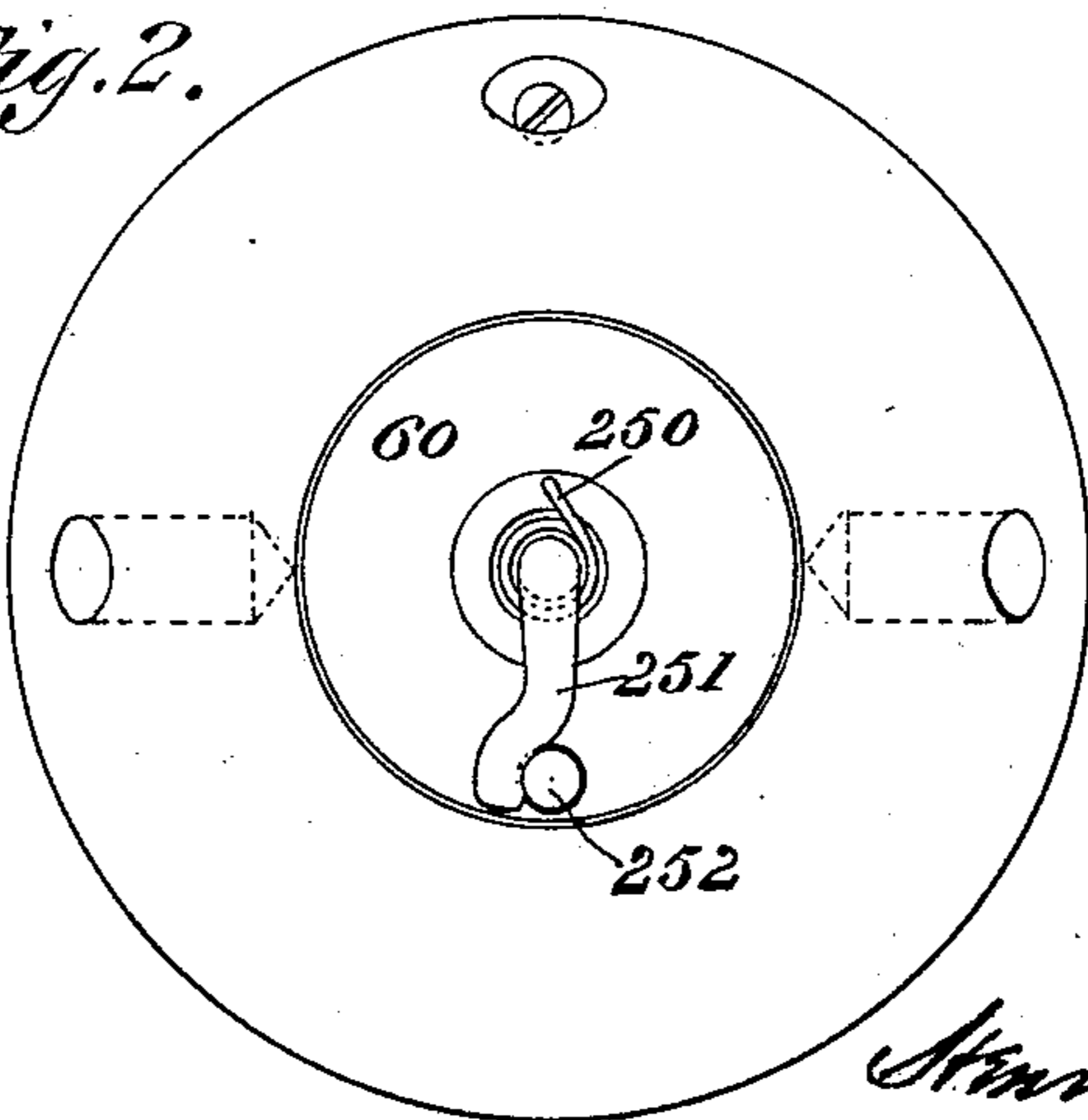
