

No. 854,896.

PATENTED MAY 28, 1907.

A. KLOSE.
ENGINE.

APPLICATION FILED FEB. 20, 1903.

5 SHEETS—SHEET 1.

Fig. 1.

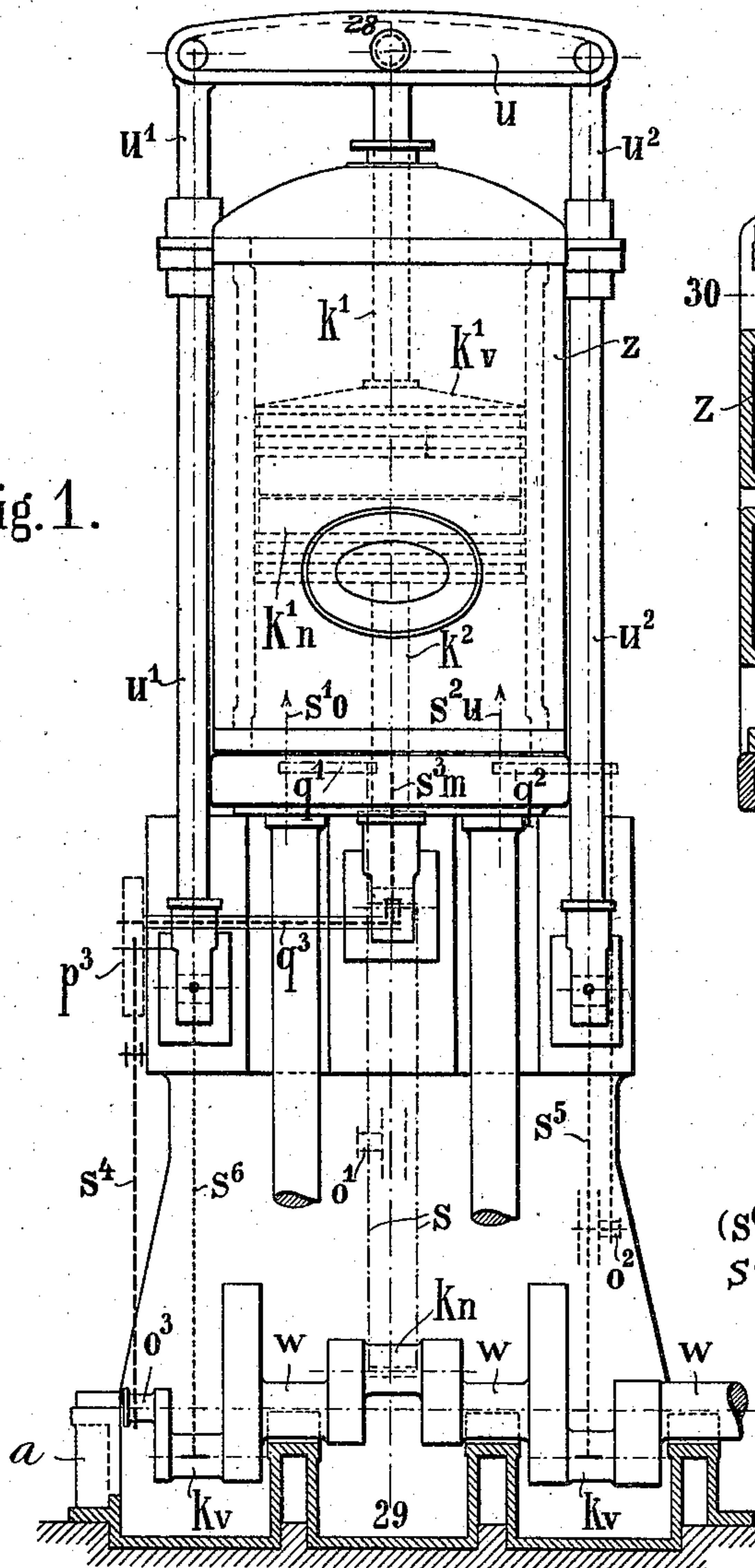


Fig. 2.

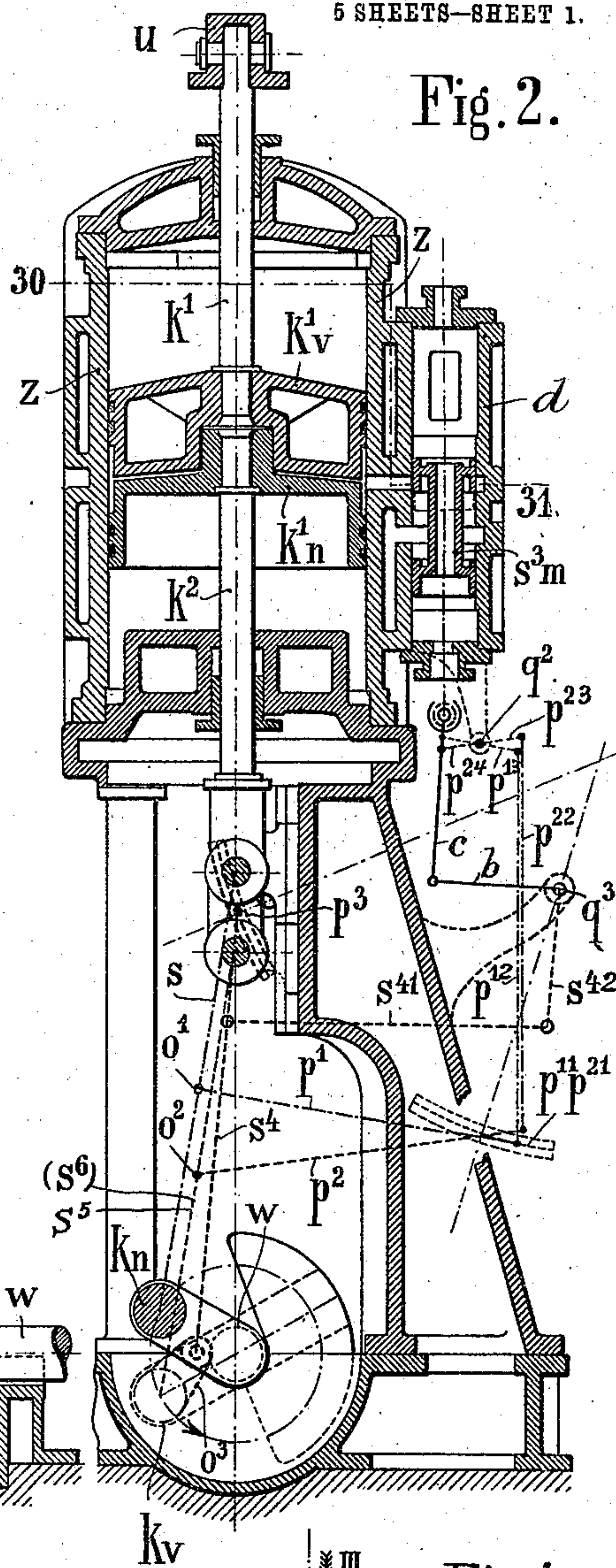


Fig. 3.

