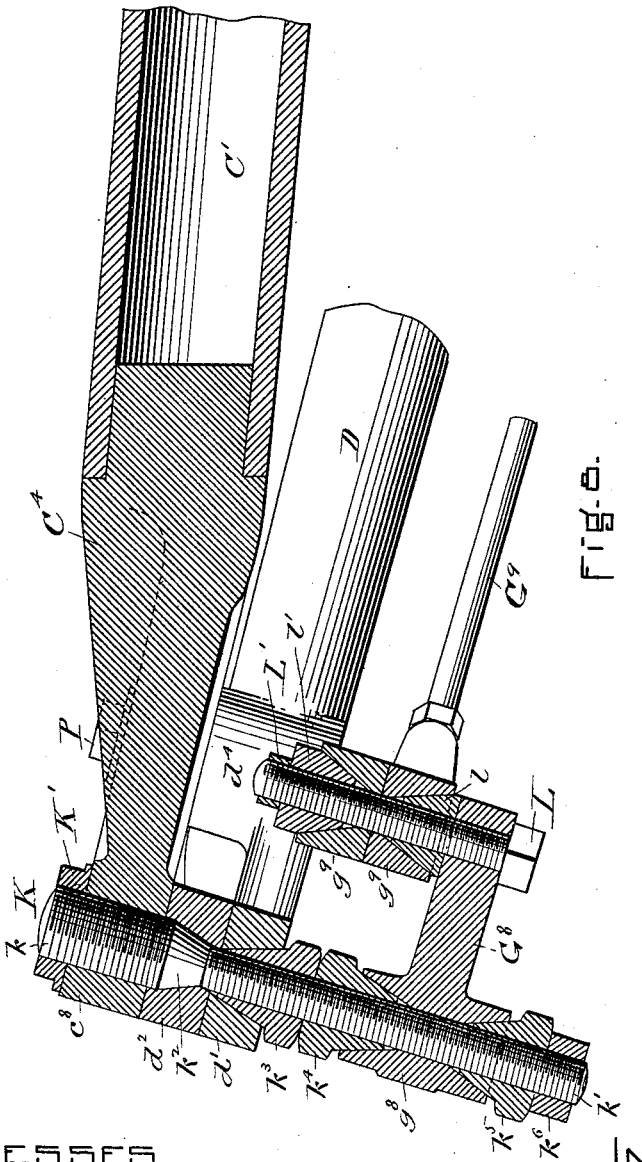

Fig. 6.

WITNESSES.
E. L. Benson.
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Atty.

(No Model.) 9 Sheets—Sheet 8.

J. S. COPELAND.

VELOCIPEDE.

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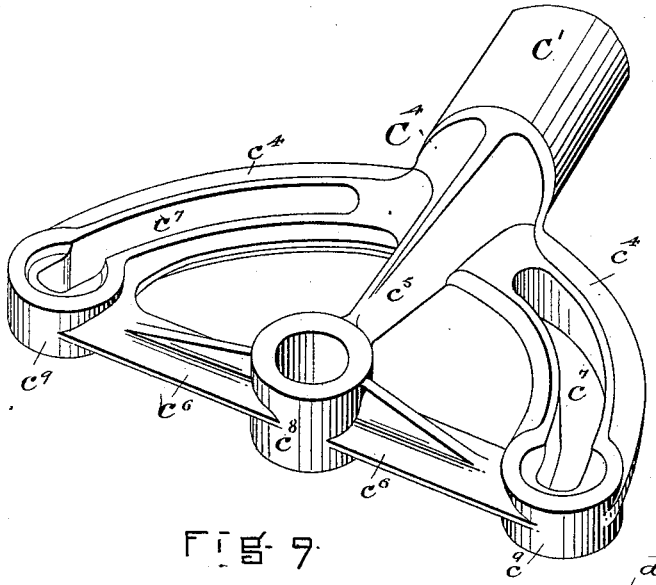

Fig. 9.

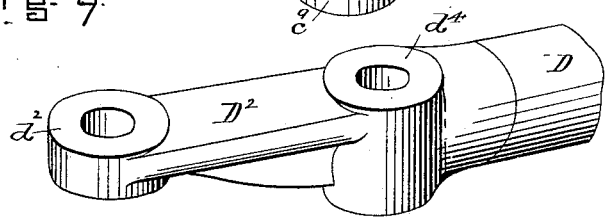

Fig. 10.