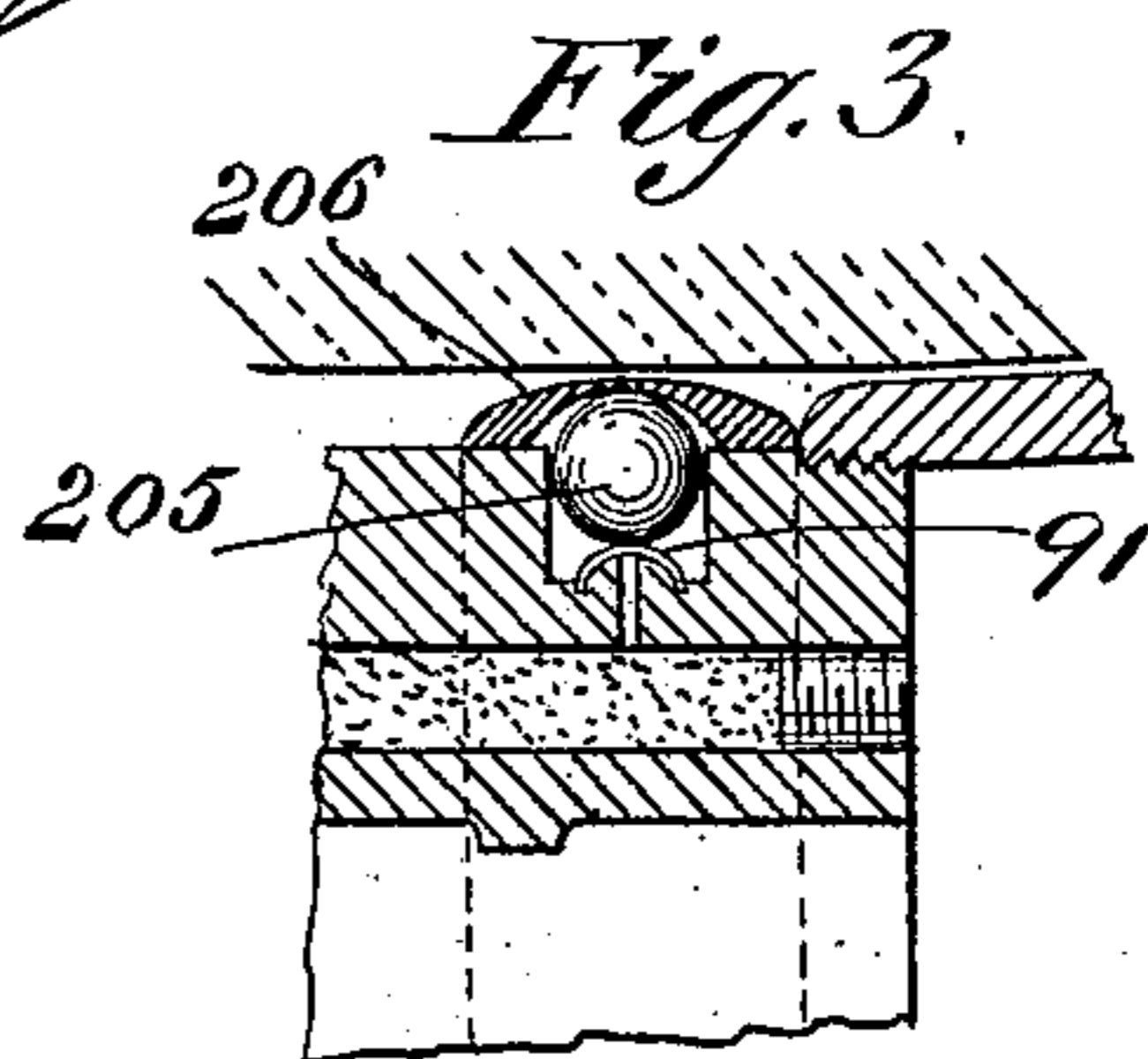


