No. 624,019. Patented May 2, 1899.

J. P. HARRINGTON.

APPARATUS FOR MAKING CRANK SHAFTS.

(Application filed Jan. 8, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 8.

Fig. 1.

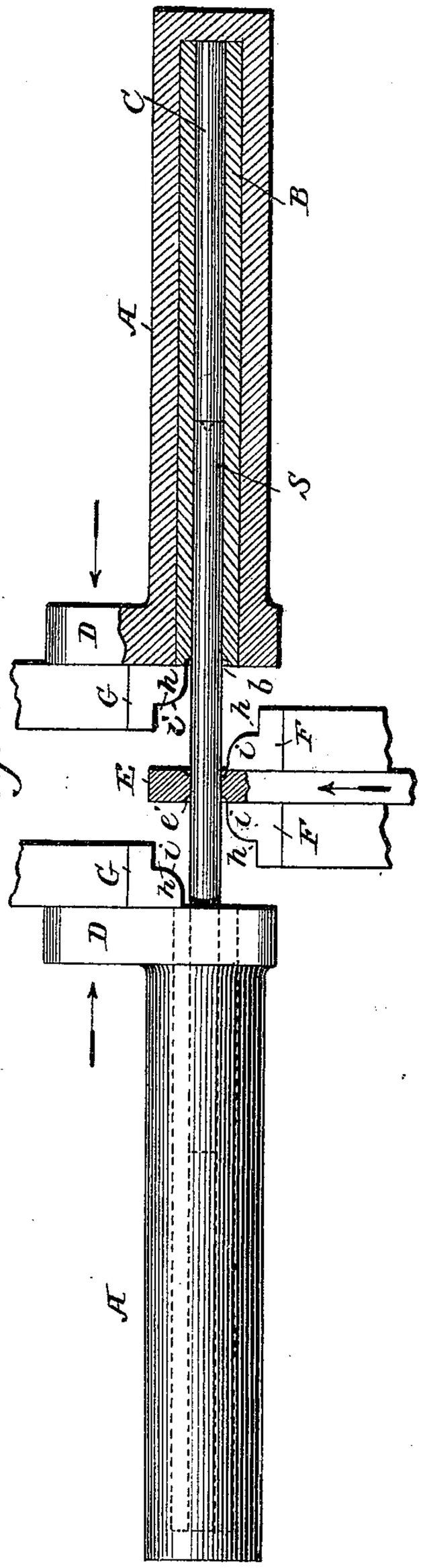
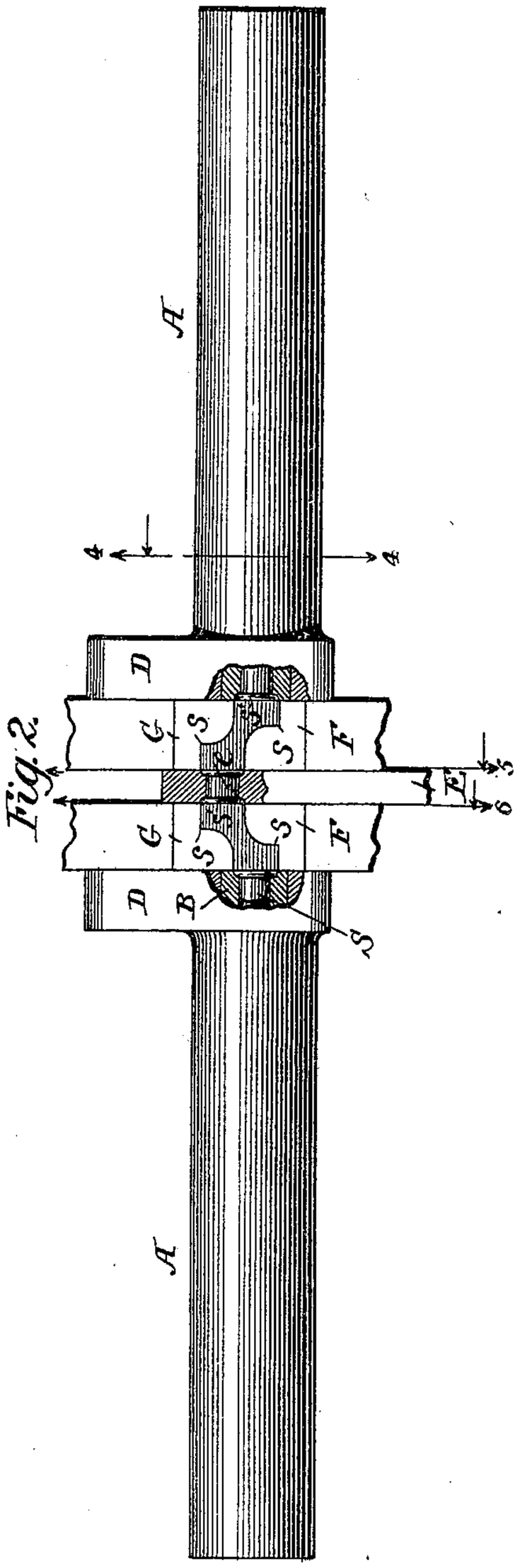