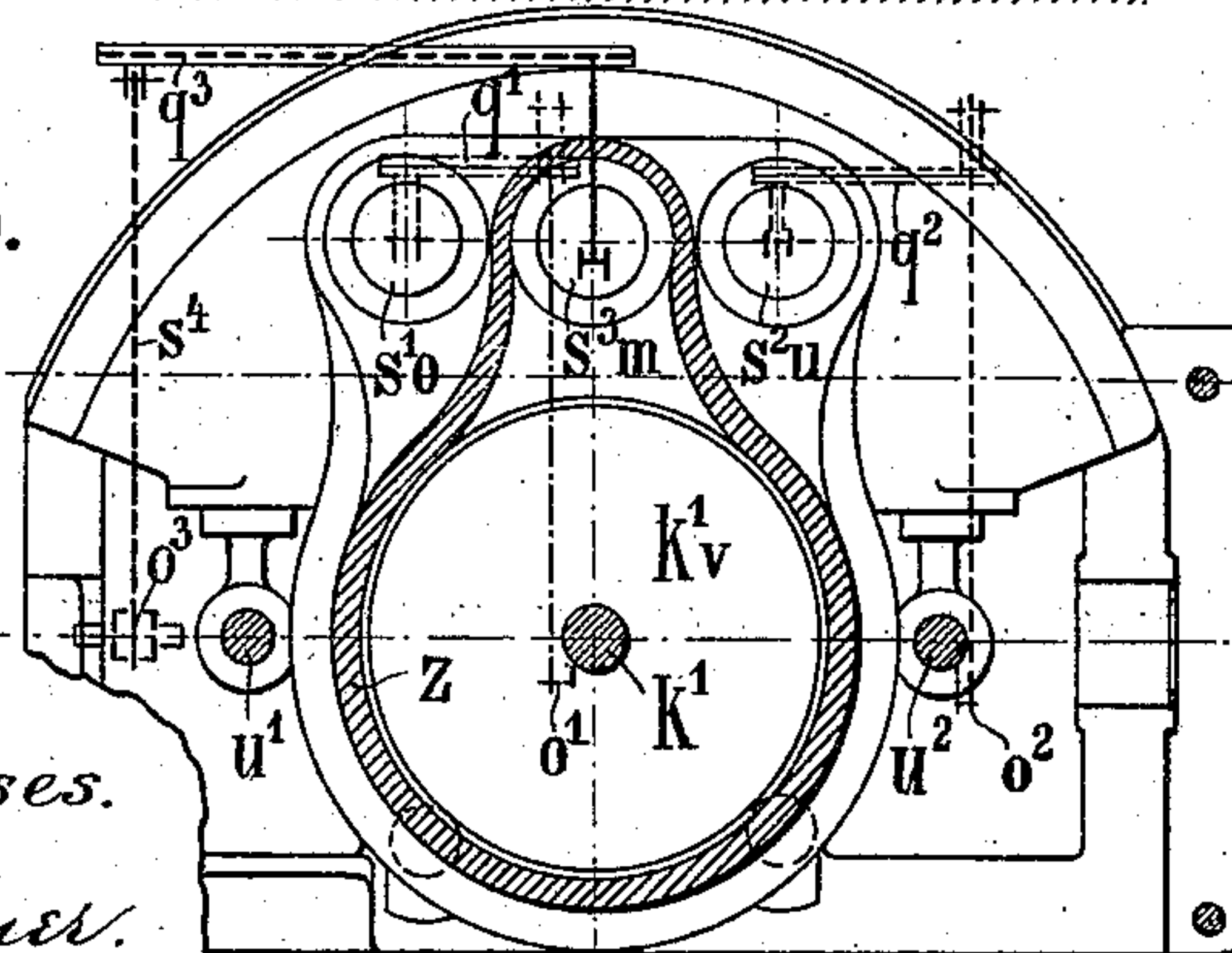
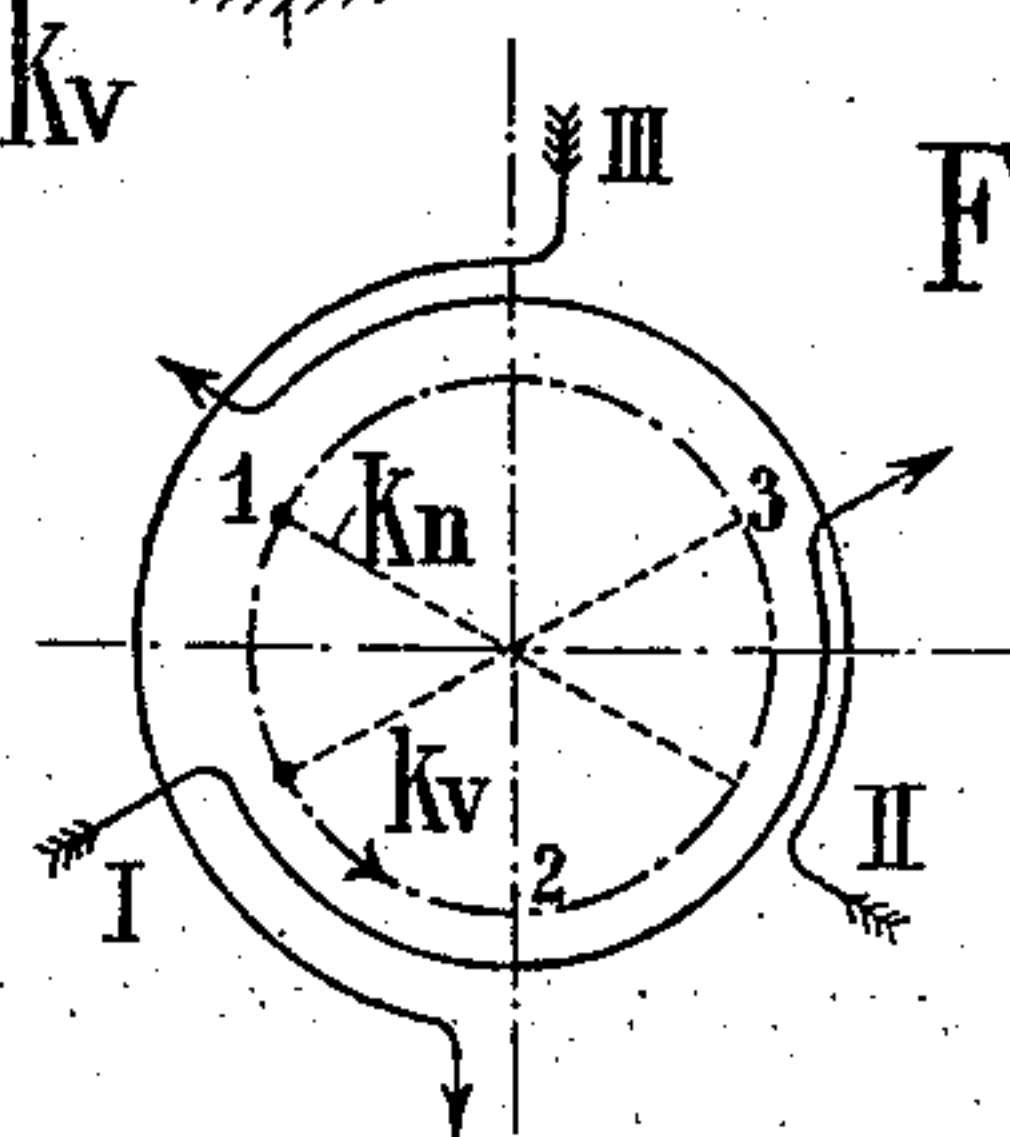


Fig. 4.