2 Sheets—Sheet 1.

No. 431,375.

Patented July 1, 1890.



INVENTOR
Harry P. Merriam
BY
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ATTORNEY

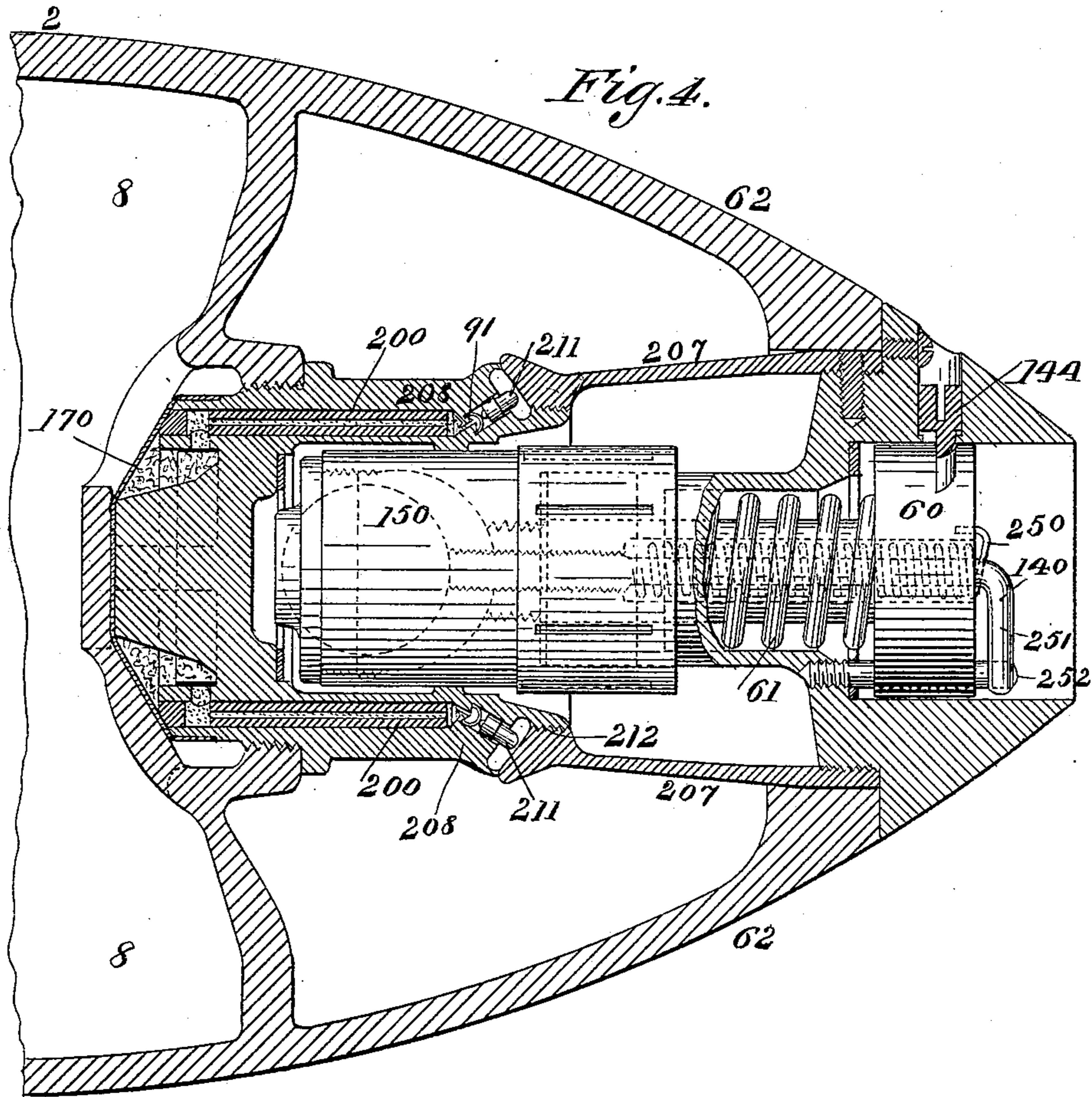
(No Model.)

