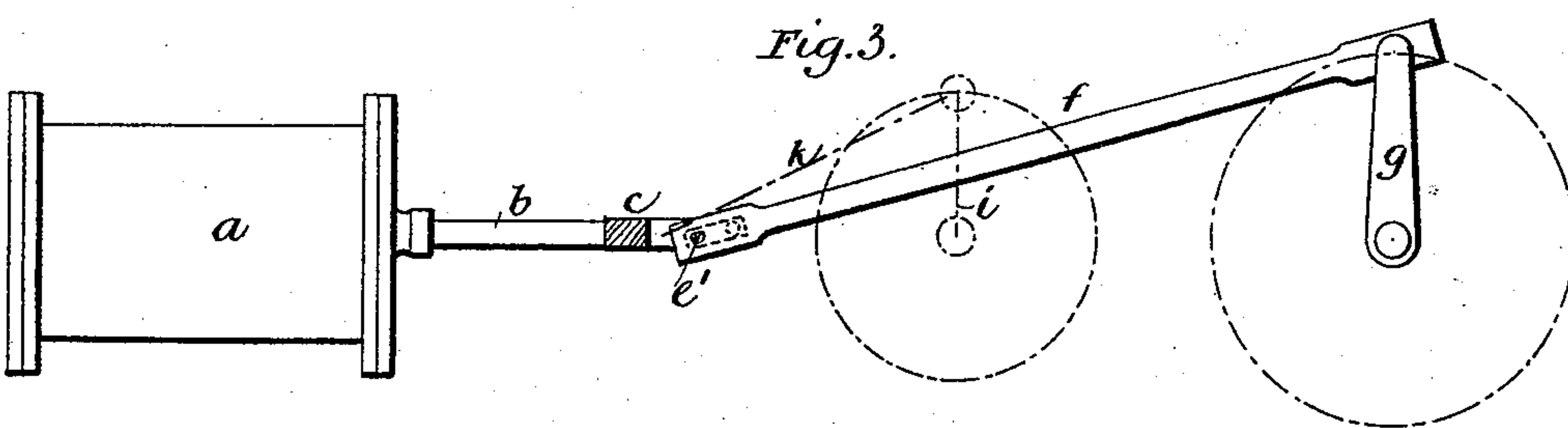
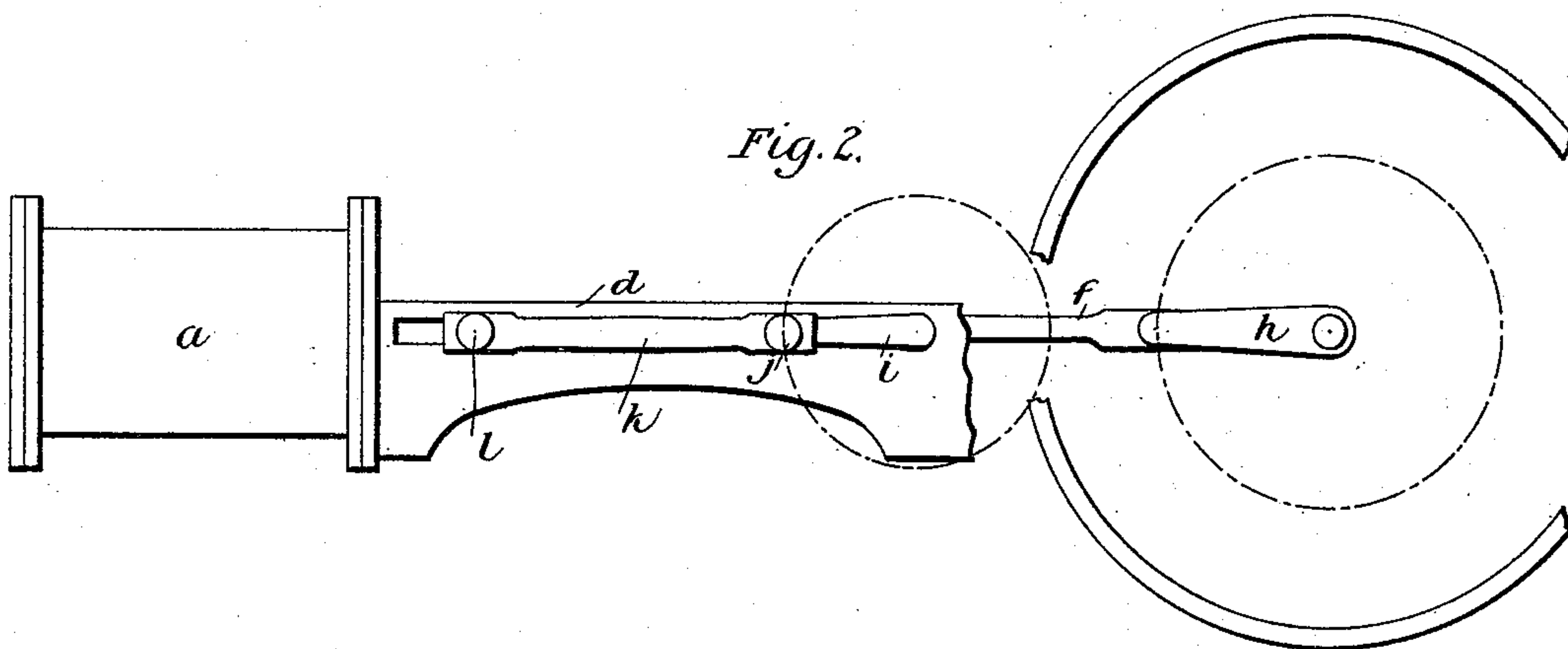
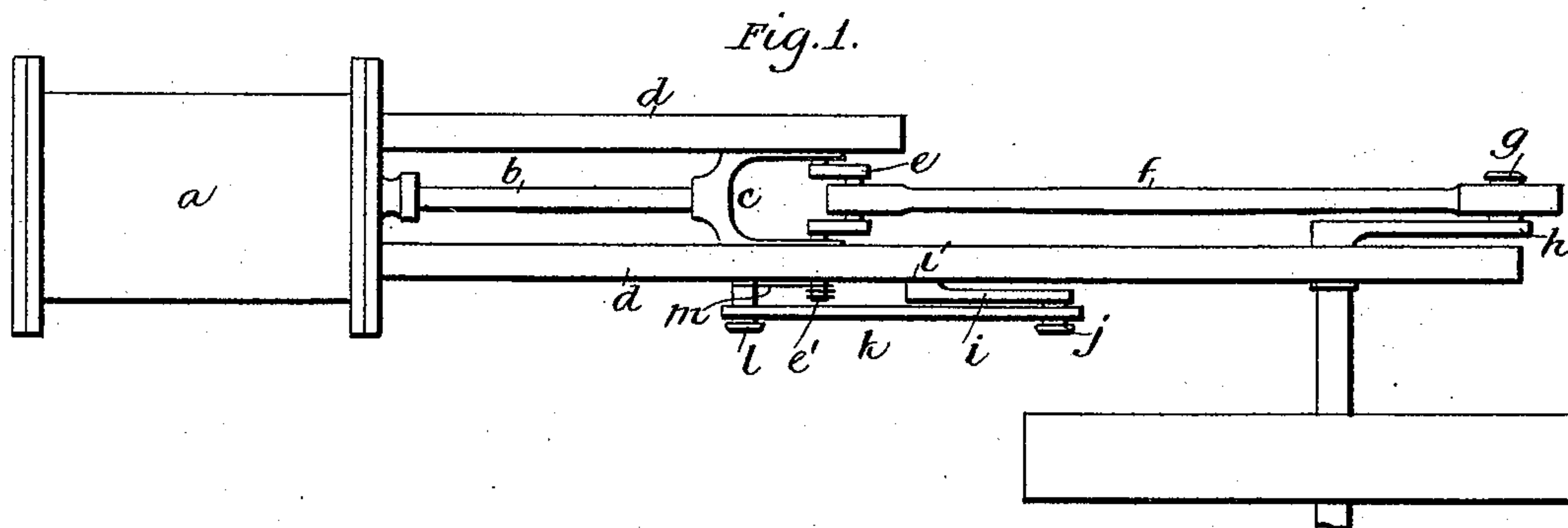


