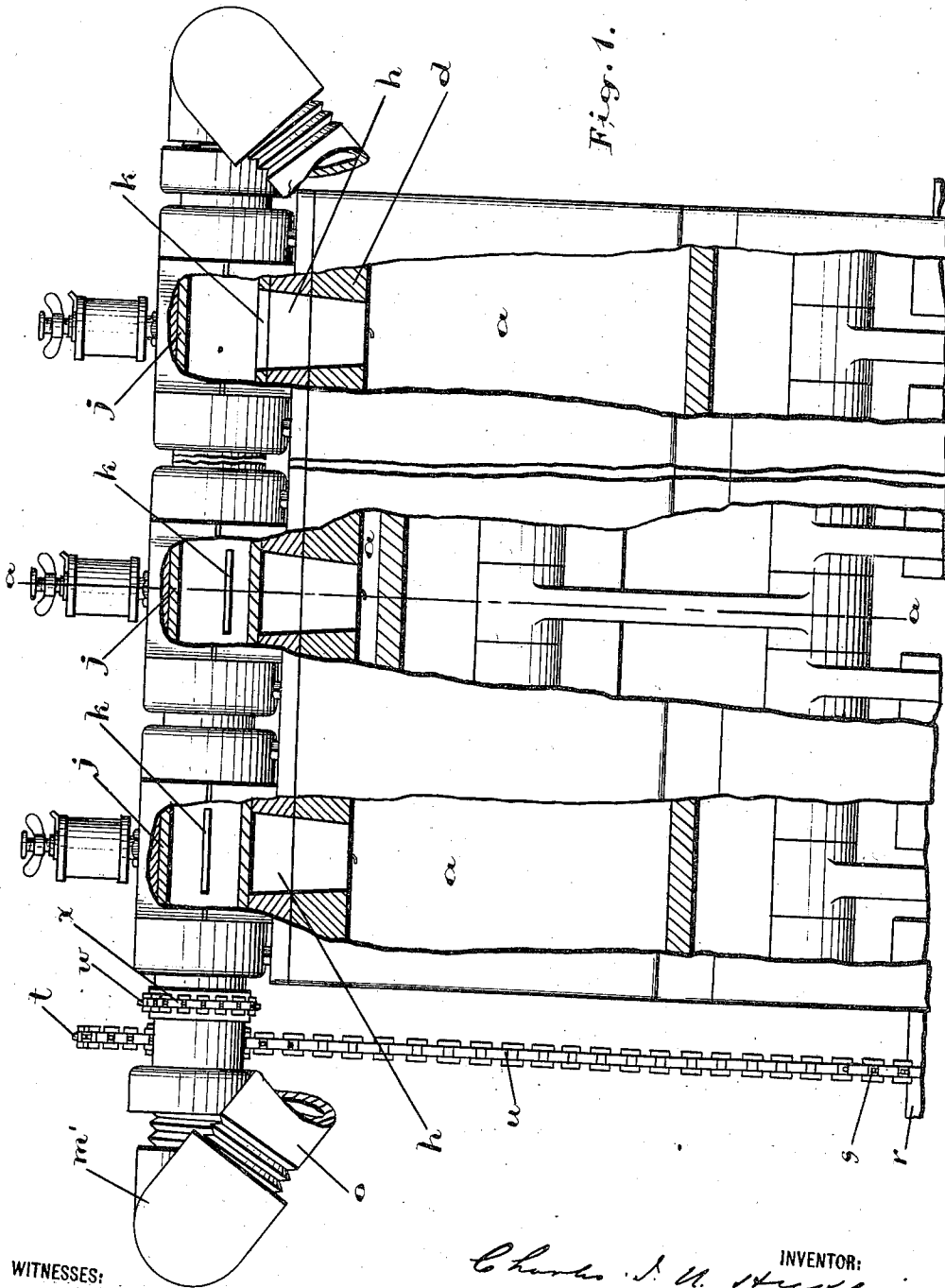


C. I. U. HICKLING.  
EXPLOSIVE ENGINE.  
APPLICATION FILED OCT. 25, 1910.

997,675.

