No. 718,422. PATENTED JAN. 13, 1903.

J. P. BROPHY.

METHOD OF MANUFACTURING ENGINE CRANKS.

APPLICATION FILED SEPT. 15, 1902.

NO MODEL.

Fig. I

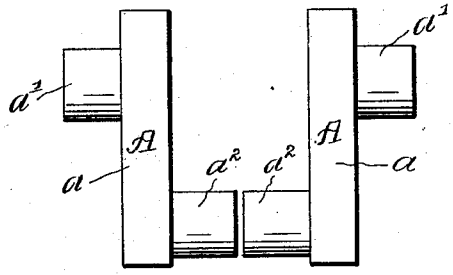



Fig. II

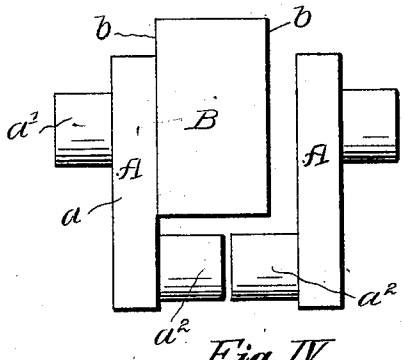



Fig. III

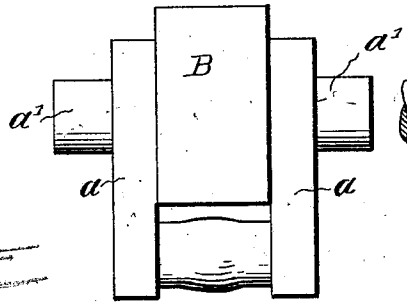



Fig. IV

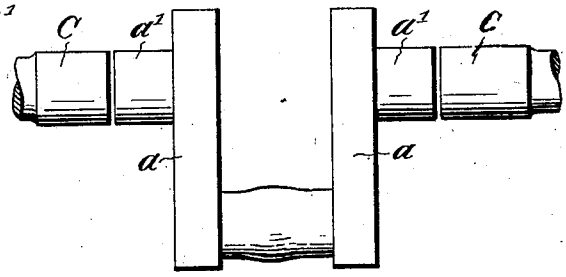



Fig. V

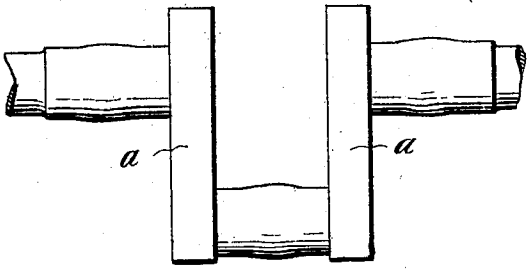
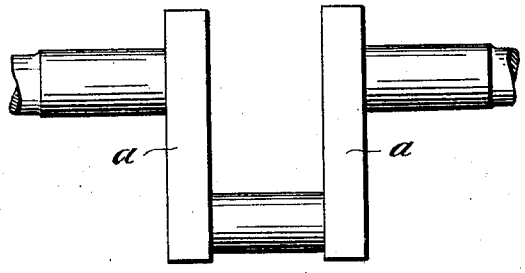



Fig. VI




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# UNITED STATES PATENT OFFICE.

JOHN P. BROPHY, OF CLEVELAND, OHIO, ASSIGNOR TO THE CLEVELAND MACHINE SCREW COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

## METHOD OF MANUFACTURING ENGINE-CRANKS.

SPECIFICATION forming part of Letters Patent No. 718,422, dated January 13, 1903.

Application filed September 15, 1902. Serial No. 123,366. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN P. BROPHY, a citizen of the United States, and a resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Methods of Manufacturing Engine-Cranks, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

My invention relates to methods of manufacturing double cranks for engines, and has for its object the production of such cranks in an economical and efficient manner.

