No. 842,246. PATENTED JAN. 29, 1907.

J. V. RICE, Jr.

HYDROCARBON ROCK DRILL.

APPLICATION FILED MAY 27, 1904.

2 SHEETS—SHEET 1.

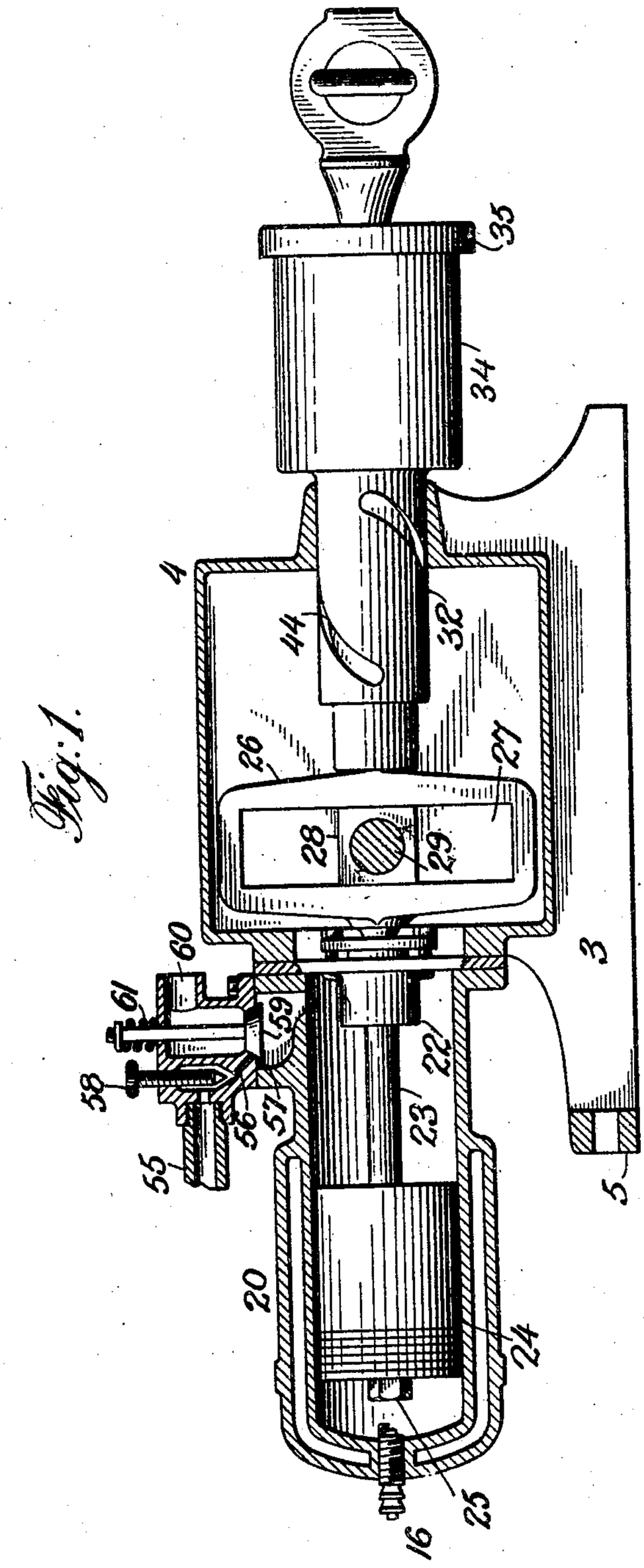

Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 2.