Fig. 2.



Witnesses
J. G. Hinkel
William E. Neff

Inventor
John P. Harrington
By Watson E. Coleman
Attorneys

No. 624,019. Patented May 2, 1899.

J. P. HARRINGTON.

APPARATUS FOR MAKING CRANK SHAFTS

(Application filed Jan. 8, 1898.)

(No Model.) 2 Sheets—Sheet 2.

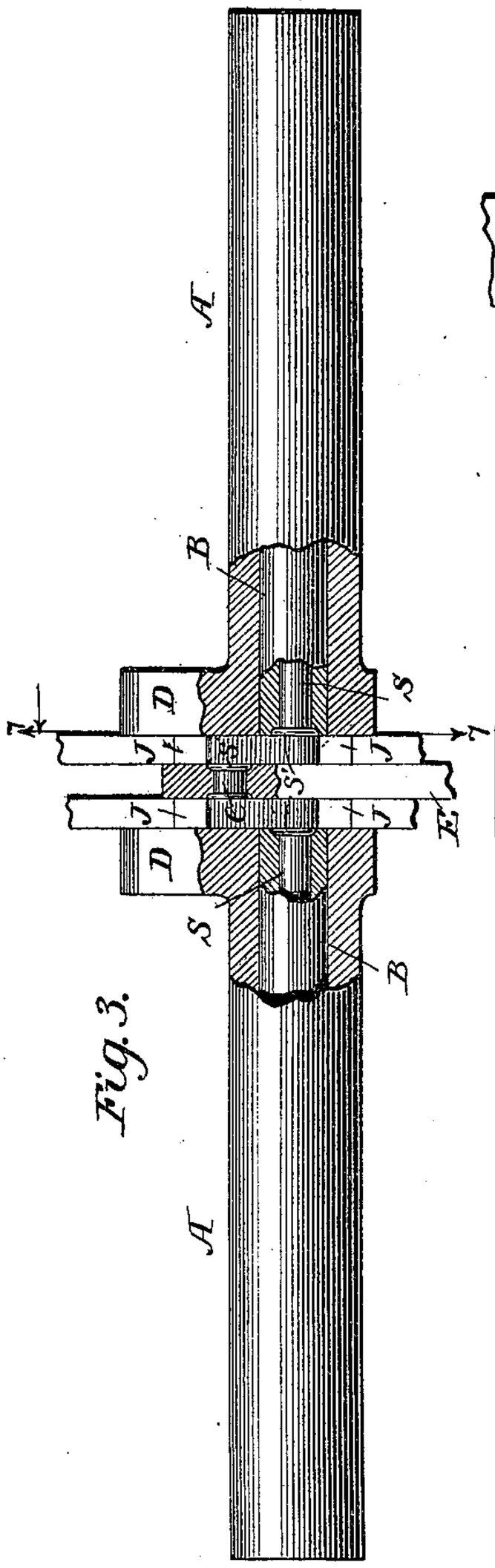


Fig. 3.

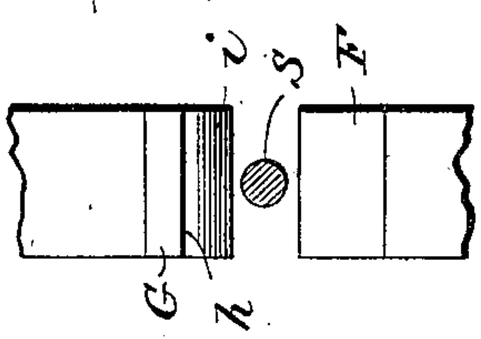


Fig. 6.

