

(No Model.)

2 Sheets—Sheet 1.

H. P. MERRIAM.
EXPLOSIVE SHELL.

No. 444,536.

Patented Jan. 13, 1891.

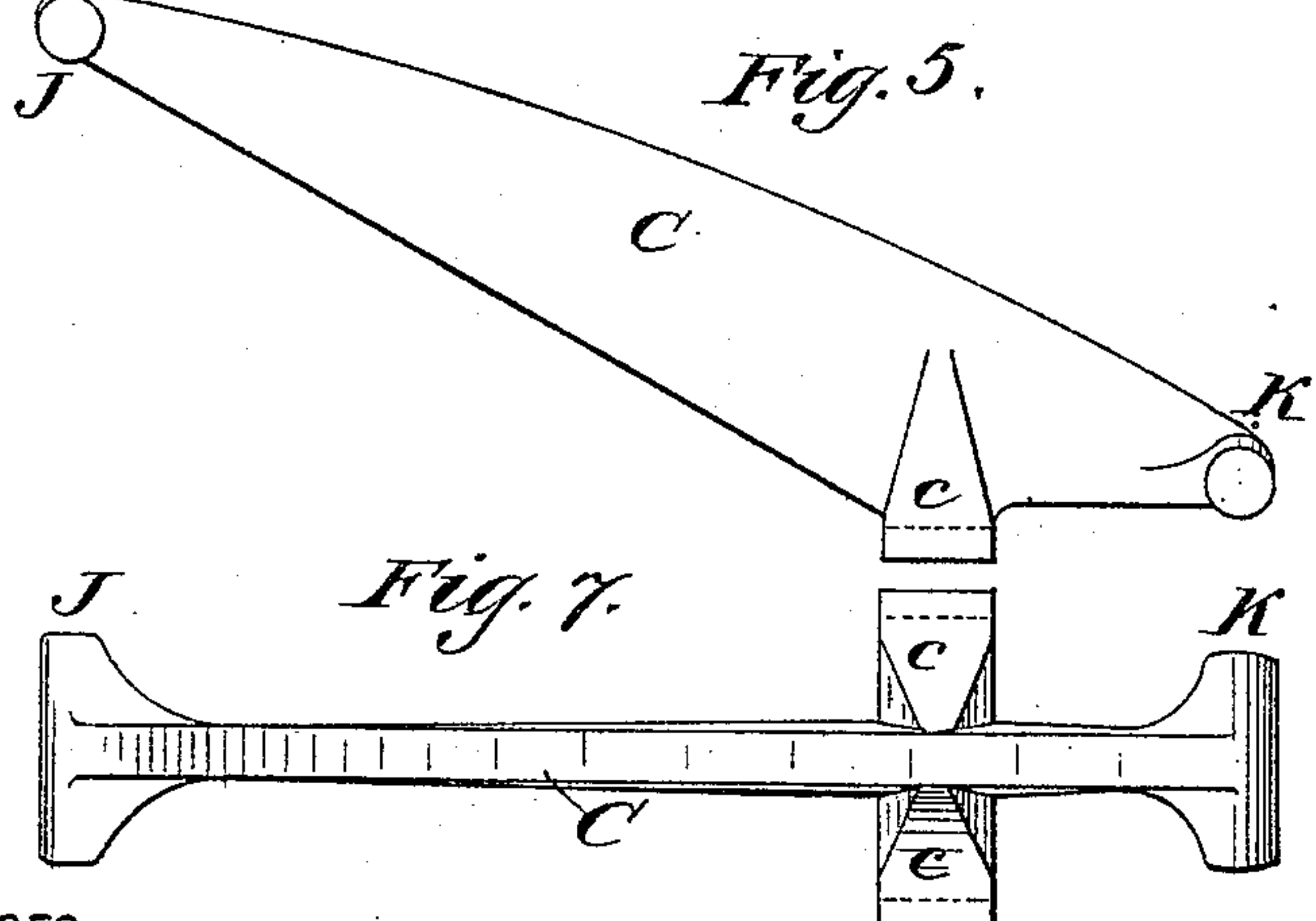
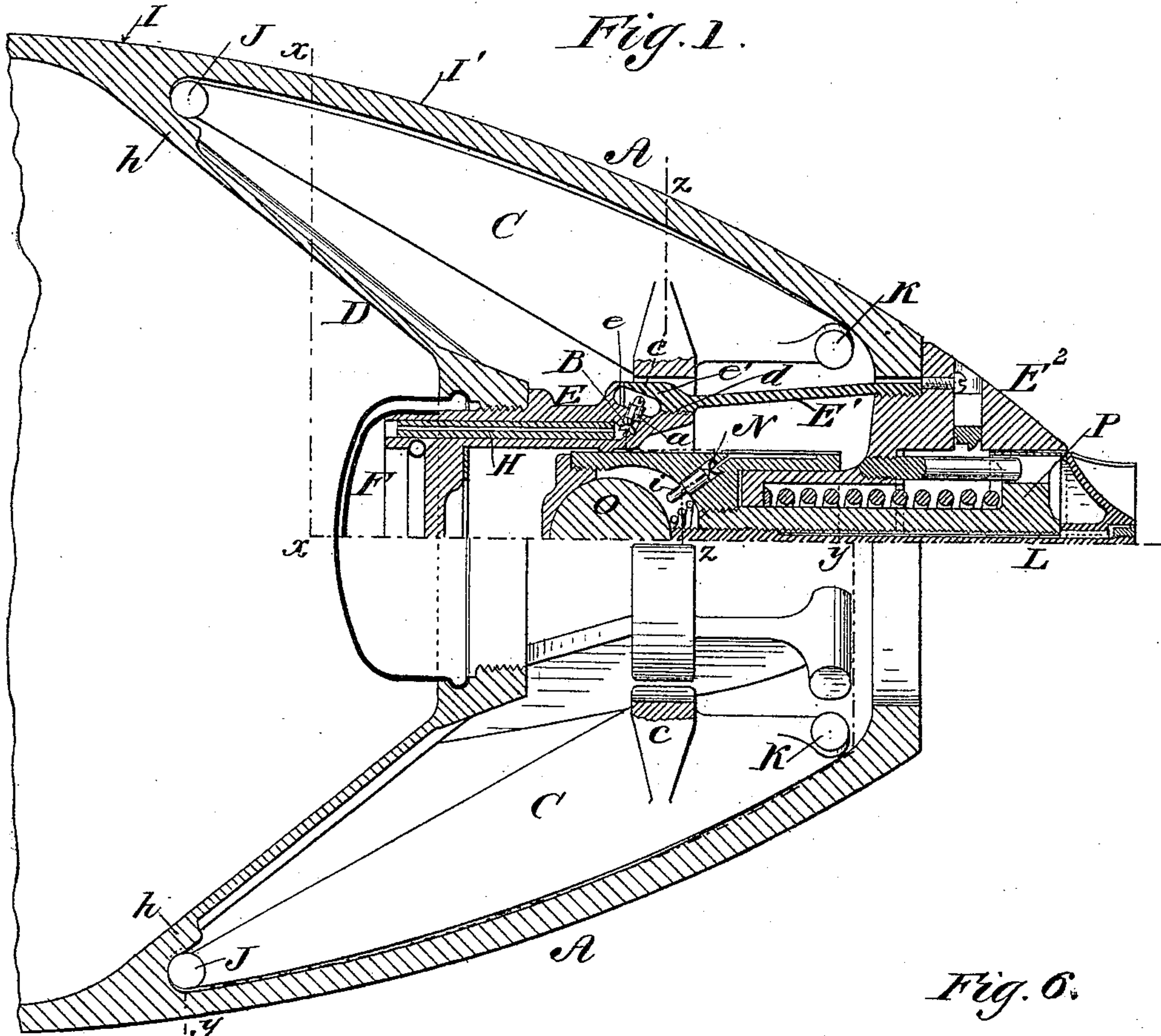