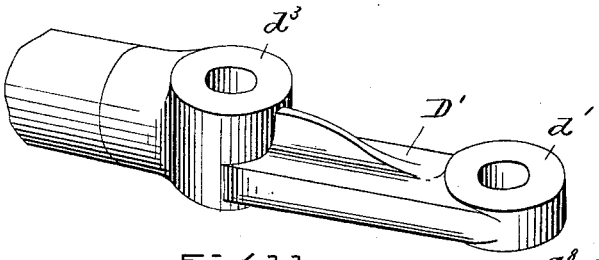

Fig. 11.

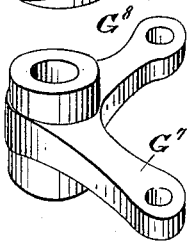

Fig. 12.

WITNESSES.

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Atty.

(No Model.) 9 Sheets—Sheet 9.

J. S. COPELAND.

VELOCIPEDE.

No. 385,847. Patented July 10, 1888.

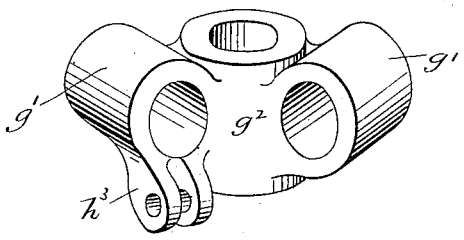

Fig. 13.

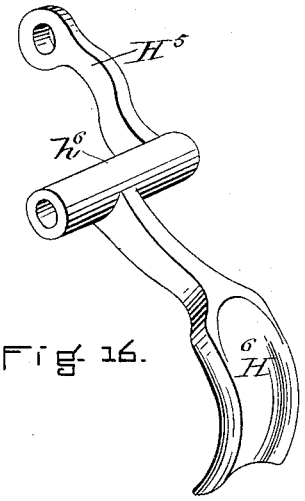

Fig. 16.

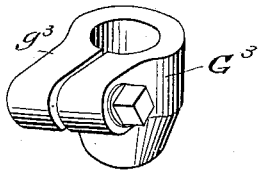

Fig. 14.

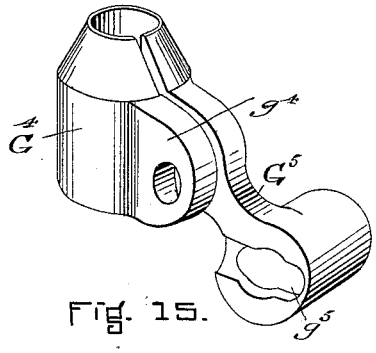

Fig. 15.

WITNESSES.

E. L. Benson.

G. F. Kehoe.

INVENTOR.

James S. Copeland.

By Charles E. Hall.

Atty

UNITED STATES PATENT OFFICE.

JAMES S. COPELAND, OF HARTFORD, CONNECTICUT, ASSIGNOR TO THE POPE MANUFACTURING COMPANY, OF PORTLAND, MAINE.

VELOCIPEDE.

SPECIFICATION forming part of Letters Patent No. 385,847, dated July 10, 1888.

Application filed December 3, 1887. Serial No. 256,845. (No model.)

To all whom it may concern:

Be it known that I, JAMES S. COPELAND, of Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Velocipedes, of which the following is a specification.