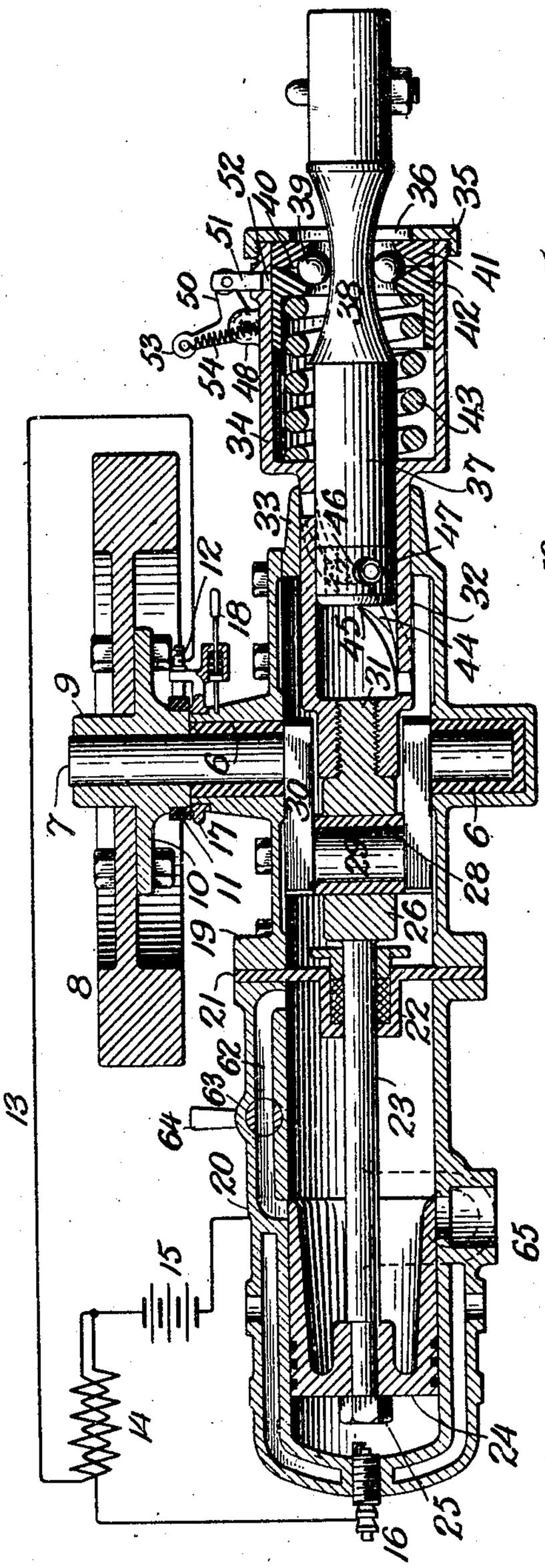


Fig. 3.

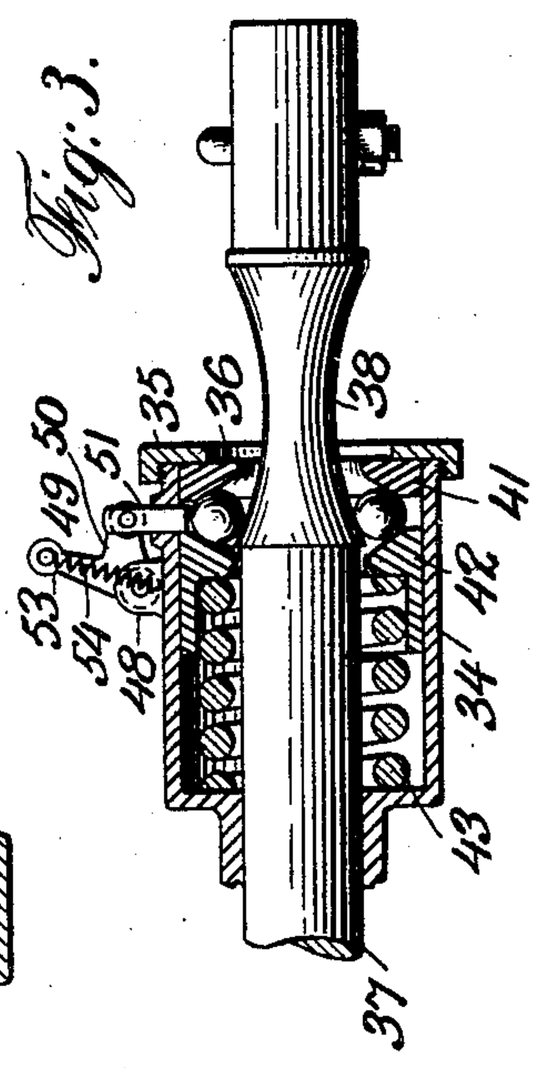
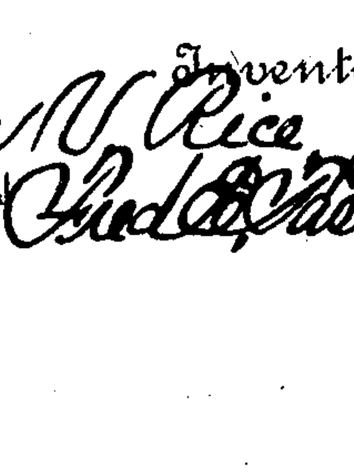


Fig. 4.