Witnesses.

H. L. Amer.
M. E. Beall.

Inventor.

Adolf Klose.
by *Henry Ott* attys.

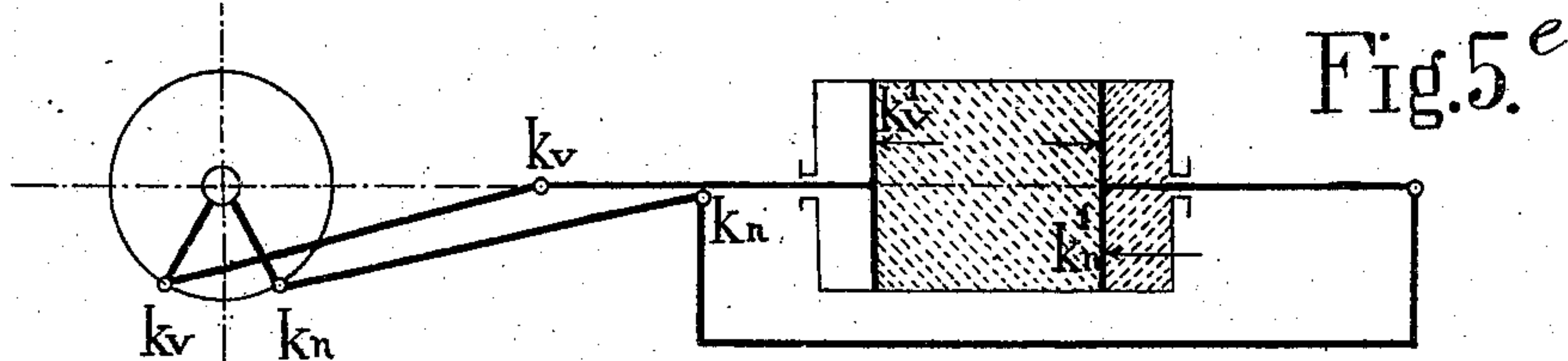
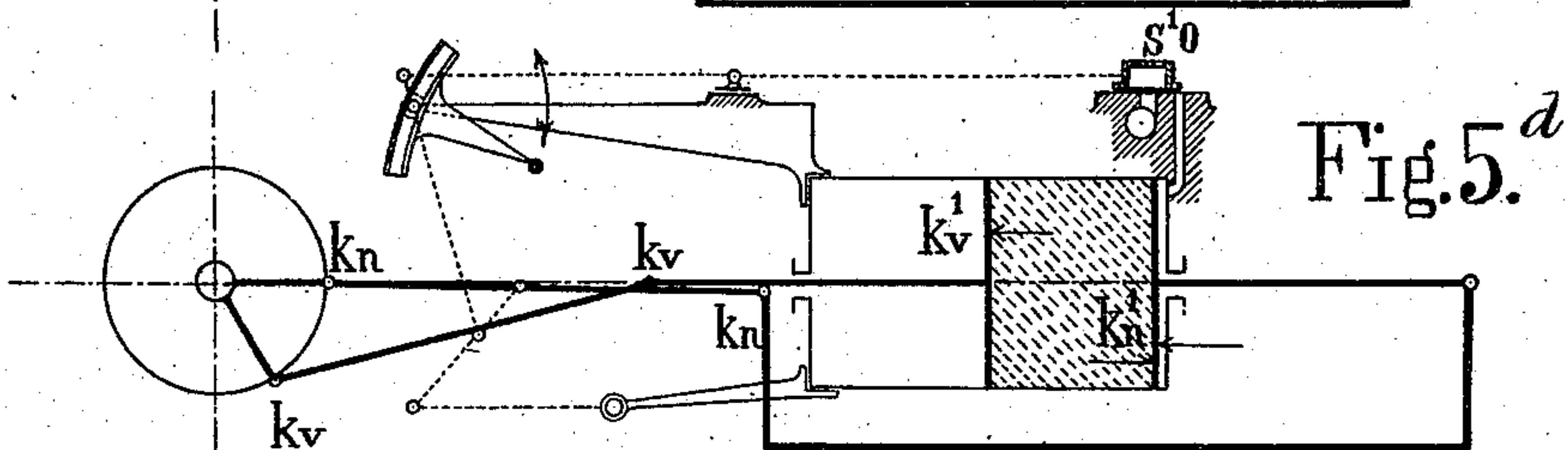
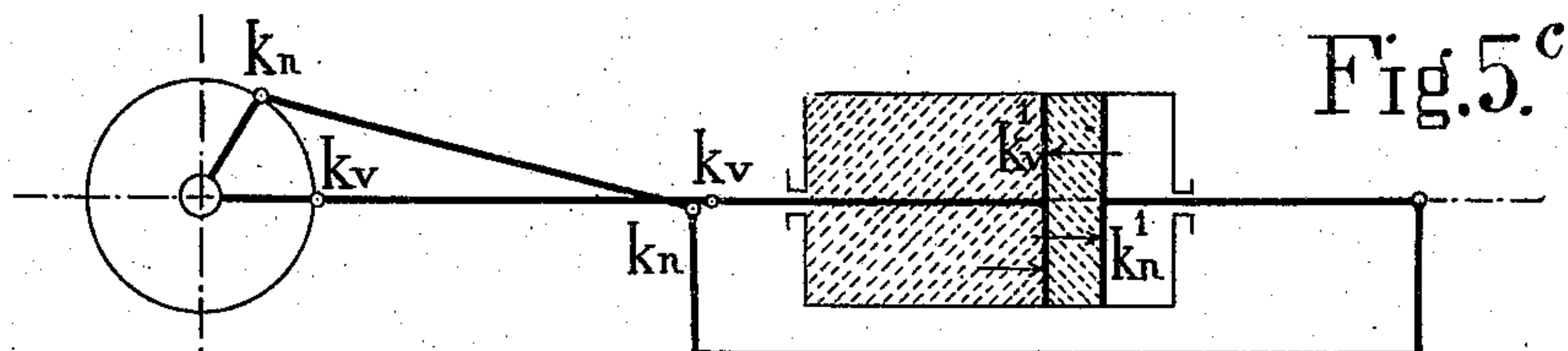
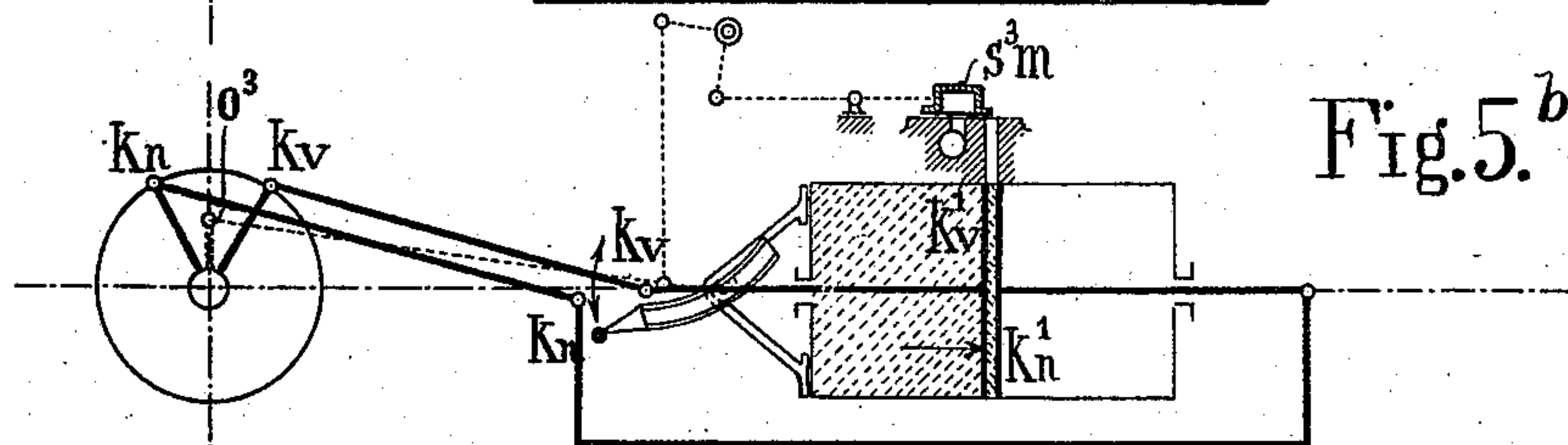
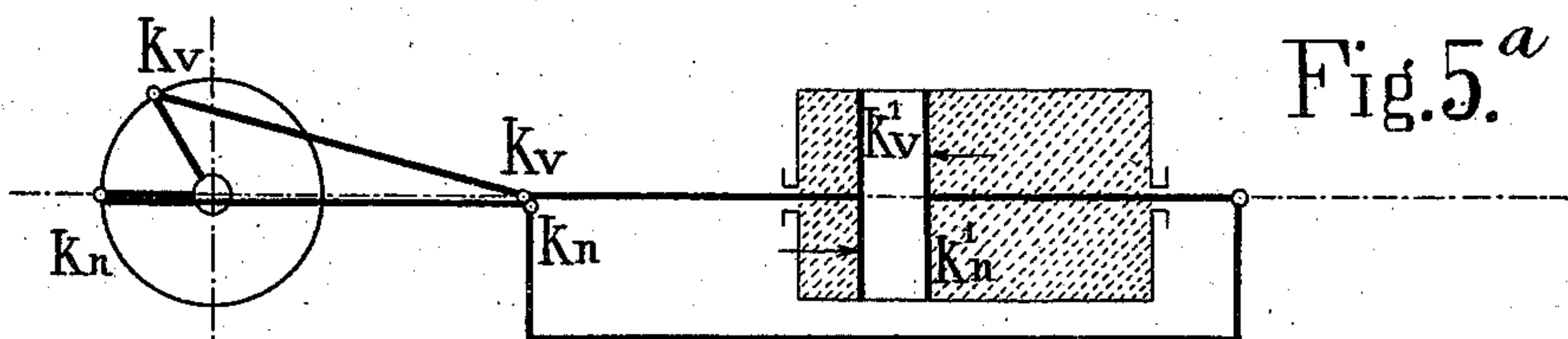
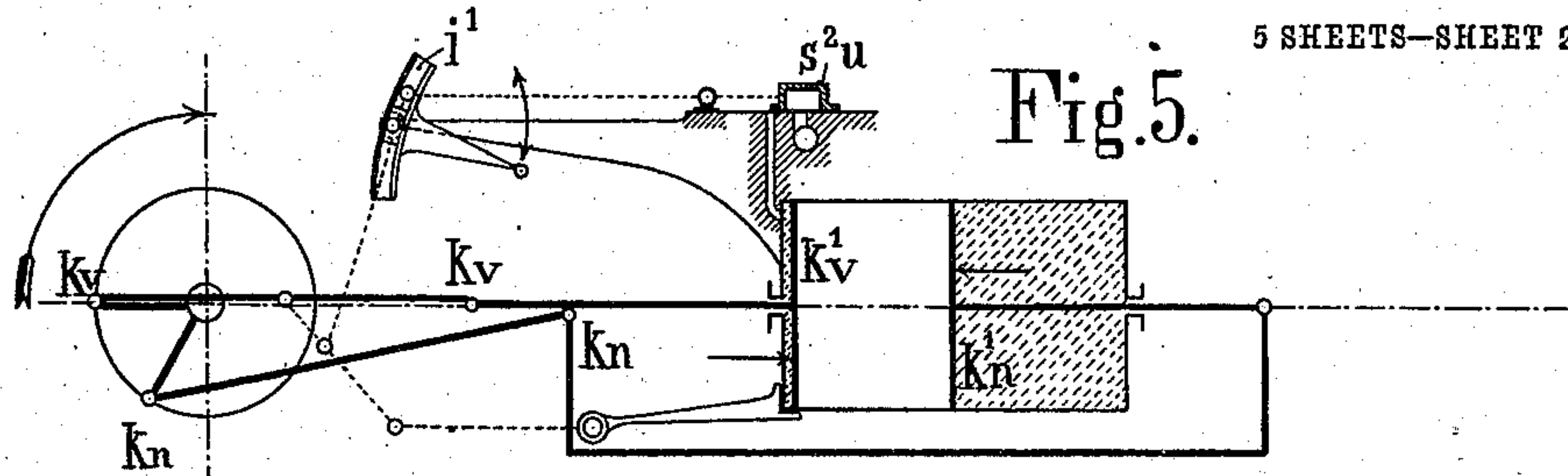
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5 SHEETS—SHEET 2.



Witnesses.
H. L. Amer,
M. E. Beall.

Inventor.
Adolf Klose.
by Henry Otto J. Batts.

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ENGINE.

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5 SHEETS—SHEET 3.

Fig. 6.