The object of my present improvements is to produce a light, efficient, economical, simple, easy-running, and convenient tricycle; and also to produce a tricycle without a long main axle and its intricate and cumbersome balance-gear, but with a single main driving-wheel and two guiding-wheels; and also to produce a tricycle which, while constructed with sufficient width for stability and safety on any road, shall be adjustable to a narrower width for actual operation, as well as to be a "folding" tricycle for the purpose of taking it through narrow doors or for storage, the design of it being that it may be used equally well with some or considerable narrowing up, especially on smooth roads and on short distances, so as to avoid the constant change of width both on starting out and on bringing it home; and also to produce a folding or variable-width tricycle in which the devices for changing the width shall be simple and convenient, and yet of ready and easy operation; and also to produce a rigid and convenient frame suitable for any velocipede having two or more wheels in which there is but one main driving-wheel; and also to construct the steering and handle bar and handle-bar supporting mechanism so as to be beneath and out of the way of the rider and leave an open front in the machine; and also to produce a velocipede having two guiding-wheels in which the guiding-wheels, in the act of steering, may be inclined as well as deflected, and therefore not only require a less motion of the steering parts and a more ready obedience of the machine to the will of the rider, but also secure a more efficient and less straining action of the machine and avoid the strain incident in the usual forms of construction upon the tire and to the wheels that are abreast in going around curves; and also to produce certain other improvements incidental to those above named in the details of velocipede construction, which will be apparent from the following description, taken in connection with the accompanying drawings.

While I show and describe my improvements as applied in one form of a tricycle, it will be obvious to any skilled in the art that they are applicable in other forms of tricycles and in other velocipedes besides tricycles, and I do not intend to limit myself in pointing out my invention and what I now consider the best form of embodying my improvements to the precise form or forms and arrangements herein shown and described.

I am aware that heretofore a tricycle has been constructed with one driving-wheel and two guiding-wheels, and also that "folding tricycles," so called, have been made, some made so by a folding frame hinged over the small rear steering-wheel and carrying in front one driving-wheel and an opposite supporting-wheel; and also that a narrowable tricycle has been constructed with one or more devices for removing one of the wheels and a part of the axle; and also that it has been proposed to narrow a tricycle by telescoping the axle between the wheels that are abreast; and also that the dwarf steering-heads, pedals, sprocket-wheels, saddle-spring, and some other parts which I use in this machine and either show or describe have been already patented. I am also aware of the two improved tricycles shown and described by E. G. Latta in his applications for patents, Serial Nos. 249,915 and 250,626, now pending, and I do not wish to be understood as claiming as my own invention any of the things which I have thus referred to, but only my improvements thereon, the nature of which I will now endeavor to discriminate.

In the drawings, Figure 1 shows in side elevation, and Fig. 2 in top plan, a tricycle embodying my improvements in one form. Fig. 3 shows the same in end elevation with the secondary frame partly folded; and Fig. 4 shows the same as Fig. 3 in top plan view, the saddle and spring and a portion of the rear part of the machine removed. Figs. 5 and 7 show parts of the same partly in section and partly in side elevation and enlarged. Fig. 6 shows in perspective one of the dwarf steering-heads. Fig. 8 shows parts of the second-

ary frame and steering devices in vertical longitudinal section. Figs. 9 to 16, inclusive, show in perspective details of my improved devices enlarged.

A is the driving-wheel, having a fixed axle, A'.

B B are guiding-wheels arranged abreast, having axles B' B', on which, as I prefer to make them, they are free to turn, and, as I prefer to arrange these wheels, the two guiding-wheels are in front and a sufficient distance apart at their remotest for stability of the machine, and the driving-wheel A is arranged to follow and track midway between. I connect rigidly with the axle of each of these steering-wheels a dwarf steering-head, B^2, on the inside by means of the lug B^3, and as this dwarf steering-head is sufficiently described in Letters Patent of A. E. Wallace, No. 312,411, I need not further describe it, except to say that it affords a swivel or spindle center joint with the frame, and I do not limit myself to the use of this kind of steering-joint.