(No Model.)

A. H. McMASTER.
CONNECTION FOR STEAM ENGINES.

No. 485,557.

Patented Nov. 1, 1892.



Arthur H. McMaster

WITNESSES

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ARTHUR H. McMASTER, OF FOWLER, COLORADO.

CONNECTION FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 485,557, dated November 1, 1892.

Application filed February 19, 1892. Serial No. 422,140. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR H. McMASTER, a citizen of the United States, residing at Fowler, in the county of Otero and State of Colorado, have invented certain new and useful Improvements in Connections for Steam-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to steam-engines, and has for its object to provide improved means whereby an increase of the stroke of the driving-crank over the stroke of the piston is obtained, said means consisting generally in forming a crank connection between the cross-head and the inner end of the connecting-rod, whereby when the piston is at the end of its forward or backward stroke the momentum of the driven part will cause the crank connecting the rod and cross-head to move in the direction of the stroke, and thereby increase the throw of the driving-crank.

My invention also consists in certain details of construction and operation whereby the above-named results are attained, all of which will be hereinafter fully and clearly set forth.

Reference being had to the accompanying drawings, forming a part of this specification, Figure 1 represents a plan view of my improved steam-engine, the parts being in the position they would assume at the end of the forward stroke. Fig. 2 is a side elevation of the same with the parts in position at the end of the backward stroke, and Fig. 3 is a section through the cross-head and connecting-rod and showing the parts in position at half-stroke.