Patented July 11, 1911.  
3 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:  
H. L. Grumble.  
Oliver B. Berman

INVENTOR:  
Charles I. U. Hickling  
by C. L. B. Berman  
att'y

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3 SHEETS-SHEET 2.

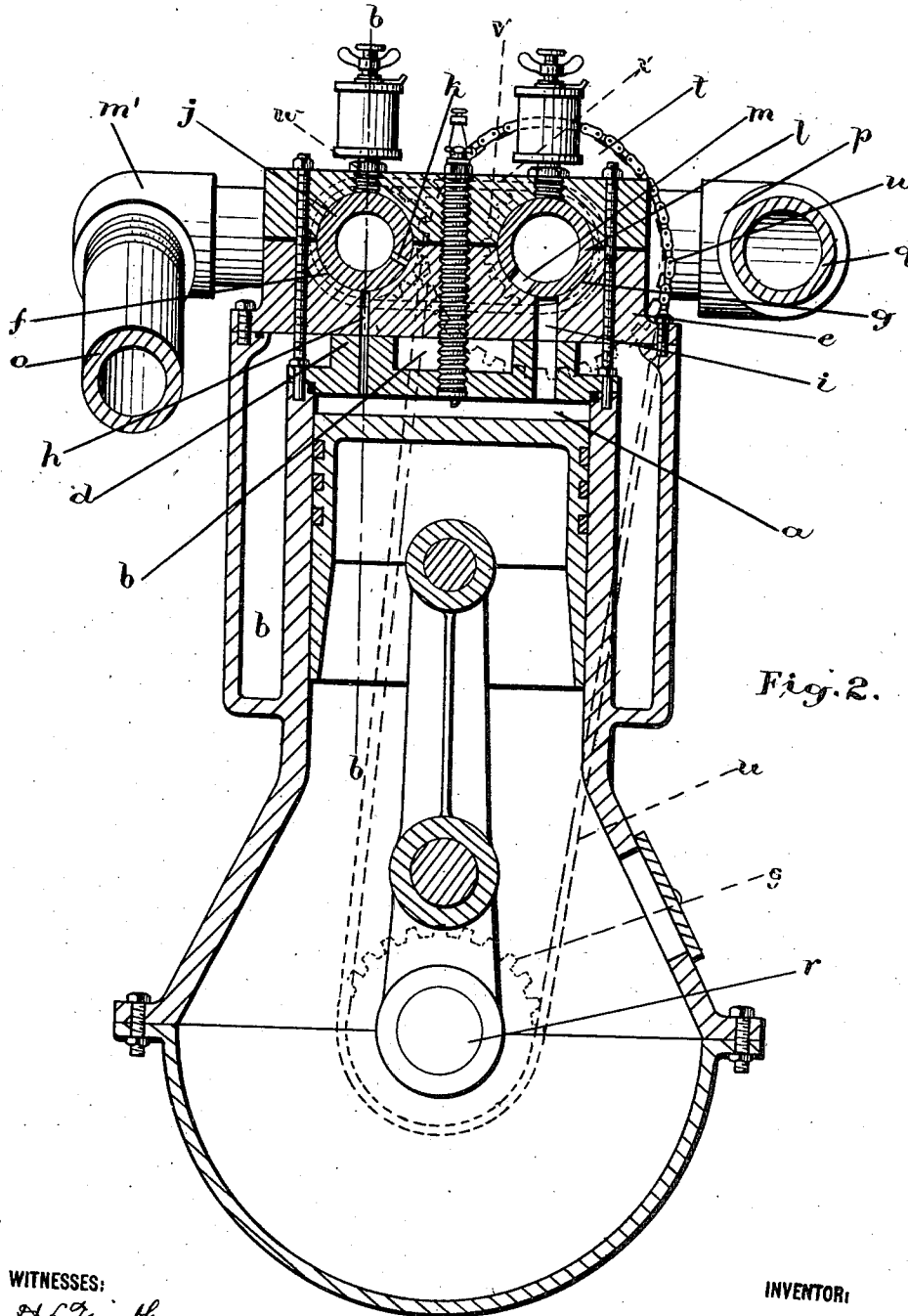


Fig. 2.