In constructing the main frame of this improved velocipede I use a vertical or nearly vertical tubular pillar, C, and a horizontal or nearly horizontal tubular reach, C', and a tubular lower fork, C^2 C^2, and a tubular upper fork, C^3 C^3, and I connect the pillar C with the reach C' and the lower fork-arms, C^2 C^2, by means of a forged bracket, c', to which they are brazed, and I connect the pillar C with the upper fork-arms, C^3 C^3, by means of a forged bracket, c E^4, to which they are brazed, and I connect the rear ends of the fork-arms C^2 C^3 on each side the driving-wheels by means of a forged bracket, c^2, which affords a bearing for or a connection with a bearing for the main axle A'. In the brackets c c', I make bearings and conical seats concentric with the pillar C for a steering-post, and in the bracket E^4, I make a vertical bearing for a seat-rod, and on the bracket c', I make two lugs for attachment of a brake-lever spoon, and to the forward end of the reach C', I connect by brazing a bracket, C^4, having two branches, c^4 c^4, with slots c^7 c^7 on circular arcs concentric with the hinge-lug c^8, connected with the branches c^4 and the main part of the bracket C^4 by a middle arm, c^5, and cross-arms C^6 C^6, extending to the limit-lugs c^9 c^9. D D are tubular transverse reaches, each connected at one end to a spindle, d, in the dwarf steering-head B^2 and constructed at the other end with an arm, D' or D^2. These arms D' D^2 are made or attached in reverse form to the reaches D, so that they may be more conveniently and compactly superimposed, and the arm D' has the hinge-lug d' corresponding to the similar lug, d^2. E is the saddle, and E' a saddle-spring. E^2 is a bent saddle-supporting rod, having one part nearly horizontal and the other part nearly vertically held in the bracket E^4 adjustably for different vertical heights of the saddles and secured by means of a set-screw or otherwise.

F F are pedals.

F' F' are brackets connected to a shaft or axle, F^2, which is held by suitable bearings in an adjustable bracket, F^3, on the reach C'. Connected with the same shaft, F^2, is a sprocket-wheel, F^4, which latter is connected by means of a driving-chain, F^5, with a sprocket-wheel, F^6, rigidly connected with the driving-wheel A. This bracket F^3 I prefer to make to inclose the reach C' and to have the split lug and screw f on the upper side, and to it on the lower side are connected by two small bolts, f^3 f^3, the bearing-lugs f^2 f^2 of the crank-shaft.

G G are the steering-handles, and G' G' are handle-bars, which are connected together and to a steering-post by means of a lug, g' g' g^2, (shown fully in Fig. 13,) arranged abaft the middle of the machine and beneath the saddle E. From this lug they are bent or curved backward, outward, upward, and forward, as shown in the drawings, so as neither to be in front of the rider nor to interfere with the free action of the rider's thighs, and also to bring the handles to proper fore-and-aft and lateral positions.

G^2 is a steering-post extending nearly vertically through the pillar C and the brackets c and c', in which it has its bearings and is adjustably seated by means of the bearing-rings G^3 G^4. I prefer to make these bearing-rings, as shown in Figs. 14 and 15, with split lugs g^3 g^4, which may be tightened for securing these rings in position on the steering-post adjustably, and also to make them with a conical surface at one end to fit into conical seats in the brackets c c'. By loosening these bearing-rings G^3 G^4 the steering-post G^2 may be adjusted in height to suit the requirements of the rider for the height of handle-bars, and when the steering-post is adjusted to the proper height, first the ring G^3 is set, holding it there, and the ring G^4 is brought up and adjusted so as to make a proper and free bearing, so that the steering-post may be revolved about its axis easily and without rattle, the conical seats and faces of the bearings serving to prevent side shake and to make better bearings. I construct the ring G^4 with an arm, G^5, which, when the ring G^4 is set upon the steering-post, will of course turn with the latter, and which terminates in a wrist, g^5, in which is jointed one end of the steering-rod G^6. The other end of the steering-rod G^6 terminates in a wrist, g^6, jointed to the arm G^7 of a bell-crank lever having a hinge-joint, g^8, about a fulcrum-bolt, k'; and G^8 is the other arm of bell-crank lever carrying the hinge-bolt L. On this bolt are the conical seating-rings l l', secured by a nut, L', which affords bearings in corresponding conical seats in the wrists g^9 g^9 of the transverse steering-rods G^9 G^9. These transverse steering-rods G^9 G^9 are each connected to one of the guiding-wheels by a wrist, g^{10}, hinged at the end of the lever-arm B^3, connected with the steering-head B^2, before described. The construction and arrangement of these parts are such that when the steering-

handles are moved through a small arc about the center of the steering-post the arm G^5 is swung forward or backward, moving the longitudinal steering-rod G^6 back and forth through a short distance, and so through the bell-crank lever G^7 G^8, pushing one of the transverse steering-rods G^9 as it pulls the other, and so deflects each of the guiding-wheels simultaneously and equally.