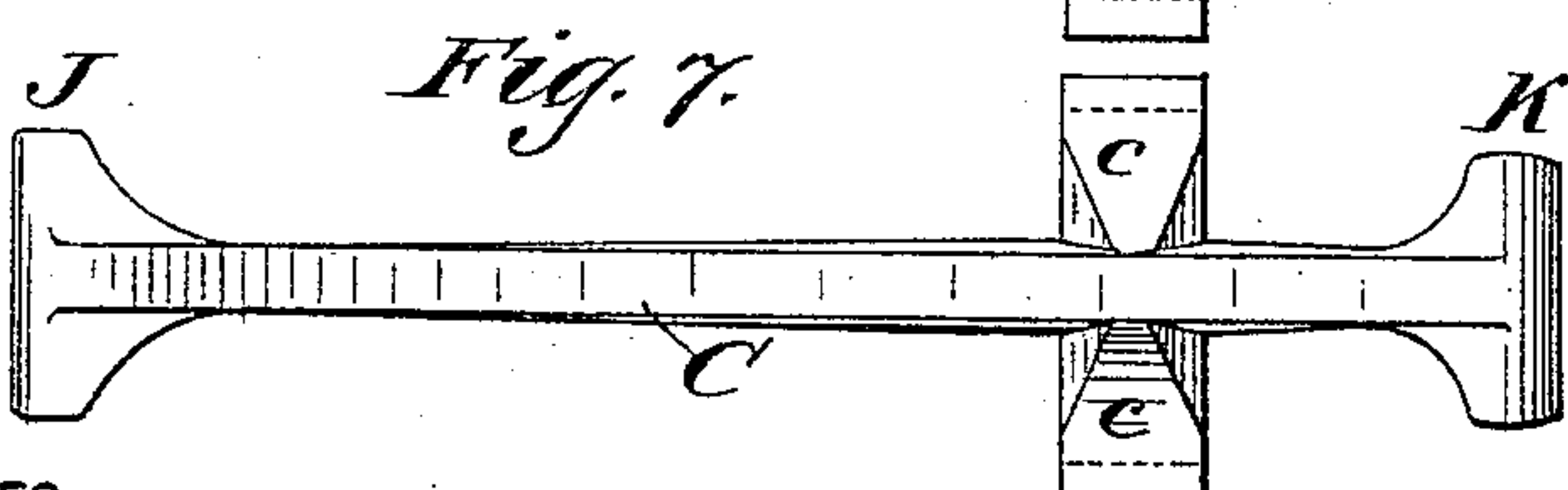
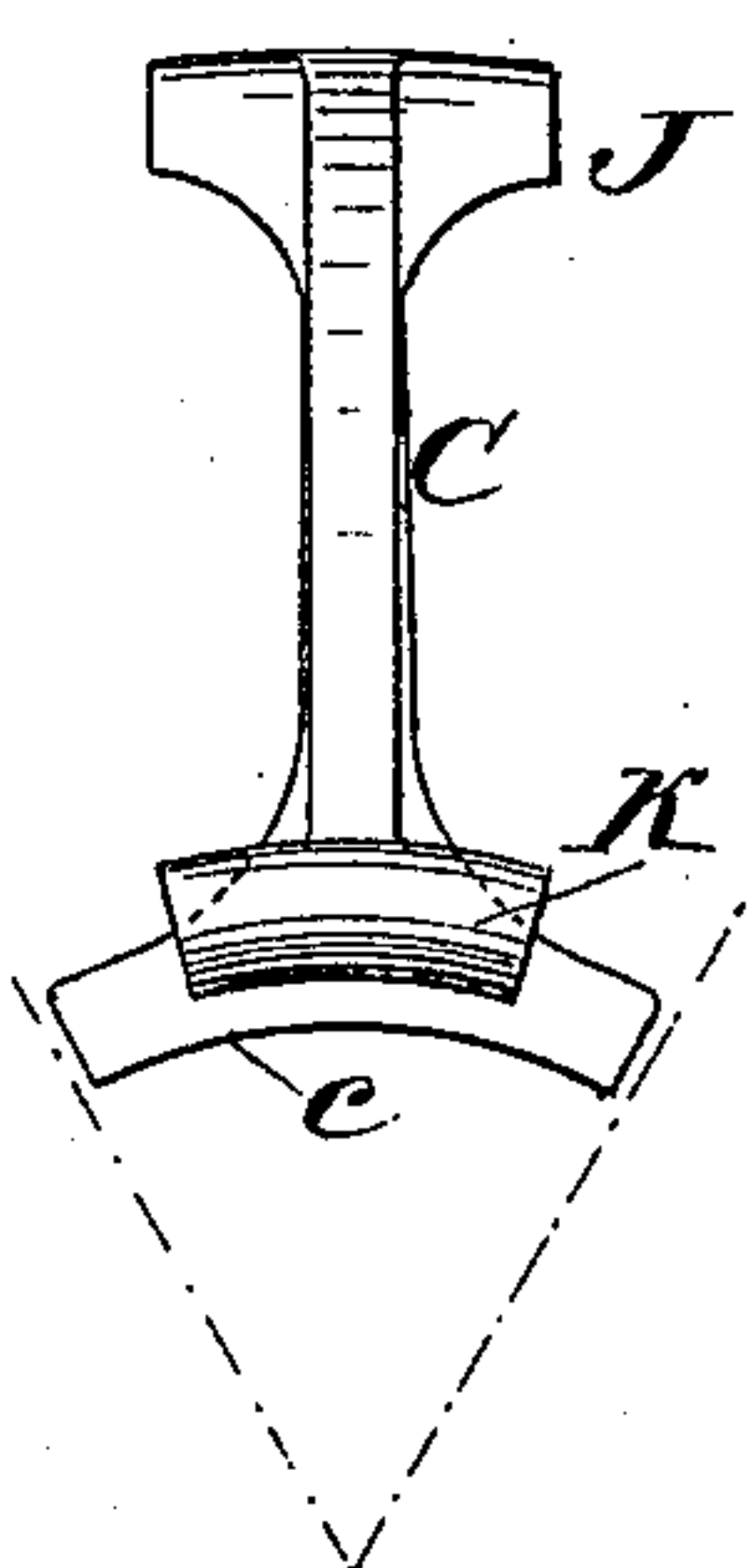