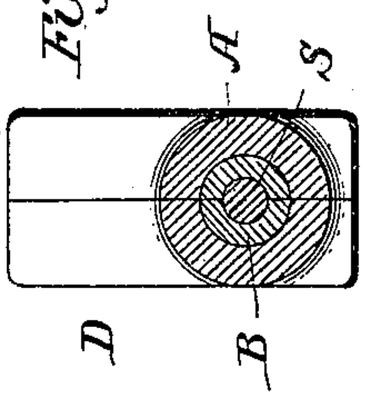


Fig. 4.

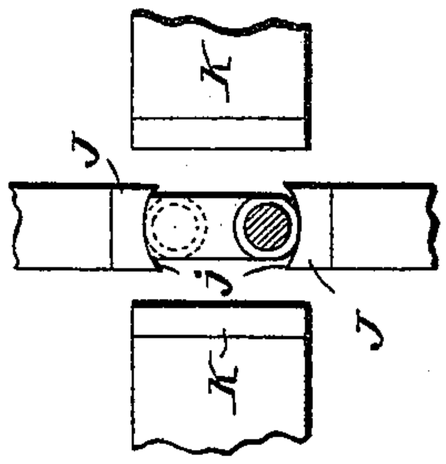


Fig. 7.

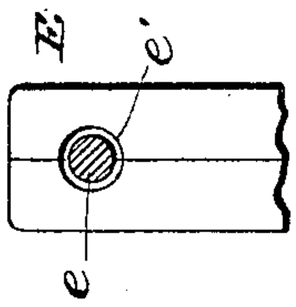


Fig. 5.

Witnesses
J. J. Hinkel
William E. Neff.

Inventor
John P. Harrington
By Watson & Watson
Attorneys

UNITED STATES PATENT OFFICE.

JOHN P. HARRINGTON, OF BALTIMORE, MARYLAND.

APPARATUS FOR MAKING CRANK-SHAFTS.

SPECIFICATION forming part of Letters Patent No. 624,019, dated May 2, 1899.

Application filed January 8, 1898. Serial No. 666,007. (No model.)

To all whom it may concern:

Be it known that I, JOHN P. HARRINGTON, a citizen of the United States, residing at Baltimore city, State of Maryland, have invented certain new and useful Improvements in Apparatus for Making Crank-Shafts, of which the following is a specification.

This invention relates to an improved mechanism for manufacturing crank-shafts; and the object of the invention is to construct crank-shafts rapidly and cheaply and at the same time to avoid cutting or rupturing the fiber of the metal.

The class of crank-shafts to which the invention relates comprises those having two cranks at some intermediate point on the crank-shaft and a common crank-pin.

The invention will be explained fully in connection with the accompanying drawings, in which—

Figure 1 is a side view, partly in section, of a set of dies adjusted to the straight blank from which the crank-shaft is to be formed. Fig. 2 shows the same dies in the advanced position which they assume to complete the first step in the process of manufacture. Fig. 3 is a side view showing the dies in position for finishing the crank-shaft, the side dies being removed. Fig. 4 is a section on the line 4 4, Fig. 2. Fig. 5 is an end view of the middle die which forms the crank-pin, taken from the line 5 5, Fig. 2. Fig. 6 is an end view of the dies which give the crank its preliminary shape, taken from the line 6 6 of Fig. 2. Fig. 7 is a view of the dies which operate on the edges of the crank to give it its final shape, taken on the line 7 7 of Fig. 3. Fig. 8 is a side view of a finished crank-shaft.

Referring to the drawings, A A indicate a pair of sockets which receive the ends of the shaft S, upon which the cranks are to be formed. The sockets have cylindrical openings equal to the diameter of the largest shafts for which the apparatus is adapted, and for smaller shafts cylindrical bushings B are used. Within the bushings are filling-blocks C, which form solid abutments for the ends of the shafts S. By varying the bushings and filling-blocks the sockets may be adapted to hold shafts of any diameter or length smaller than the maximum capacity of the sockets. On the inner ends of these socket-pieces are the main dies D. The bushings and the dies D are preferably formed in halves which are separable to permit the ready insertion and removal of the shaft, the line of division being vertical, as shown in Fig. 4. This feature, however, is not absolutely essential, as the shaft may be inserted and withdrawn by the endwise movement of the parts without separating them. Suitable means for operating the sockets and dies D are provided, such as pressure pistons or cams; but for the purposes of this application it is not deemed necessary to illustrate the operating means, such means being common and well known. The inner faces of the dies D are flat and parallel, and they are used to shape the outside faces of the cranks, as will be explained hereinafter.