H is a brake-lever, fulcrumed at H′ upon one of the steering-handles and jointed to a connecting-rod, H^2, which is jointed to a bell-crank lever, H^3, fulcrumed in the lug h^3 (shown best in Fig. 13) on the handle-bar lug g' g^2. To the other arm of the bell crank lever is hinged a vertical or nearly vertical connecting-rod, H^4 H^4, which I make in two pieces coupled together by a small clamp, h^4, to permit of extending and contracting this connecting-rod in length when the steering-post is raised or lowered in adjusting for the height of the rider. The lower end of this connecting-rod H^4 is hinged to a lever spoon-brake, H^5 H^6, (shown separately in Fig. 16,) which is fulcrumed at h^6 in a lug or lugs, h^7, on the under side of the lower fork of the frame. The lever part H^5 of this brake is affected by a small spring, (shown in Fig. 1,) so as to keep the spoon part H^6 away from or out of contact with the driving-wheel A; but the construction and arrangement of these parts are such, as will be obvious, that pressure upon the brake-handle H toward the handle-bar will cause the downward thrust of the brake-connecting rod H^4 and press the brake-spoon H^6 against the tire of the driving-wheel.

K is a hinge and fulcrum bolt, which I secure in the lug c^8 of the bracket C^4 by means of its larger threaded part, k, and the jam-nut K′. I prefer to make it with a conical bearing part, k^2, and a long threaded portion, k', upon which are threaded cones for bearings and securing-nuts.

I prefer to construct the bracket C^4 and its arms so that the under side of them shall be on a plane which, though perpendicular to the hinge and fulcrum bolt K, shall be inclined at a small angle to the horizontal plane when the machine is in its normal position on a level surface. Then the bolt K is inclined and the steering-spindles d d are inclined slightly backward, and the transverse reaches D D and connecting-rods G^9 G^9 are practically level when they are extended, as shown in Fig. 2, but are inclined when they are partly folded, as shown in Figs. 3, 4, 5, 7, and 8. The hinge-bolt L is also similarly inclined, so that the axes of the bolts K and L and of the spindles d d and steering-heads B^2 B^2 are parallel and inclined in all positions. The object of making these parts inclined to the horizontal plane of the machine when in its normal position, instead of perpendicular to it, is to produce an inclination both parallel and equal to the guiding-wheels B B when they are deflected. An inclination of these parts is made backward, so that when the guiding-wheels are deflected the inclination of the guiding-wheels shall be toward the center of the circle and arc of which they are described in the act of steering, thus avoiding the liability to skidding on the ground and to stripping the tires and to straining the wheels and the machine. Upon the bolt K, at the conical seat k^2, I place the lug d^2 of the end D^2 of the right-hand bar D, which has a conical bearing to fit upon the conical seat, and next to it I place the lug d' of the end D′ of the left-hand arm or reach D, which also has a reverse conical bearing, and then I set up into this last conical bearing the adjusting-cone k^3, which is threaded upon the smaller part, k', of the bolt K, so as to give a free but well adjusted hinge-bearing to the transverse reaches D D upon this bolt K. I then screw on the conical bearing-nut k^4, which serves both as a check-nut to the cone k^3 and as a part of the bearing for the fulcrum-lug g^8 of the bell-crank steering-lever G^7 G^8, this latter having a double conical bearing and being held on its under side by the adjusting-cone k^5, which in turn is secured by the jam-nut k^6. On the hinge-bolt L, I thread first the cone l, which affords a bearing for the wrist g^9 of one of the transverse steering-rods placed upon it. I then place the other wrist g^9, with a reversed cone-bearing, upon the bolt L, and follow it with the threaded cone l', which adjusts the bearing of both wrists, and secure it and all the parts together by means of the jam-nut L′. The construction and relation of these transverse reaches and their connecting parts, and transverse steering-rods and their connecting parts are such that as the reaches D D are swung to any position the guiding-wheels B B are preserved in vertical parallel fore-and-aft planes in whatever position of nearness or remoteness to each other they are, these planes being also parallel to the vertical longitudinal plane through the middle of the machine.