Fig. 6.



WITNESSES:
H. F. Parker.
Chas. Hanemann

INVENTOR
Henry P. Merriam
Chas W. Dorben
BY ATTY.

(No Model.)

2 Sheets—Sheet 2.

H. P. MERRIAM.
EXPLOSIVE SHELL.

No. 444,536.

Patented Jan. 13, 1891.

Fig. 2

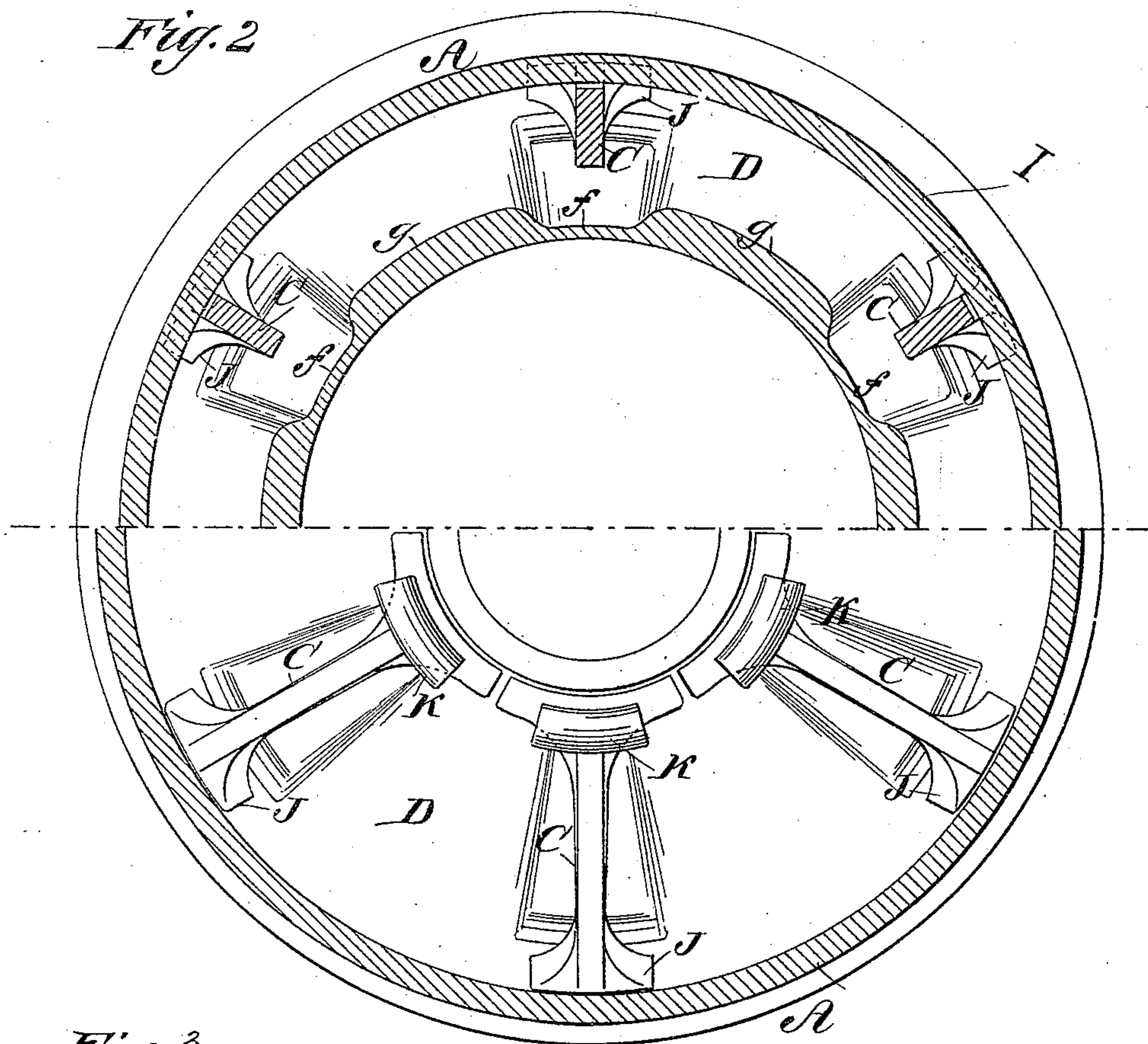
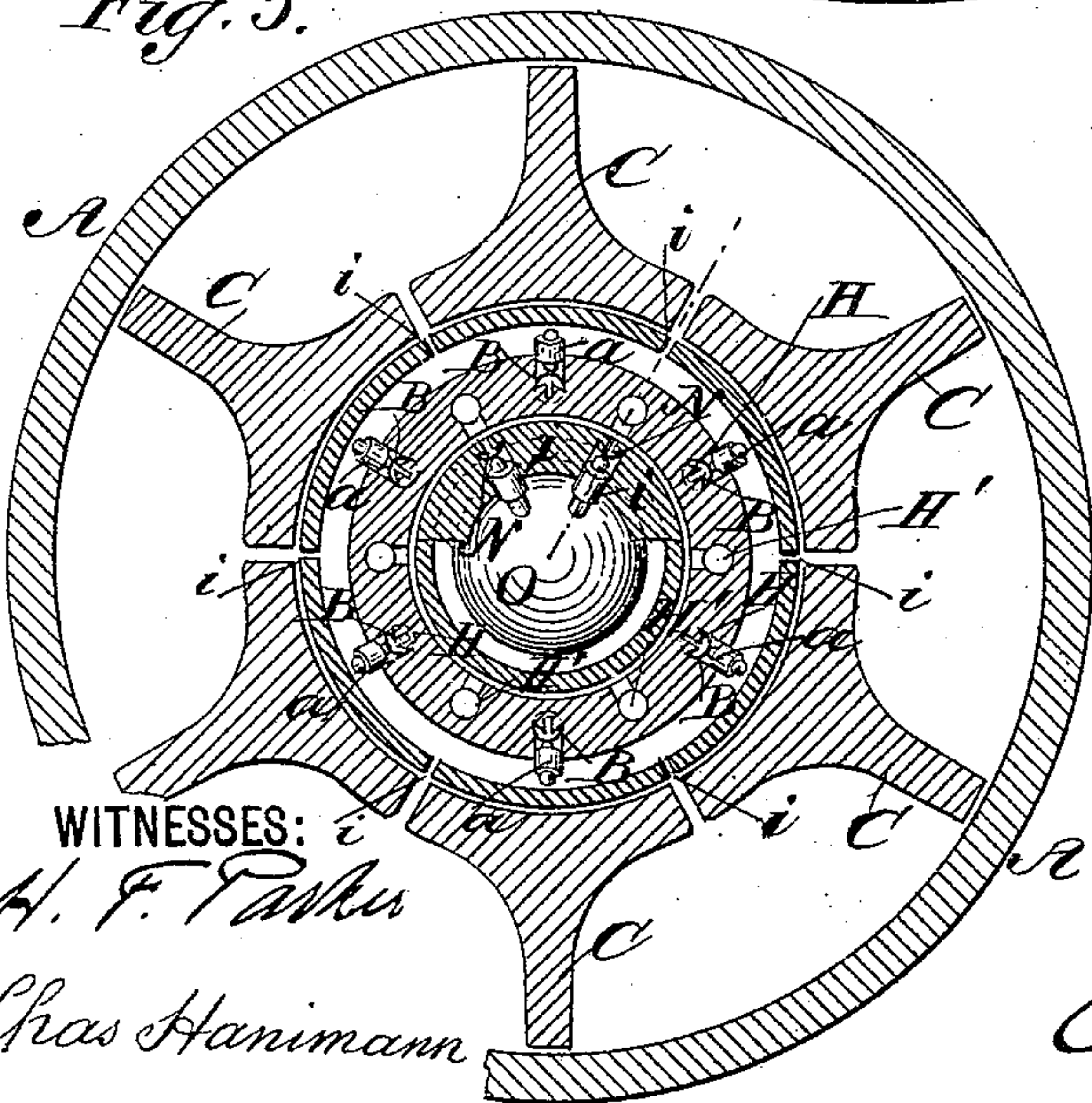


Fig. 3.