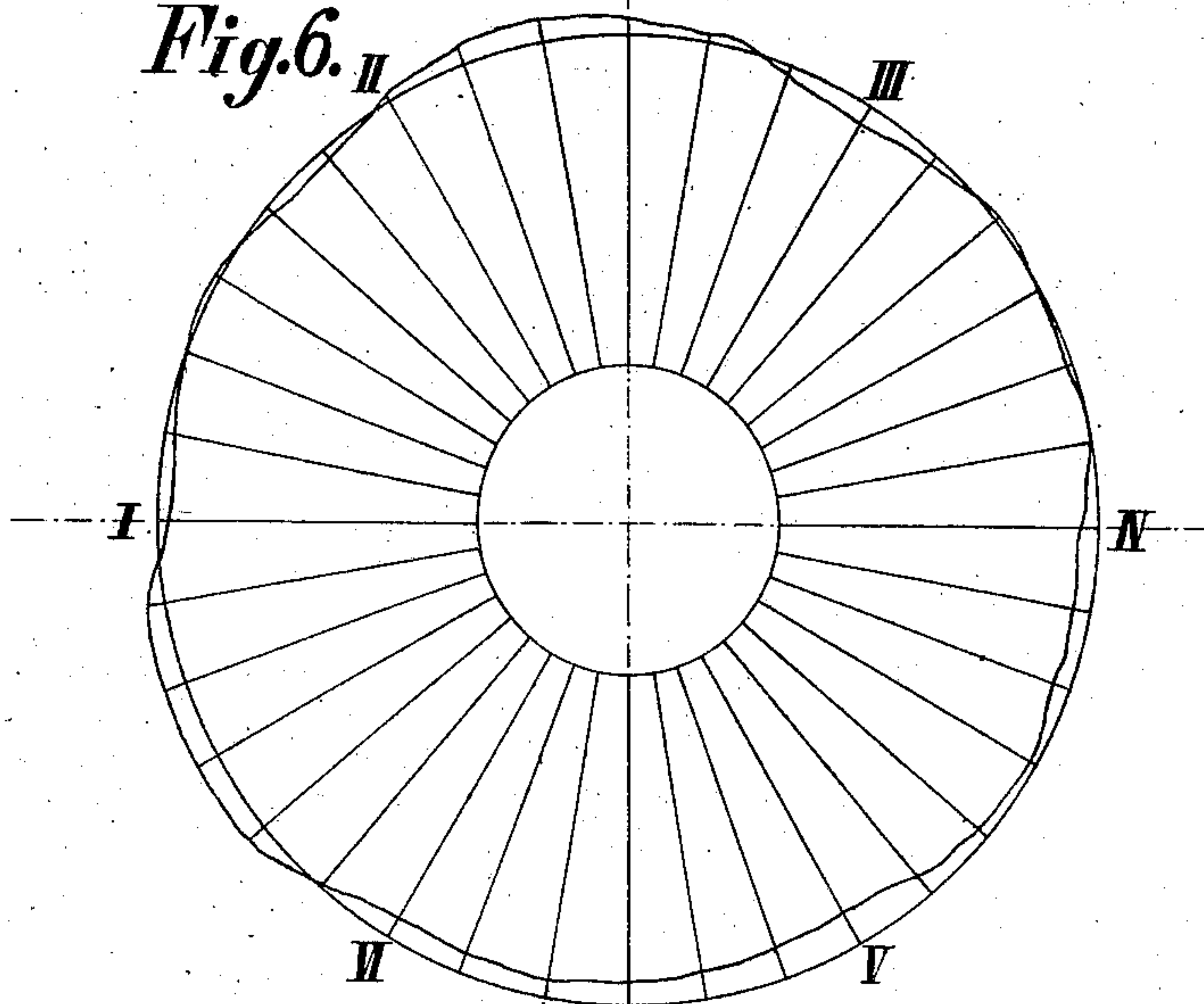
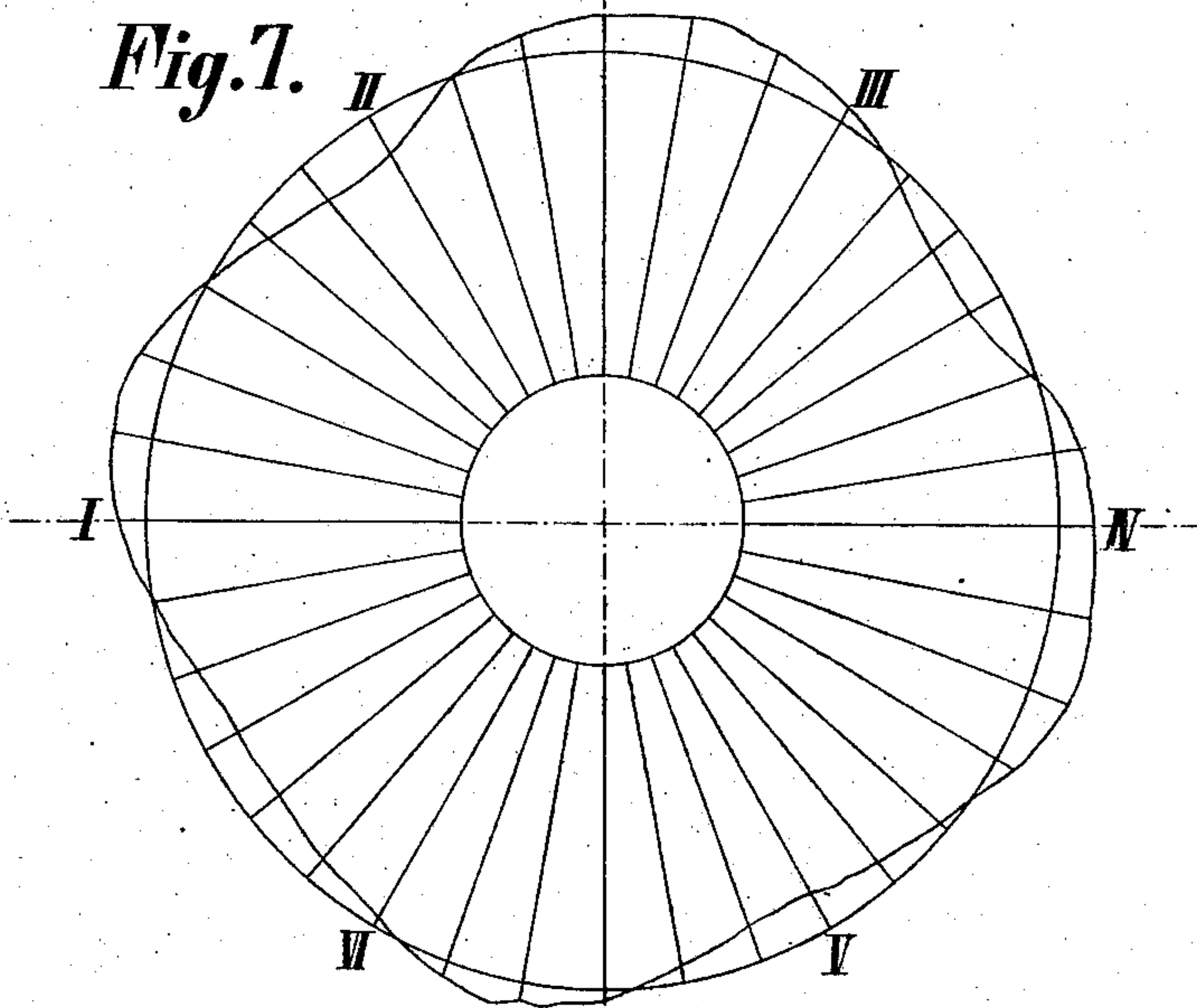


Fig. 7.