P P are securing bolts or screws, seated in the lugs d^3 d^4 of the transverse reaches D D, and swinging with them freely when loosened in the slots c^7 c^7, and which, when tightened, secure the transverse reaches in any desired position to the bracket C^4. I prefer to make countersinks on the upper side of the lugs c^9 c^9, to receive the head or nut of the bolts P when they are brought to the normal position, and thus increase the security of the parts; and similar countersinks may be arranged at equal distances from these—one, two, or more—in each of the arms c^4 c^4, for a similar purpose, and also as guides for bringing the bolts to equal positions on either side in contracting the width of the machine. I also place a dust and mud guard, Q, over the driving-wheel, which may be held to the forks C^2 C^3 by braces Q′ Q′, as shown, or in any suitable manner.

It is obvious now that parts of my improvements may be used without using the whole of them, and that modifications in the form and

arrangement of details of the machine may be made by any one skilled in the art without departing from the substance of my invention; and I do not mean to limit myself to the precise things herein shown and described.

I claim as new and of my invention—

1. In a velocipede-frame, the tubular pillar C, the tubular forks C^2 C^2 and C^3 C^3, and the connecting-brackets c c' c^2, constructed and combined essentially as set forth.

2. In a velocipede-frame, a combined seat-supporting and handle-supporting bracket, E^4 c, constructed to hold a seat-rod and steering-post separately and adjacently.

3. In a velocipede-frame, a connecting-bracket, as c', constructed to connect a fork and a reach and to afford a tubular seat for a handle-bar-supporting rod.

4. In a velocipede-frame, a connecting-bracket, as c', constructed to connect a fork and reach, and a tubular pillar, and to afford a tubular seat for a handle-bar-supporting rod.

5. In a velocipede-frame having a longitudinal reach, as C', and a transverse reach, as D D, an arc-bracket, as C^4, constructed to operate essentially as set forth.

6. In a velocipede-frame, the combination, with a longitudinal reach, as C', of two transverse reaches, as D D, hinged as at K, and an arc-bracket, as C^4, having slots, as c^7 c^7, and bolts, as P P, essentially as set forth.

7. In a velocipede, the combination, with a longitudinal reach, as C', of two transverse reaches, as D D, hinged as at K, and an inclined arc-bracket, as C^4, and bolts, as P P, having a plurality of positions in the bracket, and inclined steering spindles d d, essentially as set forth.

8. In a velocipede-frame, the combination of a longitudinal reach, as C', a transverse reach, as D D, an arc-bracket, as C^4, having arms, as c^4 c^4, and bolt-lugs, as c^9 c^9, and bolts, as P P, securing the bracket and transverse reaches together.

9. The combination, with a reach, as C', in a velocipede, of two wheels, as B B, and their axles, two dwarf heads, as B^2 B^2, and hinged transverse reach, as D D, arms, as c^4 c^4, having slots curved on circular arcs concentric with the hinge of the transverse reach, and devices for securing the longitudinal reach and the two arms of the transverse reach at different angles with each other.

10. The combination, with any suitable frame and driving and steering and seat, handle, and pedal mechanisms in a velocipede, of two parallel guiding-wheels and folding mechanism, substantially as described, constructed to be adjusted and operated with a less or greater width between the guiding-wheels.

11. The combination, with a single rear driving-wheel, as A, with its sprocket, as F^6, and chain, as F^5, and a suitable frame having parts for supporting seat and handle devices adjacent to the driving-wheel, and a forward reaching part, as C', of a driving-sprocket, as F^4, a bell-crank axle, and bearing mechanisms located forward of the seat and handle supports and connected with the forward reach and adjustable sprocket, as F^3, essentially as set forth.

12. The combination, in a velocipede, of a vertical central handle-bar supporting and steering post, as G^2, beneath the seat and forward of the seat-supporting rod and in rear of pedal-driving sprocket mechanism.

13. In the steering mechanism of a velocipede, the combination of a vertical steering-post, as G^2, seats for it, as c c', and adjustable bearing-rings, as G^3 G^4, constructed and combined essentially as set forth.

14. In combination with a vertical steering-post, as G^2, and a longitudinal steering-rod, as G^6, an adjustable steering wrist and joint, as G^5, essentially as set forth.

15. In a velocipede steering mechanism, the combination, with a steering post, as G^2, of a handle-bar lug, as g' g^2, and a steering wrist and joint, as G^4, adjustable relatively to each other about the axis of the post.