2 Sheets—Sheet 2.

H. P. MERRIAM.
SHELL FOR HIGH EXPLOSIVES.

No. 431,375.

Patented July 1, 1890.



WITNESSES:

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UNITED STATES PATENT OFFICE.

HENRY P. MERRIAM, OF NEW YORK, N. Y.

SHELL FOR HIGH EXPLOSIVES.

SPECIFICATION forming part of Letters Patent No. 431,375, dated July 1, 1890.

Application filed September 23, 1889. Serial No. 324,719. (No model.)

To all whom it may concern:

Be it known that I, HENRY P. MERRIAM, a citizen of the United States, residing at the city, county, and State of New York, have invented certain new and useful Improvements in Shells for High Explosives, of which the following is a specification.

My invention consists in a novel construction of the instant-action detonator, whereby the same may be actuated by collapse of any portion of the collapsible shell-head within which it is located, being annular in form, the percussion-caps thereof facing all sides of the interior of the head.

My invention also consists in the employment of a single detonator actuated in common by a quick-action or a delay-action fuse, according to the nature of the concussion, upon a solid or a water target.

My invention also includes other novel details of construction, and in order to enable others skilled in the art to understand and use the same I will proceed to describe different forms of mechanism embodying the elements of my invention, and to point out in the appended claims its novel characteristics.

Referring to the accompanying drawings, Figure 1 is a sectional elevation of the head of a shell, showing the percussion-caps of the detonator directed toward various portions of the collapsible head; Fig. 2, a front elevation of the detonator bearing-case; Fig. 3, a detail view of one of the percussion-caps that face the shell-head; and Fig. 4 a sectional elevation of a shell-head, also showing the percussion-caps of the detonator directed toward various portions of the collapsible head, but illustrating a modification of the transmitting medium between the head and caps.

8 represents the chamber of the shell charged with high explosive, such as dynamite. The instant-action and the delay-action detonators are both embodied in the head of the shell. The ball-detonator and case thereof herein described correspond in general character to that described by me in a separate patent application filed simultaneously herewith, Serial No. 324,718.

158 are the delay-action fuses connected to and operated by the compressible apex 60, and 200 the instant-action fuses. The deto-

nator 170 is used in common for delay action and instant action. The fuse-channels 200 have connection with the percussion-caps 91, as designated in the upper part of Fig. 1 and in both the upper and lower part of Fig. 4, and are filled with fulminate throughout, so as to convey the fire from the caps 91 to the detonator 170 instantly. The remaining fuse-channels 158, such as indicated by the one in the lower portion of Fig. 1, and which connect with the caps 16, are partly filled with meal powder or other slow-burning compound to effect delay action. It is also to be noted that the longitudinal channels 152 of the hammer-case 150 do not have a direct connection with the channels 158; but the explosive compound therein is permitted to fill the chamber 201 with flame when the caps 16 are discharged, said flame having access to the channels 158 through the space 203.

The caps 91 in Fig. 1 are surmounted by balls 205, placed loosely over them in the recesses or holes in which the cap-nipples are located, and said balls are confined in place by a ring 206, having a groove within it with inclined sides. Either a compression or an endwise movement of this ring will force the balls inward, exploding the caps 91. The parts 207 208 of the detonator-case, becoming telescoped by an axial concussion of the shell, will crowd the ring 205, its inclined surface bearing inward upon the balls, discharging the caps. Surrounding the ring 206 there is also a soft-metal filling 210 between the same and the collapsible head. A rupture or compression of any portion of the head upon a solid target will displace the yielding metal filling 210 sufficiently to crush or displace some part of the ring 206, producing instantaneous detonation.

In Fig. 4 the caps 91, connecting with the fulminate-channels 200, are provided with firing-pins 211, diverging or radiating toward various sides of the head 62. The part 207 of the detonator-case itself is utilized in this instance to transmit compression from the head 62 to the firing-pins either in a direct line of axis of the shell or obliquely, as the case may be. A filling 210 may, however, be supplied in this as in the preceding instance. The part 207 is attached to the part 208 of the

detonator-case by means of a screw-thread 212, which is stripped when the parts telescope.