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HYDROCARBON ROCK-DRILL.

No. 842,246. Specification of Letters Patent. Patented Jan. 29, 1907.

Application filed May 27, 1904. Serial No. 210,112.

To all whom it may concern:

Be it known that I, JOHN V. RICE, Jr., a citizen of the United States of America, and a resident of Bordentown, in the county of Burlington and State of New Jersey, have invented certain new and useful Improvements in Hydrocarbon Rock-Drills, of which the following is a specification.

My invention relates to improvements in hydrocarbon or gas-actuated rock-drills, and has for its object the compact and economical disposition and arrangement of its operative parts whereby these parts are relieved from exposure, the lubrication of the same facilitated, and the operation of the device rendered less dangerous to the attendant. By the arrangement of the rock-drill as shown and described I am also enabled to reduce the length of the drill to a minimum, which results in a material saving in weight and cost. These and other objects and details of my invention are clearly described in the following specification and pointed out in the appended claims.

In the drawings forming a part of this specification like reference characters refer to the same parts.

Figure 1 is a longitudinal vertical sectional view of my improved drill. Fig. 2 is a longitudinal horizontal sectional view of the same. Fig. 3 is a detail view. Fig. 4 is a detail end view of the clutch mechanism.

The drill is adapted to be mounted on the usual saddle of a tripod or other support, which it has not been considered necessary to illustrate, and depending flanges 3 of the casing 4 have the usual rails on their outer face, and a perforated cross-piece 5 receives the screw to adjust the drill along the saddle. The casing 4 is substantially a rectangular box, whose side walls are provided with soft-metal bearings 6 for the crank 7, which is consequently situated about the mid-length of the drill proper and carries a fly-wheel 8 on its outer end. The fly-wheel is a separate piece from its hub 9 and has its spokes bolted to the flange 10 of the hub, while the latter carries a commutator-ring 11 with the usual contact-segment to coöperate with the brush 12 to complete the circuit 13 through the induction-coil 14, battery 15, sparker 16, and frame of the drill. The brush 12 is carried by a shifting ring 17 on the exterior of the bearing-boss adjacent to the fly-wheel, and the ring is provided with a spring-pressed pin 18, adapted to be set in one of several holes in the said boss to cause the closing of the circuit at some predetermined point of the piston's stroke.

As will be seen in Fig. 2, one of the side walls of the casing is removable to allow access to the interior, and the said wall is secured in place by suitable bolts or other desirable means, while the rear end of the casing has flanges 19, to which is secured the cylinder 20; but interposed between the casing and cylinder is a wall 21 with packing-box 22, through which the piston-rod 23 plays. The piston 24 is of the type commonly used in gas-engines, being bell-shaped, with suitable packing-rings and perforated head through which the end of the rod 23 passes to receive the nut 25, which secures it in place, and the forward end of the rod 23 carries a yoke 26, in whose slot 27 plays a block 28, carried by the crank-pin 29 of the crank-arms 30.

The yoke 26 on the side opposite the piston-rod has a threaded stud 31, adapted to carry a tube 32, playing through a bearing 33 at the forward side of the casing 4 and having an enlarged outside cylindrical or sleeve-like section 34, on which is screwed a cap 35 with an opening 36, the object of which is to admit the passage of the drill-carrier 37. The carrier 37 plays loosely in the tube 32 and its extension 34 and has a reduced portion 38, on which play hardened balls 39, contained in a V-shaped raceway 40, formed by the inclined faces of rings 41 and 42, fitting the outer end of the extension 34, but confined therein by the cap 35. The ring 41 is practically stationary; but the ring 42 compresses the spring 43 when separated from the ring 41 by the pressure of the balls 39 riding down the inclined face of the rings, and this is brought about by the longitudinal thrust of the carrier 38 in either direction and the movement of the inclined face of the reduced part 38 through the circle of balls 39 forcing them outward into the V-shaped space 40 and separating the rings. It is obvious, therefore, that the tendency of the balls is to seek the smallest diametrical section of the part 38 and normally to force the carrier, by reason of the pressure of the spring, to attain that relative position with them.