Witnesses.

H. L. Amer.
M. E. Beall.

Inventor.

Adolf Klose.
by Henry O. S. Potts.

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ENGINE.

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5 SHEETS—SHEET 4.

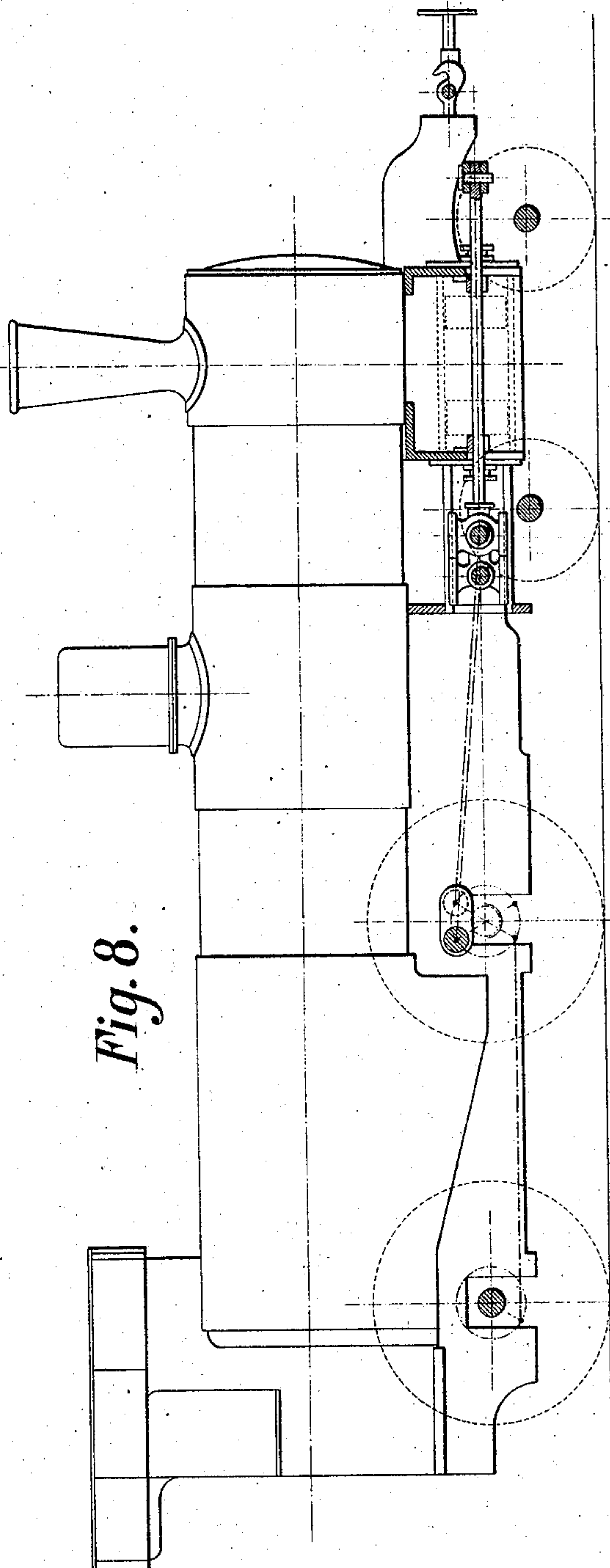


Fig. 8.

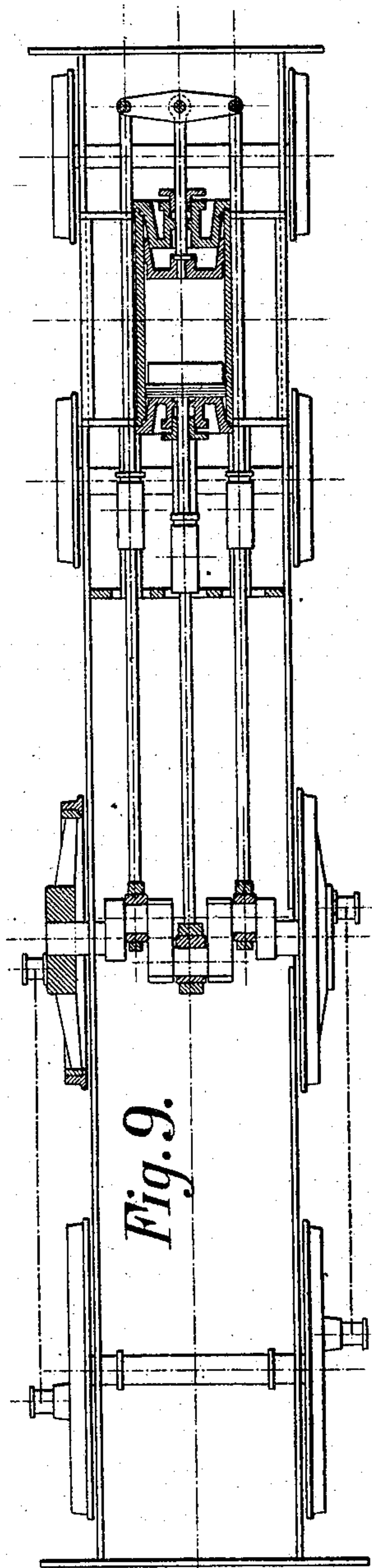


Fig. 9.

Witnesses.

H. L. Amer.

M. E. Beall.

Inventor.

Adolf Klose.

by Harry Orthman atty.

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A. KLOSE.
ENGINE.

APPLICATION FILED FEB. 20, 1903.

5 SHEETS—SHEET 5.

Fig. 10.