In the said drawings I have shown my improvements in connection with such portions only of a single acting engine to which they especially relate, and in which the reference-letter *a* denotes the cylinder, and *b* the piston-rod, to which is attached the cross-head *c*, moving in suitable guides *d*, these parts being of ordinary construction.

e is a crank journaled in suitable bearings formed in the cross-head and on which is mounted the inner end of the connecting-rod *f*, the outer end of the latter having connec-

tion with the crank-pin *g* on the driving-crank *h* in the usual manner.

i is an auxiliary crank mounted upon a short shaft *i'*, journaled in the guide-frame, and has a crank-pin *j* thereon, which has connection through the rod *k* with a pin *l*, secured to the cross-head. This crank *i* operates to limit the stroke of the piston and prevent injury to the cylinder-heads. Other mechanism may, however, be employed for this purpose, as it is obvious where the invention is employed on an eight-driver locomotive and some other classes of engines there would be no room for the auxiliary crank and connecting-rod. One end of the shaft *e'* of the crank *e* extends beyond the guide *d* and has coiled thereon a spring *m*, one end of which is connected to the said shaft and the other to the pin *l* on the cross-head. The function of this spring is to keep the crank *e* normally off the dead-center. Other means may, however, be employed to effect this result, and I do not in consequence limit myself to the use of a spring for this purpose.

The operation is as follows: The stroke of the piston is first determined and the throw of the auxiliary crank adjusted to correspond thereto, as before stated. The stroke of the driving-crank is then measured and adjusted in such a manner as that one complete forward or backward stroke of the piston will give a three-eighths throw to the driving-crank. The crank *e* in the cross-head is then measured to give a throw equal to one-eighth of the driving-crank, or, in other words, one-half of the difference between the throw of the driving-crank and the stroke of the piston. A stroke of the piston—take, for instance, the forward one—will impart a three-eighths throw to the driving-crank, and the fly-wheel should be of such a size as that its momentum will carry it one-eighth of a stroke, the crank *e* moving with the connecting-rod to permit this increase of stroke. The backward stroke of the piston then gives another three-eighths throw to the driving-crank and the momentum causes the crank *e* to move backward and finish the stroke. The spring or its equivalent construction operates with the crank *e* to prevent the latter from resting on a dead-center, as before stated.

By my invention I am enabled to obtain a large increase of the stroke of the driving-crank over that of the piston and by the employment of very few parts. My improvements, while shown and described in connection with a single-acting engine, may be as advantageously employed in connection with a double, triple, or quadruple engine.

In cases where my invention is applied to finished engines or engines that have been in use and the stroke of the driving-crank cannot be enlarged the length of the stroke of the piston must be diminished to take up all surplus space in the cylinder. This may be done by shortening the length of the cylinder by employing heads of increased thickness or by increasing the thickness of the piston-head. It will be found that by applying my invention to such engines there is a saving of steam equal to one-eighth of the stroke of the piston.

I claim as my invention—

1. In an engine, the combination of the cross-head and its operating mechanism, a driving-crank having a throw greater than the stroke of the piston, a rod connected at one end with said driving-crank, and a crank journaled in the cross-head and having an independent movement and having connection with the other end of the rod, substantially as described, and for the purposes set forth.

2. In an engine, the combination of the cross-head and its operating mechanism, a driving-crank having a throw greater than the stroke of the piston, a rod connected at one end with said driving-crank, a crank jour-

naled in the cross-head and having connection with the other end of the rod, and mechanism for limiting the throw of the piston, substantially as described.

3. In an engine, the combination of a cross-head and its operating mechanism, a crank journaled in the said cross-head, a driving-crank having a throw greater than the stroke of the piston, a rod connecting said driving-crank and the crank on the cross-head, and an auxiliary crank having rod connection with the cross-head, all for the purposes set forth.

4. In an engine, the combination of a cross-head and its operating mechanism, a crank journaled in said cross-head, a driving-crank having a throw greater than the stroke of the piston, a rod connecting the driving-crank and the crank in the cross-head, and means, substantially as described, connected with the crank in the cross-head for overcoming its dead-centers.

5. In an engine, and in combination with a cross-head, a crank journaled therein and having its shaft extending beyond the head, a spring connected with the shaft and the head, a driving-crank having a throw greater than the stroke of the piston, a rod connecting the driving-crank and the crank in the cross-head, and an auxiliary crank and a rod connecting the same with a pin on the cross-head, all for the purposes set forth.

In testimony whereof I affix my signature in presence of two witnesses.

ARTHUR H. McMASTER.

Witnesses:

L. C. TRUHAUP,
THOS. P. HARE.