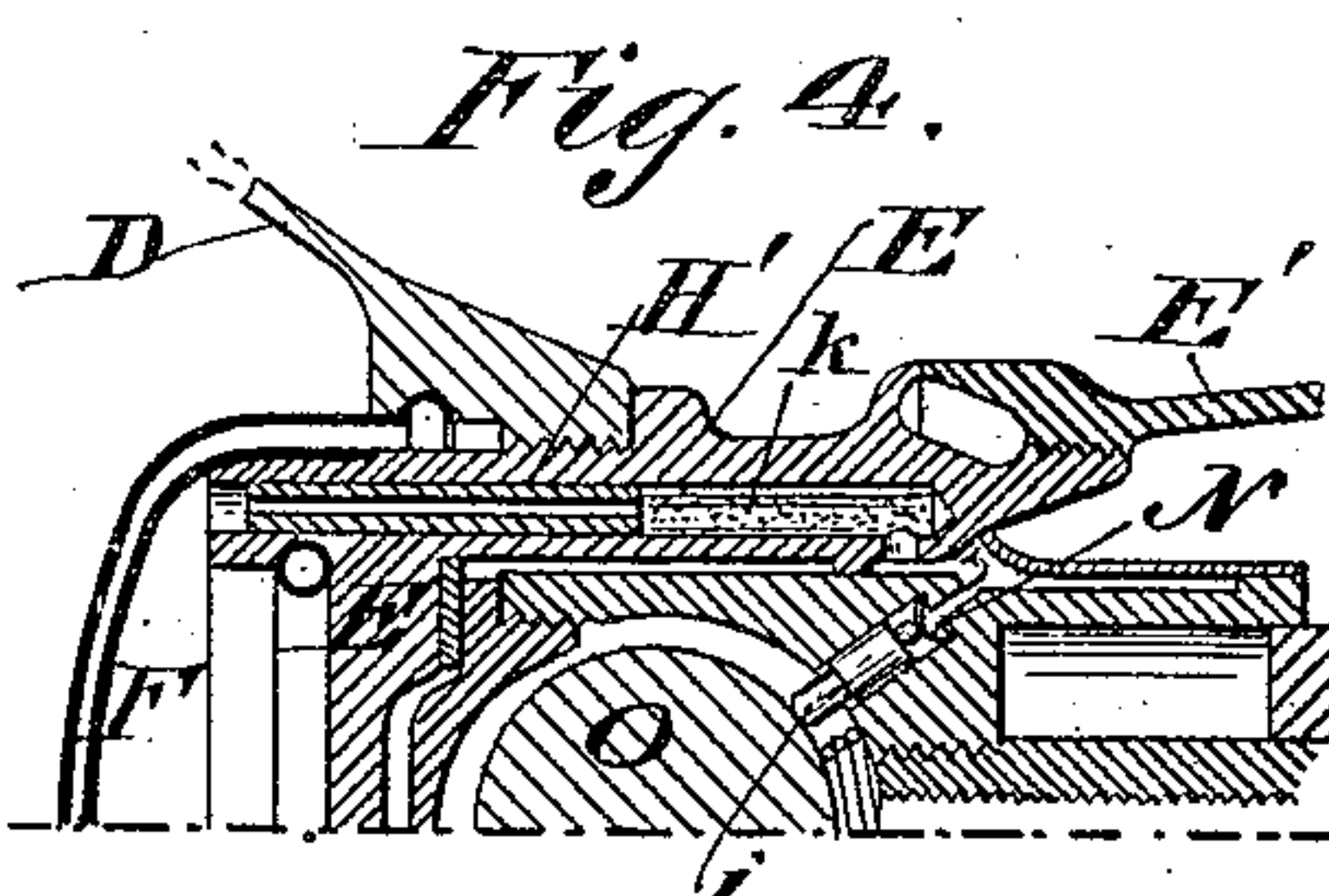


WITNESSES:

H. F. Parker

Chas Hanemann

Fig. 4.



INVENTOR

H. P. Merriam

Chas W. Dorlan

BY

ATTY.

UNITED STATES PATENT OFFICE.

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

EXPLOSIVE SHELL.

SPECIFICATION forming part of Letters Patent No. 444,536, dated January 13, 1891.

Application filed April 19, 1890. Serial No. 348,717. (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 Explosive Shells, of which the following is a specification.

My invention relates to explosive shells in which the impact-fuse is actuated by the indentation or rupture of a collapsible head; and the object of the invention is to provide for insuring detonation of the explosive charge within the shell in the event of such indentation or rupture occurring at any lateral portion of the collapsible head apart from its center or apex.

