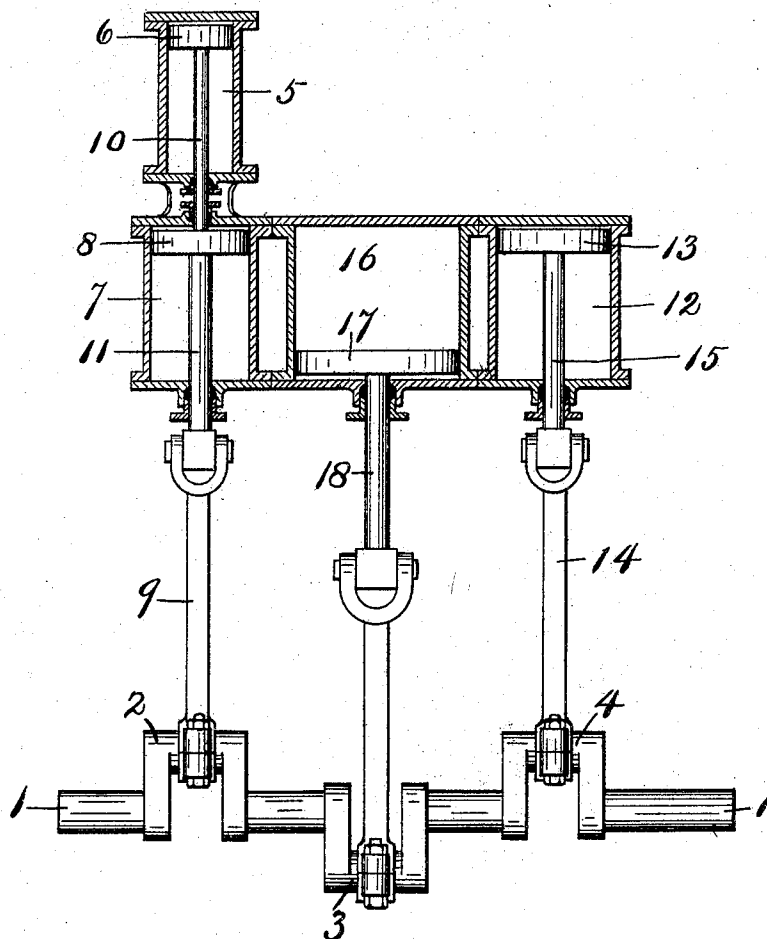


No. 794,281.

PATENTED JULY 11, 1905.

E. P. CLAPP,
MEANS FOR BALANCING COMPOUND ENGINES.
APPLICATION FILED JUNE 23, 1903.



WITNESSES=
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UNITED STATES PATENT OFFICE.

EDWIN P. CLAPP, OF NORTH RUSH, NEW YORK.

MEANS FOR BALANCING COMPOUND ENGINES.

SPECIFICATION forming part of Letters Patent No. 794,281, dated July 11, 1905.

Application filed June 23, 1903. Serial No. 162,756.

To all whom it may concern:

Be it known that I, EDWIN P. CLAPP, a citizen of the United States, and a resident of North Rush, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Means for Balancing Compound Engines, of which the following is a specification.

This invention relates to means for balancing compound engines so as to avoid vibrations commonly found in such devices.

In the present case the invention is applied to a quadruple compound engine.

In the drawings, the shaft 1 has three cranks 2, 3, and 4. The cranks 2 and 4 are set oppositely to the crank 3, and said cranks 2 and 4 are set in line on the same side of the shaft. Compounding occurs in the usual way by leading the steam first to the high-pressure cylinder 5 and acting upon its piston 6, thence into the cylinder 7 and acting upon its piston 8, while pistons 6 and 8 are connected together and to the connecting-rod 9 by means of the piston-rods 10 and 11. From the cylinder 7 the steam passes to the cylinder 12 and acts upon its piston 13, which is connected with the connecting-rod 14 by the piston-rod 15. From the cylinder 12 steam is connected to the cylinder 16 and acts upon its piston 17, which is connected by the piston-rod 18 with the connecting-rod 19. The connecting-rod 9 is connected to the crank 2, the connecting-rod 14 to the crank 4, and the connecting-rod 19 to the crank 3. The cylinders 5, 7, 12, and 16 increase in size, as required for the due expansion of the steam in a manner well known.

The pounding and vibration commonly found in engines, and particularly in engines where several cranks are employed, is due generally to the fact that the cranks do not support the weights of the connecting-rods and attached parts in positions symmetrically arranged around the axis of the shaft 1. In this invention the combined weights of the piston 6, rod 10, piston 8, rod 11, and rod 9 are made equal to the combined weights of

the piston 13, rod 15, and connecting-rod 14, and the combined weights of the piston 6, rod 10, piston 8, rod 11, connecting-rod 9, piston 13, rod 15, and connecting-rod 14 are equal to the combined weights of the piston 17, rod 18, and connecting-rod 19. With this arrangement of the weights at every point of the stroke or revolution of the cranks the weights are equally distributed and there is no point at which there is a force except that of the steam tending to cause or to resist revolution of the shaft 1. It is clear that this principle may be applied in other cases than that of the specific form shown. There may be more or less than four cylinders, with their related pistons and cranks.

The arrangement here shown, although of four cylinders, is arranged as for three cylinders. There are three cranks and three connecting-rods. The two outer cranks have connecting-rods and movable parts connected thereto which are equal in weight to each other. The middle crank has a connecting-rod with connected moving parts which are equal in weight to the two outer connecting-rods and their connecting moving parts. It will be obvious that this arrangement produces the greatest possible steadiness and freedom from vibration, together with removal of strain upon the crank-shaft, the cranks, and the bearings to the utmost degree.

What I claim is—

1. The combination of a shaft having three cranks the two outer cranks being arranged oppositely to the middle crank, a connecting-rod and other moving parts attached to each crank, the weight of the middle connecting-rod and its connected moving parts being equal to the combined weights of the two outer connecting-rods and their connected moving parts, and the two outer connecting-rods and their connected moving parts being equal in weight to each other.

2. The combination of a shaft having three cranks, the two outer cranks being arranged oppositely to the middle crank, a connecting-

rod and other moving parts attached to each crank, the weight of the middle connecting-rod and its connected moving parts being equal to the combined weights of the two
5 outer connecting-rods and their connecting moving parts, and the two outer connecting-rods and their connected moving parts being equal in weight to each other, in combination

with four cylinders and four pistons, one of which cylinders is in line with one of the other 10 cylinders.

EDWIN P. CLAPP.

Witnesses:

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