The crank-pin is formed by a central die E, which is movable at right angles to the movement of the dies D. This die E is preferably divided vertically, as shown in Fig. 5. It has a central opening *e*, through which the shaft passes, as shown in Fig. 1, and which determines the size of the crank-pin. This opening is preferably rabbeted at *e'* to form annular shoulders at the ends of the crank-pin, as shown in Fig. 8. The dies D are similarly rabbeted at *b* to form annular shoulders on the shaft adjoining the cranks. These shoulders strengthen the connections between the cranks and the shaft and crank-pin.

Adjacent to the die E are a pair of dies F, which coöperate with a similar pair of dies G adjacent to the dies D to give the crank its preliminary shape, as shown in Fig. 2. These dies are formed with right-angled recesses *h*, into which the metal is upset to form the angles *s* of the cranks. They are also provided with rounding shoulders *i*, which perform the preliminary bending of the blank, as illustrated in Fig. 2.

The shaft is suitably heated and the ends are fitted into the sockets A, and the die E is closed upon the portion which is to form the crank-pin, as shown in Fig. 1, the dies F and G occupying the positions shown in that figure. To perform the first step in the process, the shanks A and the dies D and G are moved toward each other, and simultaneously the die E and the dies F are moved vertically. The dies G are prevented from vertical move-

ment, and in consequence the parts assume the position as shown in Fig. 2. During this operation the metal is upset into the angles *h*, and the corners *s* of the cranks are formed. At the same time the cranks are turned up to an angle of about forty-five degrees with the shaft, and the metal is upset sufficiently to form the shoulders *s'* adjacent to the cranks. The dies F and G are now withdrawn, and two pairs of dies J, equal in thickness to the cranks and having curved faces *j*, are substituted. These dies have a reciprocating movement, and they form the rounded ends of the cranks. Upon the sides of each crank, as shown in Fig. 7, are a pair of dies K, equal in thickness to the cranks and adapted to form the edges thereof. The dies K have a reciprocating movement, and they strike the cranks alternately with the dies J.

The second operation in forming the cranks consists in removing the dies F and G and then giving the die E a further movement until the crank-pin is brought to its proper position and at the same time moving inward the dies D to bring the shaft ends into proper relation with the cranks and to turn the cranks at right angles to the shaft. This brings the dies D and E into the position shown in Fig. 3, and while they are held in this position the third operation, which consists in hammering or pressing the edges and ends of the cranks into shape, is performed by the alternately-reciprocating dies J and K.

All of the above operations may be completed in a very brief space of time, so that a crank-shaft may be finished with a single heating of the blank.

By my improved apparatus the angles of the cranks are formed perfectly and there is a minimum disturbance of the grain or fiber of the metal. The angles of the cranks are perfect and the junctions of the cranks with the pin and shaft are very strong.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A mechanism for forming from a straight blank a crank-shaft having a double crank and an intermediate pin, comprising means for forcing the crank-pin out of line with the blank and at the same time upsetting the metal to provide sufficient stock for the cranks and forming the corners of said cranks before they are brought into parallel relation with each other, and means for subsequently bringing said cranks into parallel relation by straightening their intermediate portions without disturbing their corners, whereby rupture and destruction of the fiber of the metal are reduced to a minimum.

2. A mechanism for forming from a straight blank a crank-shaft having a double crank and an intermediate pin, comprising means for forcing the crank-pin out of line with the blank and at the same time upsetting the blank to provide sufficient stock for the cranks and forming the corners of said cranks, means for subsequently forcing the crank-pin to its proper position and at the same time bringing the cranks into parallel relation without disturbing said corners, and means for finishing the ends and edges of the cranks.

3. In a machine for making crank-shafts, the combination with the sockets for holding the blank, of the crank-pin die E and the opposing dies F, G, substantially as described.

4. In a machine for forming crank-shafts, the combination with the sockets for holding the shaft, provided with the side dies D of the crank-pin die E, substantially as described.

5. In a machine for forming crank-shafts, the combination with the sockets for holding the blank, provided with the side dies D, of the crank-pin die E and the reciprocating dies J, K, for finishing the crank, substantially as described.

6. In a machine for forming crank-shafts, the combination of the sockets A, the bushings B, the filling-block C and suitable dies for shaping the cranks, substantially as described.

7. In a machine for forming crank-shafts, the opposing dies F, G, having angular recesses *h* to form the angles of the cranks and the shoulders *i* for partially bending the cranks, substantially as described.

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

JOHN P. HARRINGTON.

Witnesses:

HARRY W. RODGERS,

A. L. MARTIN.