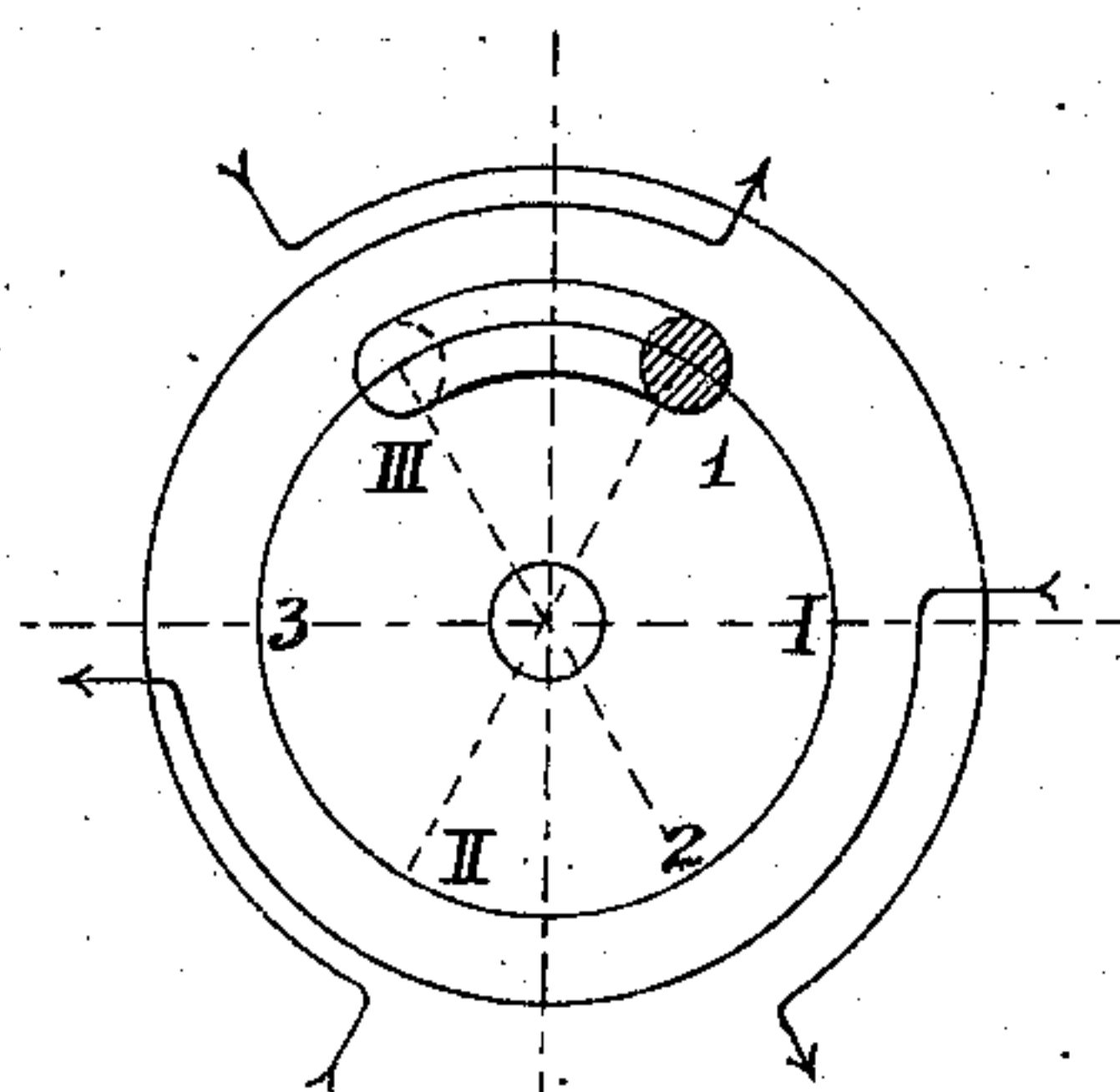
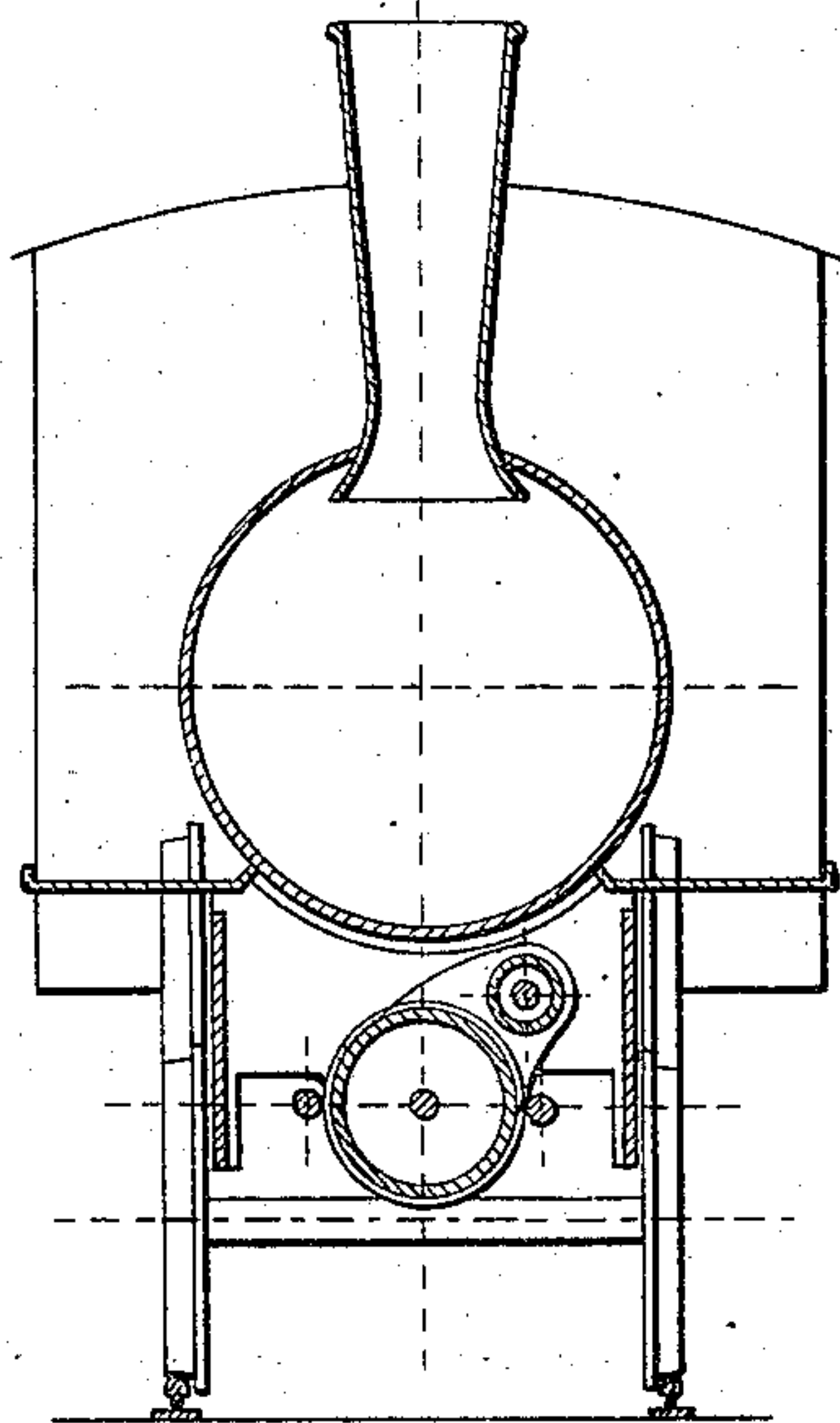


Fig. 11.