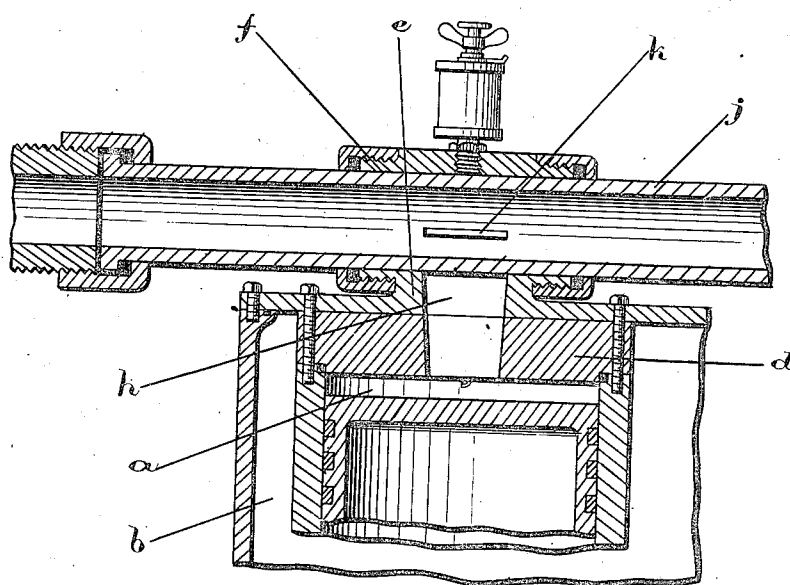
WITNESSES:  
A. L. Trimble  
Oliver Baleman

INVENTOR:

Charles I. U. Hickling  
by Charles I. U. Hickling  
att'y

997,675.

3 SHEETS—SHEET 3.



*Fig. 3.*

WITNESSES:

H. L. Trimble  
Olive Bateman

INVENTOR:

*Charles I. W. Hiestand*  
*by Chas I & Richd*  
*Atty*

# UNITED STATES PATENT OFFICE.

CHARLES I. U. HICKLING, OF COLLINGWOOD, ONTARIO, CANADA.

## EXPLOSIVE-ENGINE.

997,675.

Specification of Letters Patent.

Patented July 11, 1911.

Application filed October 25, 1910. Serial No. 589,046.

*To all whom it may concern:*

Be it known that I, CHARLES I. U. HICKLING, of the town of Collingwood, in the county of Simcoe and Province of Ontario, Canada, have invented certain new and useful Improvements in Explosive-Engines; and I hereby declare that the following is a full, clear, and exact description of the same.

No engine can realize the full power, which theoretically, its explosive charge should produce, and even under the most favorable working conditions, with the observance of all rules and the use of all means, mechanical or otherwise, to conserve energy, it must fall below the approximate estimate. One cause for this loss of energy, is the unavoidable variation of temperature resulting from the difference between the highest explosion temperature and the initial temperature, and another cause is the leakage at the valve seats resulting from the unequal expansion of the valve parts caused by this variation of temperature.

My invention therefore relates to the construction of the valve mechanism for an explosive engine, whereby the difficulties resulting from leakage, tremor and hammering, can be eliminated and approximately the full power of the engine can be obtained.