16. In a velocipede steering mechanism, the combination, with a steering-post, as G^2, of steering wrist and joint, adjustable both vertically and about the axis of the post.

17. In a velocipede steering mechanism, the combination, with a steering-post, as G^2, of a combined adjustable bearing-ring and a steering wrist and joint, as G^4 G^5, essentially as set forth.

18. The combination, in a velocipede, of a handle and bar, a vertical steering post and wrist, a guiding-wheel and lever-arm, and a horizontal steering-rod, as G^6, and its joints.

19. In a velocipede, the combination, with a vertical steering post and wrist and a longitudinal steering-rod, of a hinge-bolt, crank-lever, and transverse steering-rod, as G^9, on a lever-arm connected with the guiding-wheel.

20. In a velocipede having two guiding-wheels and a longitudinal steering-rod, two transverse steering-rods, as G^9 G^9, hinged together at their inner ends and each to an arm from one wheel at its outer end, and connected by lever-arms, as G^7 G^8, to operate with the longitudinal steering-rod.

21. In combination with a steering-handle of a velocipede and suitable connections operated by it, a bell-crank lever, as G^7 G^8, two transverse steering-rods, as G^9 G^9, arms, as G^{10} G^{10}, and the axis of two swivel guiding-wheels.

22. The combination, in a velocipede, of two guiding-wheels, a folding secondary frame, and a folding secondary steering mechanism, constructed and combined with a main frame, and a main steering mechanism, essentially as set forth, to permit and secure parallelism of the guiding-wheels in different positions, and at the same time an automatic adjustment of the steering devices to secure equal deflection of the wheels in guiding the machine.

23. The combination, in a velocipede, with a

part of the main frame, as C′, and a part of the main steering mechanism, as G^6, and with two guiding-wheels, as B B, and their suitable axles and swivel steering-heads, of adjustable hinged reaches, as D D′ and D D^2, and securing devices, as d^4 c^4 c^7 P, and adjustable ring steering-rods, as G^9, lever-arms, as G^{10} G^{10} G^8 G^7, and their suitable connections, constructed to operate essentially as set forth.

24. In a velocipede, the combination of bolt K k', lug c^8, nut K′, cones k^2 k^3, and lugs d' d^2, essentially as set forth.

25. In a velocipede, the combination of bolt K k', lug c^8, nut K′, cones k^2 k^3 k^4 k^5, nut k^6, and lugs d' d^2 g^8, essentially as set forth.

26. In a velocipede, the combination of bolt L, lever G^8, cones l l', nut L′, and rod ends g^9 g^9, essentially as set forth.

27. The combination, in a velocipede, of a brake-lever, as H, connecting-rod, as H^2, bell-crank lever, as H^3, adjustable connecting-rod, as H^4, and lever-brake, as H^5 H^6, constructed to operate from a handle-bar upon the periphery of a wheel.

28. An improved velocipede consisting in a single driving-wheel and two guiding-wheels abreast and a suitable main frame, and seat, pedal, driving, and main steering mechanisms, and folding transverse secondary frame and steering devices, constructed to operate with the guiding-wheels at two or more different distances apart, essentially as set forth.

29. An improved velocipede consisting in any suitable driving wheel or wheels and driving mechanism, a main frame, seat, pedal, and handle, and main steering mechanisms, and two guiding-wheels abreast, and a secondary transverse frame and steering devices, constructed to operate both to incline and to deflect the guiding-wheels in parallel planes in steering, essentially as set forth.

30. An improved velocipede consisting in any suitable driving wheel or wheels and driving mechanism, a main frame, seat, pedal, handle, and main steering mechanisms, and two guiding-wheels abreast, a secondary transverse folding frame, and steering devices constructed to operate in two or more positions of breadth between the guiding-wheels, both to incline and to deflect the guiding-wheels in parallel planes in steering, essentially as set forth.

31. An improved velocipede consisting in suitable driving and guiding wheels, frame, pedal, and guiding, seat, and handle mechanisms, constructed with an adjustable seat-supporting rod, and adjacent to it an adjustable handle-supporting steering-post, as G^2, located in rear of the crank-sprocket and beneath the seat, essentially as set forth.

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Witnesses:
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