My invention consists in employing a series of radiating longitudinal webs within the collapsible head, in conjunction with an annular series of percussion-primers opposite the inner surfaces of the webs, which surfaces are extended segmentally to encircle all of the said series of primers, while the latter are connected by fuses with the detonator. The radiating webs thereby form firm ridges fitting the interior of the conoidal head of the shell, and when the latter is crushed at any part one or more of said webs are driven in edgewise, compressing the inner surfaces thereof against one or several of the primers, actuating the detonator.

My invention also consists in fulcruming the longitudinal extremities of the webs in the fore and aft portions of the head, so that the exploding-surface, which is intermediate to such extremities, will invariably be driven in by a lateral blow applied at any point in the length of the webs, which thus act as levers moving about the one or the other fulcrum, as the case may be.

My invention also consists in employing a cone-shaped supporting-shell for the detonator, in conjunction with a telescoping primer-case, which cone-shaped shell is attached to or integral at its base with the larger circumference of the interior of the conoidal head, and converges forward toward and against one telescoping member of the primer-case. The cone is corrugated or grooved in the direction of its length, (or it may be constructed of separate arms,) so that the compression of the side of the conoidal head where it merges into

the cylindrical body of the shell will contract a part of the base of the cone, thrusting its corresponding side forward endwise toward the primer-case, telescoping the latter and exploding the primer. The cone and the radiating webs are co-operative, both acting in opposite directions upon the common circular series of primers, as will hereinafter appear.

Referring to the accompanying drawings, Figure 1 is a longitudinal section through the head of the shell, the upper part of the figure showing the fuse and detonator in position, the lower part showing the same removed. Fig. 2 is a cross-section, the upper half of the figure being taken on the line $x x$, Fig. 1, and the lower half on the line $y y$, said figure. Fig. 3 is a cross-section taken on the line $z z$, Fig. 1. Fig. 4 is a partial longitudinal section showing one of the immersion-fuses that are connected with the primers N, and showing the movable case for said primers N in the depressed position occupied when the immersion-fuses are actuated. Figs. 5, 6, and 7 are detail views of one of the webs shown in side plan and end views, respectively.

A is the collapsible head of the shell, made integral with or fastened at its base to the body of the shell; B, the annular series of percussion-primers facing the interior of the head, and C C the radiating webs. These webs bear segmental projections c , encircling the said primers, as distinctly shown in Fig. 3, and acting as exploding-surfaces. The ends of the webs C are provided with fulcrums J K, consisting of lateral projections which bear in the annular sockets terminating the cavity within the conoidal head. The fulcrum J bears inwardly on the thickened part h at the base of the cone D, while the fulcrum K bears at any suitable point near the apex. According as the collapse occurs chiefly toward the one or the other end of the conoidal head, the web C will act as a lever about the one or the other fulcrum J or K, contracting the segmental ring composed of the projections c .

D is the interior cone, integral with or fastened at its base h to the body of the shell, and into the lesser diameter of this cone (or frustum) is secured the inner end of the telescoping primer-case E E' by a screw-thread or otherwise. The forward member E' of the

primer-case is composed of an independent sleeve screw-threaded to the main member E, and connected also with the apex E².

F is the detonator filled with gun-cotton or other explosive, and H one of the several impact-fuse tubes arranged in circular series filled with fulminate to give instant action. Each one of the series of percussion-primers B is connected with such a fuse-tube, and has a firing-pin *a* opposite it, inclined at an angle toward the front of the shell.

e' is an overlapping flange of the forward sleeve E', which flange has a beveled or conic interior surface opposite the adjacent conic surface *e* of the member E, through which the firing-pins project. The flange *e'* is interposed between the firing-pins and the exploding segments or surfaces *c* of the webs C. Should the shell strike a solid target, driving the apex E² backward in the axial line of the shell, or nearly so, the sleeve E' will telescope the case E, stripping the screw-thread *d*, and discharge the primers B by contraction of the firing-pins within the cone-shaped converging surface of the flange *e'*, which acts as a wedge. Should the shell for any reason strike sidewise at the point I, where the conoidal head merges into the cylindrical body of the shell, or especially should the rupture occur at a circumferential point (I, Fig. 2) between the webs, the indentation made will transmit a movement endwise through the length of the cone D, at a corresponding side thereof, driving the member E of the primer-case forward against the member E', contracting the firing-pins as before. For this purpose the cone D is ribbed or corrugated endwise, as appears in cross-section in the upper part of Fig. 2, the thin parts of the metal *f* between the ribbed or thicker parts *g* becoming separated by the blow, so that such thick parts act as independent arms in transmitting the described forward motion to the primer-case E. The cone D and webs C are thus co-operative, the cone thrusting the member E of the primer-case forward so as to advance the surface *e*, bearing the firing-pins *a*, against the flange *e'*, while the webs C contract the said flange *e'* simultaneously in case the indentation occurs at a point in the length of the collapsible head, such as I', near its base. The initial ring *e'* bearing the conical surface, as also the part of the case E at the threaded portion *d*, may be more or less weakened circumferentially by reducing the thickness of metal at regular distances, or by means of saw-cuts, as at *i*, Fig. 3. By this means the webs C may more readily compress the adjacent portions of the ring *e'* against the primers or their firing-pins.