In carrying out my invention I provide the cylinders with a superposed valve chamber casing separated from the cylinders by water cooled spacers to prevent the heat resulting from the exploding charges, being transmitted by contact to, and, effecting the expansion of, the valve chamber casing, and I make the valve chamber casing with two lengthwise valve chambers, one having inlet ports, and the other having outlet ports, for the cylinders, controlled by rotary tubular valves connected respectively with the carbureter and the exhaust pipe and provided with ports communicating, during the rotation of the valves, respectively with the inlet and outlet ports, the valves being rotated by sprocket wheels and chain from the crank shaft.

For an understanding of the invention reference is to be had to the following description and to the accompanying drawings in which:

Figure 1, is a side elevation of the explosive engine. Fig. 2, is a cross section on the line *a-a* Fig. 1. Fig. 3, is a transverse section on the line *b-b* Fig. 2.

Like characters of reference refer to like

parts throughout the specification and drawings.

The sides of the cylinders *a*, as is usual in the case of water cooled explosive engines, are provided with a water jacket casing *b* which extends to the top of the spacers *d* projecting upwardly from the cylinder heads *c*. Supported on the top of the water casing jacket *b* and spacers *d* is the valve chamber casing *e* separated by them from the cylinder heads *c*. The valve chamber casing forms with the water jacket casing a water jacket around the sides and across the tops of the cylinders, which prevents the heat from the cylinders being radiated to the interior of the valve chamber casing and impeding the action of the valves therein. In the valve chamber casing are two valve chambers *f* and *g* extending lengthwise of the engine. The bottom of the valve chamber casing forms the top of the water jacket, the contents of which maintain the valve chamber casing at a substantially uniform temperature. The valve chamber *f* is provided with an inlet port *h*, and, the valve chamber *g* is provided with an exhaust port *i*, for each cylinder. In the valve chamber *f* is a rotary tubular valve *j* having ports *k* registering, as the valve rotates, with the inlet port *h*, and in the valve chamber *g* is a rotary tubular valve *l* having ports *m* registering, as that valve rotates, with the exhaust ports *i*. The valve *j* is revolvably connected, by universal couplings *m'*, to the carbureter pipes *o*, and the valve *l* is revolvably connected, by universal couplings *p*, to the exhaust pipe *q*. On the crank shaft *r* is a sprocket wheel *s* and on the exhaust valve *l* is a sprocket wheel *t*, around which passes the sprocket chain *u* transmitting the motion of the crank shaft to the valve *l*. On the valve *l* is a second sprocket wheel *v* and on the valve *j* is a sprocket wheel *w* around which passes the sprocket chain *x* transmitting the motion of the valve *l* to the valve *j*.

The mixture of air and gas flowing from the carbureter pipes to the tubular valve *j* passes through the ports *k* and *h* to the cylinders *a*, and from the cylinders the exploded mixture passes through the ports *i* and *m* to the exhaust pipe *q*, as is usual in engines of this type. The heat of the cylinder heads resulting from the explosions in the cylinders, is prevented from being transmitted to the valve chamber casing by the

water jacket across the top of the cylinder head and by the water cooled spacers  $\delta$  holding the valve chamber casing separated from the cylinders.

5 Having thus fully described my invention what I claim as new and desire to secure by Letters Patent is:

10 An explosive engine comprising, a cylinder, spacers projecting upwardly from the cylinder head, inlet and exhaust ports formed through the spacers into the cylinder, a casing surrounding the side of the cylinder and extending to the top of the spacers, a valve chamber supported on the  
15 spacers and top of the casing and separated

by them from the cylinder head and having inlet and exhaust ports alined with those of the cylinder, said valve chamber forming with the casing a water jacket around the side and across the top of the cylinder, rotary tubular valves in the valve chamber having ports registering, during the rotation of the valves, with those of the cylinder, and means for causing the rotation of the valves.  
Collingwood, October, 1910.

CHARLES I. U. HICKLING.

Signed in the presence of—

R. J. GALLAUGHER,  
E. A. HICKLING.