The tube 32 is provided on opposite sides with spiral slots 44 to receive antifriction-rollers 45, carried by studs 46, which project from a ring 47 on the rear end of the drill-

carrier 37, and contains a suitable ratchet or clutch mechanism, as shown in Fig. 4, consisting of rollers, balls, or pins 70 in slots 72, and adapted to clutch the part 71 of carrier 37, which mechanism is adapted to move the carrier through a certain part of its rotation in order to increase the cutting capacity of the drill-point. This rotation of the drill-carrier is brought about by the independent longitudinal movement of the carrier through the resiliency of the spring 43. The forward end of the carrier is provided with the usual means for clamping the drill in a socket therein.

One side of the extension 34 has ears or lugs 48 projecting from its surface, and between the same is pivoted a bell-crank lever 49, one arm 50 of which carries a bolt 51, playing in an opening 52 in the extension and normally outside of the ring 42. The arm 53 has attached to it one end of a spring 54, whose other end is secured to the extension, so as to put the spring under tension and hold the bolt positively in or out of its opening. The object of this bolt is to hold the rings 41 and 42 apart when forced open by the balls on certain occasions when it may be necessary to release the drill-carrier from the pressure of the balls and spring.

The fluid for use in the vapor flows through the pipe 55 and into a duct 56, which has its outlet in the valve-seat 57, the amount of flow being regulated by the needle-valve 58 and shut off by the supply-valve 59 itself. The valve admits air through the inlet 60 with each back stroke of the piston, the spring 61 on the valve-stem yielding to the suction caused by the reverse movement, and the air rushes into the forward end of the cylinder, carrying with it the necessary fluid and forming an explosive mixture therein. With the forward movement of the piston this mixture is gradually compressed until the rear end of the piston 24 has passed the rear end of a passage-way 62, whose cross-sectional area is regulated by a cut-off valve 63, operated from the outside of the cylinder by a handle 64, when the compressed mixture is permitted to rush to the explosion end of the cylinder, when the return of the piston compresses it, and the instant the piston starts on its forward movement again the commutator 11 reaches a point where by means of the brush 12 the circuit 13 is closed and the flash of the sparker 16 explodes the compressed vapor, giving impetus to the moving piston.

As the piston moves forward it clears the exhaust-port 65 and allows the escape of the burnt gas or its products just before admitting the new supply of vapor.

It is obvious that various details of construction may be modified without departing from the spirit of my invention as set forth in the following claims.

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

1. In a rock-drill, the combination with a cylinder, of a piston in said cylinder, a piston-rod, a fly-wheel, means actuated by said piston-rod for actuating said fly-wheel, a tube carried by said rod, and a drill-carrier mounted in said tube.

2. In a rock-drill, the combination with a cylinder, of a piston in said cylinder a yoke at the forward end of the piston-rod, a tube carried by said rod, a drill-carrier yieldably mounted in said tube, crank-arms with cross-pin playing in the yoke and a fly-wheel.

3. In a rock-drill, the combination of a cylinder a piston carried by the cylinder, a piston-rod with a yoke, crank-arms with cross-pin and block playing in the yoke, a slotted tube carried by the yoke, and a drill-carrier yieldably mounted in the tube.

4. In a rock-drill, the combination of a cylinder, a piston therein, a yoke, crank-shaft with arms and cross-pin, a drill-carrier, a tube carrying same, an extension to the cylinder inclosing the crank-arms, shaft, yoke and tube, and a head to the tube with yielding means between the tube and the drill-carrier.

5. In a rock-drill, the combination of a cylinder, a piston therein, a piston-rod, a drill-carrier, an extension secured to the cylinder; a yoke secured to the piston-rod, crank-arms, crank-shafts and a tube for the drill-carrier contained within the extension, a fly-wheel, a head on the tube, resilient means for coupling the head and drill-carrier the drill-carrier, and means for relieving the drill-carrier of the control of the resilient means.

6. In a rock-drill, the combination of a cylinder, a piston therein, an extension secured to the cylinder, a crank-shaft journaled in the extension, a piston-rod playing in the cylinder and extension, a yoke secured to the front end of the piston, crank-arms with cross-pin and block playing in the slot of the yoke, a tube secured to the front of the yoke, a bell-shaped head to the tube, coöperating rings carried within the head, a spring pressing on one of the rings, a drill-carrier with reduced portion, ball-bearings playing on the reduced portion of the drill-carrier and between the rings, a bolt adapted to be inserted between the coöperating rings when separated to hold them apart, and rotating means connecting the tube with the drill-carrier.

Signed at New York city this 16th day of May, 1904.

JOHN V. RICE, JR.

Witnesses:
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