Witnesses.

H. L. Amer.
M. E. Beall.

Inventor.

Adolf Klose.
by [Signature] attys.

UNITED STATES PATENT OFFICE.

ADOLPH KLOSE, OF BERLIN, GERMANY.

ENGINE.

No. 854,896.

Specification of Letters Patent.

Patented May 28, 1907.

Application filed February 20, 1903. Serial No. 144,349.

To all whom it may concern:

Be it known that I, ADOLPH KLOSE, a subject of the King of Prussia, German Emperor, and residing at No. 33 Furfürstendamm, Berlin, in the Kingdom of Prussia, German Empire, civil engineer, have invented certain new and useful Improvements in Reciprocating Engines, of which the following is a description.

This invention relates to reciprocating engines, of the kind, in which two pistons operate in one cylinder, and my improvements in such engines refer to certain combinations and arrangements of parts, as are more fully described hereinafter.

In order to make my invention more clear, I refer to the accompanying drawings, in which similar letters denote similar parts through the several views and in which

Figure 1 is a front view of an engine constructed according to my invention, some parts being broken off and the steam distributing valves being removed. Fig. 2 is a vertical section on line 28, 29 of Fig. 1. Fig. 3 is a horizontal section on line 30, 31 of Fig. 2. Fig. 4 is a diagram representing the admission and the exit of the driving medium at the various positions of the two pistons. Figs. 5—5^e are diagrams, showing various positions of cranks and pistons during a revolution of the crank shaft. Fig. 6 is a tangential diagram of an engine having cranks set 60° apart according to this invention. Fig. 7 is a similar diagram of a twin cylinder engine having cranks at right angles. Fig. 8 is a locomotive, partly in elevation and partly in section showing this form of invention applied thereto. Fig. 9 is a horizontal section of Fig. 8. Fig. 10 is a vertical section, and Fig. 11 is a diagram of the admission to the cylinder.

My invention comprises an engine having a single cylinder in which there are two pistons connected to cranks making an angle between them of about 60°.

Referring to Figs. 1—3, *z* is the cylinder in which there are two pistons *k'v* and *k'n* fixed to the upper and lower piston rods *k'* and *k''*, respectively. The rod *k'* is connected to a cross-head *u*, whose guide rods *u'* and *u''* are connected by connecting rods *s''* and *s'* to cranks *k v* on the crank shaft *w* journaled in the frame *a*. On the end of the shaft *w* is a crank *o''* whose rod *s''* slides in the link *p''*. The rod *s''* is connected by rod *s''* to a crank-arm *s''* that rocks the shaft *q''*, which in turn

has an arm *b* connected by a link *c* to the slide valve *s''m*, here shown as a balanced or piston valve in valve casing *d* to control the steam between the two pistons *k'v* and *k'n*. The valve mechanism for the lower part of the cylinder is operated from one of the rods operated by the upper piston and here shown as the one *s'*. The rod *p'* being connected to *s'* at the point *o'* and operates in the link *p'* from which it has a connection *p''* to the arm *p''* on rock shaft *q'* that imparts its motion by arm *p''* and a suitable link to the valve *s'u* for the lower end of the cylinder. The valve *s'o* is operated from the central connecting rod *s* to which the rod *p'* is connected at the point *o'*, the opposite end of which rod operates the link *p''*, that is connected by rod *p''* operating the arm *p''* on rock shaft *q'*, which in turn by a similar arm and a link operates the valve.

The engine operates as a four-third cycle, that is, for every revolution of the crank shaft there are four piston movements and the steam is admitted three times into the cylinder, at the top, center, and bottom, consequently there must be three valves and operating mechanisms. Any suitable form of valve mechanism may be used.

In Figs. 5—5^e are diagrammatically shown the six main positions of the cranks and the pistons connected thereto. The direction of movement of the crank shaft in all of these figures is the same as that indicated by the arrow, Fig. 5. In Fig. 5, the piston *k'v* and its crank are at the dead point and valve *s'u* is opened to admit steam, while the piston *k'n* is still driven forward by the steam behind it to the position shown in Fig. 5^a, during which time the piston *k'v* has moved toward the one *k'n* now at the limit of its travel. Both pistons now move toward the center of the cylinder, Fig. 5^b when steam is admitted between them and exhausted from behind the piston *k'n* to position, Fig. 5^c, piston *k'v* reaching the limit of its travel forward and steam exhausted from behind it. The expansion of the steam between the two pistons carries them to the position, Fig. 5^d, when valve *s'o* admits steam to the piston *k'n* and begins to drive this piston on its stroke to position, Fig. 5^e, when exhaust of the steam between the two pistons begins. The parts then move to the position, Fig. 5, completing the cycle.

By selecting a crank angle of about 60° there is an economical distribution of steam

and power in the cylinder as well as power transmitted to the crank shaft. It will easily be seen that the pressure on the crank shaft, Fig. 6, is very regular for cranks set at 60° as will readily be seen when compared with Fig. 7, of a twin cylinder engine whose cranks are set 90° apart.

Figs. 8, 9, 10 show such an engine on a locomotive where there is a single cylinder placed centrally below the boiler and operates in every respect the same as the engine described with respect to Figs. 1-3. Such a locomotive runs very easily since the piston pressures are balanced with respect to the longitudinal central plane of the locomotive and will not produce a turning movement about a vertical axis lying in this plane.

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

1. In a steam engine a cylinder having steam admission ports at each end and at the center, in combination with a pair of double acting pistons in the cylinder, a single crank shaft to which said pistons are connected and by which the relative movements of the pistons are controlled, a valve operating crank on the crank shaft, a separate valve for each port in the cylinder and mechanism connecting said valves to the valve operat-

ing crank, the stroke of said pistons being greater than half the length of the cylinder and said valve mechanism operating to admit steam between the pistons when in their middle position in the cylinder, said steam being expanded during the movement of one of the pistons past the middle of the cylinder.

2. In an engine, a cylinder in combination with two pistons therein and a crank shaft whose cranks make an angle of substantially sixty degrees, whereby each piston for a portion of its travel will traverse a portion of the path of the other piston and suitable valve mechanism, substantially as described.

3. In an engine, the combination with a cylinder, of two pistons therein, cranks set substantially sixty degrees apart and suitable valve mechanism to admit steam at each end of the cylinder and at its center between the two pistons, whereby each piston will traverse a portion of the path of the other piston, substantially as described.

In testimony, that I claim the foregoing as my invention, I have signed my name in presence of two subscribing witnesses.

ADOLPH KLOSE.

Witnesses:

HENRY HASPER,
WOLDEMAR HAUPT.