The construction of the discharging apparatus L for the immersion-fuse corresponds to that described in my separate patent application filed September 23, 1889, Serial No. 324,718, and will not therefore require a detailed description here.

Certain of the fuses (designated in Figs. 3

and 4 as H') are reserved as time-fuses, and have the connection shown with the percussion-primers N when the same are thrust rearwardly, as in Fig. 4, by immersion of the shell and depression of the piston P. The ball-hammer O is then thrust relatively forward, actuating one or more of the firing-pins *i*, exploding the primer N, the detonator F, common to both the immersion and the impact fuses, being actuated with an element of delay by means of a slow-burning compound *k*, occupying a portion of the length of the fuse-channels H'. The telescoping parts of the case E E' and the converging flange *e* opposite the cap are also described and claimed in my separate patent application filed September 23, 1889, Serial No. 324,719, and are not therefore claimed herein, except in conjunction with the other co-operative parts.

The spaces between the webs C may be filled with a suitable soft-metal filling similar to that shown and described in said application No. 324,719, whereby a contraction of the flange *e'* is further insured when the shell strikes a solid target.

What I claim herein, and desire to secure by Letters Patent, is—

1. In an explosive shell, a collapsible head, a series of longitudinal webs therein converging radially toward the axis of the shell, in conjunction with an annular series of percussion-primers opposite the inner surfaces of the said webs, and a detonator for the shell charge actuated by the said primers.

2. The combination, in an explosive shell, of a collapsible head, a detonator adjacent the shell charge, an annular series of percussion-primers in the central portion of the head connected with the detonator, and radiating webs bearing exploding-surfaces opposite the primers, extended segmentally to encircle the same, said webs forming longitudinal ridges fitting the interior of the collapsible head.

3. The combination, in an explosive shell, of a collapsible head, a detonator adjacent the shell charge, an annular series of percussion-primers in the central portion of the head connected with the detonator, and radiating webs bearing externally throughout the length of the interior surface of the head and having interior exploding-surfaces opposite the said annular series of primers located in a transverse plane of the head intermediate to the length of said webs.

4. In combination with the collapsible head of an explosive shell for actuating the impact-fuses, the longitudinal webs converging toward the axis at the head, the annular series of percussion-primers opposite the inner surfaces of the webs, located in a transverse plane of the head intermediate to the length of the webs, and fulcrums, substantially as described, provided to the said webs in front and in rear of the said annular series of percussion-primers.

5. The combination, in a collapsible explosive shell, of a telescoping primer-case within

the head, one member whereof bears the percussion-primers, the other member bearing a contracting surface opposite the same, and a cone-shaped shell within the head connected at its base with the larger circumference of said head at the latter's junction with the shell-body, said cone converging forward toward and bearing one telescoping member of the primer-case, for the purpose set forth.

6. The combination, with a cylindrical explosive shell, of a collapsible conoidal head, an annular series of detonating percussion-primers therein, an axial telescoping primer-case having adjacent conic surfaces between which such primers or their firing-pins are located, longitudinal radiating webs bearing exploding-surfaces opposite the said adjacent conic surfaces of the primer-case, extending to the surface of the head throughout the length thereof, and an interior conic shell connected at its base with the base of the head and converging forward toward and

bearing one member of said primer-case, co-operating thereby to thrust the said conic surfaces together in a direction opposing the contracting movement of the said webs when the head of the shell is ruptured laterally, in the manner described.

7. The combination, in an explosive shell, of a cylindric body, an exterior conic or conoidal head and an interior conic or conoidal head, both united at a common base, converging at different angles toward the axis of the shell, and a two-part detonating fuse-case the members whereof are secured to the apices or lesser diameters of the respective cones or conoidal heads, and primers or firing-pins interposed between the said members actuated by longitudinal compression of the case.

HENRY P. MERRIAM.

Witnesses:

CHAS. W. FORBES,
CHAS. HANIMANN.