It has heretofore been customary in the manufacture of double cranks and shafts therefor to forge a piece of metal into the approximate required form, which embodied an enlarged solid eccentric portion which was afterward turned out to form the inner opposing faces of the crank-cheeks and the journal for the connecting-rod. This operation involved a very slow and hence expensive process of turning and the waste of a large amount of material as well. In my improved process I approximate very much more nearly the ultimate form of the crank and shaft before finally finishing it than was possible by the above-described former method, and thereby effect a great reduction in the expenditure of time and labor and of the waste of material in producing the finished shaft and crank.

Such invention consists of a method hereinafter fully described, and specifically set forth in the claims.

The annexed drawings and the following description set forth in detail one mode of carrying out the invention, such disclosed mode constituting but one of various ways in which the principle of the invention may be used.

In said annexed drawings, Figure I represents a view in front elevation of the two cheeks of a double-crank shaft forming two elements of the crank structure after the first step in the process has been completed and in juxtaposition. Fig. II represents such two elements in juxtaposition after the second step in the process has been completed and in readiness for the third step. Fig. III represents the two elements after the third step has been completed. Fig. IV represents the two elements as shown in Fig. III, showing the ends of the two parts of the crank-shaft in position for welding on the crank. Fig. V represents the structure upon completion of such welding, and Fig. VI represents the structure as completed.

In carrying out my improved process two duplicate elements A, Fig. I, are formed by drop-forging, each element having a cheek portion $a$, a crank-shaft boss $a'$, and a connecting-rod-journal boss $a^2$. The thickness of cheek portion $a$ and the diameters of the bosses $a'$ and $a^2$ are made somewhat greater than they are intended to be in the finished crank, and the combined length of the connecting-rod-journal bosses $a^2\,a^2$ is made somewhat greater than the intended length of such journal in said finished crank. Each of the two elements is now subjected to a turning or milling process, and its inner face—that is, the face contiguous to the connecting-rod-journal boss—finished off to a perfect plane at right angles with the journal-boss axis. They are then placed, as shown in Fig. II, with the two journal-bosses in juxtaposition on either side of a rigid block B, having two parallel plane surfaces $b\,b$. These two surfaces are a distance from each other exactly equal to that which it is required that the two inner faces of the cheeks of the finished crank shall be. The two elements are now caused to approach each other in the direction of the journal-boss axes until they touch and a current of electricity passed through such bosses of a character such as to heat them to a welding heat. The approach is continued until the said two inner faces of the cheeks contact the opposite parallel surfaces $b\,b$ of the block, the ends of the two bosses thereby becoming merged into and welded to one another, as shown in Fig. III. The above-described operation is performed by mechanism suitable to the purpose. The two crank-shaft portions C C are now welded upon the bosses $a'\,a'$, and the structure's form is now that illustrated in Fig. V. The shaft portions and the

connecting-rod journal are now placed in a lathe and finished off to the required diameters.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any one of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention—

1. In the process of manufacturing double cranks, the steps which consist in first forming the two crank-cheeks with connecting-rod and crank-shaft journal bosses, welding the connecting-rod-journal bosses to form the body of the connecting-rod journal, and welding the crank-shaft-journal portions to the crank-shaft-journal bosses.

2. The process of manufacturing double cranks, consisting of first forming the two crank-cheeks with connecting-rod and crank-shaft journal bosses, finishing the two inner faces of the said cheeks, welding the two connecting-rod-journal bosses to form the body of the connecting-rod journal, and welding the crank-shaft-journal portions to the crank-shaft-journal bosses.

3. In the process of manufacturing double cranks, the steps which consist in forming each of the two crank-cheeks with a connecting-rod-journal boss, heating such bosses to a welding heat, welding such bosses together by bringing them together longitudinally and bringing the inner cheek-faces into contact with oppositely-disposed and relatively fixed surfaces whereby a predetermined relationship of said faces relatively to each other may be imparted thereto.

Signed by me this 8th day of September, 1902.

JOHN P. BROPHY.

Attest:

GEO. W. SAYWELL,

A. E. MERKEL.