The safety screw-rod 140 is herein provided with a coiled winding-spring 250 in lieu of the wind-wheel described in the separate application, one end of which spring is connected to the head 60, the other end being attached to the rod. The end 251 of the rod 140 is constructed in the form of a hook, which engages with a stud 252, when the spring is wound and piston 60 depressed. The latch 144 retains the piston 60 in its retracted position by engagement with the notch 145, as in Fig. 10. When the projectile is accelerated, the hammer-case 150 and piston 60 are driven back by inertia pressing the beveled latch 144 out of the notch 145. As the projectile leaves the gun, the spring 61 then advances the piston to the position of Fig. 1, and the hook 251, leaving the stud 252, permits the spring 250 to unwind, unscrewing the rod 140, withdrawing it, and releasing the ball 120.

The air-cushion confined in the chamber immediately in front of the detonating-case 150 checks the same from a too violent forward movement at the time of discharging the projectile from the gun, insuring against possibility of the ball-hammer prematurely exploding the caps in the event of the said hammer being insecurely retained.

It is to be understood that by the term "delay," as applied to the fuses herein, I have reference to fuses capable of various time adjustment, according to the proportion of slow-burning compound introduced therein, and that such fuses may, if desired, be adjusted to the minimum of time in their action.

I claim as my invention—

1. In an explosive shell, the combination of a collapsible shell-head, a detonator, percussion-primers within the shell-head connected by fuse-channels with the detonator disposed in directions radiating toward all parts circumferentially of the interior of the head, and a body of transmitting material, substantially as described, interposed between the primers and the said surrounding interior of the head, whereby a collapse of any portion of the same will compress the transmitting material about and toward the primers discharging the detonator.

2. In an explosive shell, the combination of a collapsible shell-head, a detonator, percussion-primers within the head arranged in an annular series disposed toward the sides thereof, and an annular case opposite the primers connected directly to the apex of the head, whereby the collapse of the latter in the

direction of the axial line of the shell is transmitted to explode the said primers.

3. The combination, in an explosive shell, of a collapsible conoidal head, an annular series of detonating percussion-primers therein, and an axial telescoping primer-case having adjacent conic surfaces, substantially as shown, between which such primers or their firing-pins are located.

4. The combination, in an explosive shell, of a collapsible conoidal head, a stationary detonator and primer-case bearing the primers or their firing-pins in an annular series diverging toward and within said head, and a sleeve projected inwardly from the apex of the head, bearing a converging conic surface or flange opposite and adjacent the said primers or their firing-pins, so as to contract the same when the head is collapsed, as set forth.

5. The combination, with an explosive shell, of a detonator for the shell-charge having a channel or channels provided with instant-action fuses, a collapsible shell-head capable of resisting concussion upon a water-target, percussion-primers discharged by collapse of the said head communicating to said instant-action fuses, also a channel or channels communicating with the detonator, provided with delay-action fuses, a depressible apex of the shell-head yielding to concussion upon a water-target, and percussion-primers communicating to the delay-action fuses discharged by the depression of said apex in the manner described.

6. The combination, in an explosive shell, of a detonator, a hammer-case within the shell-head movable lengthwise thereof, percussion-primers within the said movable case and fuse-channels communicating with the detonator and with the primers, a depressible shell apex connected to the hammer-case for actuating it, a hammer movable within said case, a rod extending axially through the apex and screw-threaded into the hammer-case to retain the hammer in a stationary position, a torsional spring for unscrewing the rod when released and retracting it from the hammer, a hook upon the end of the rod extending through the apex, and a pin 252, parallel with the movement of the apex, intercepting the rotation of the hook when the apex is depressed, but releasing the same when the apex is advanced, substantially as and for the purposes set forth.

HENRY P. MERRIAM.

Witnesses:

CHAS. W. FORBES,
R. SOLANO.