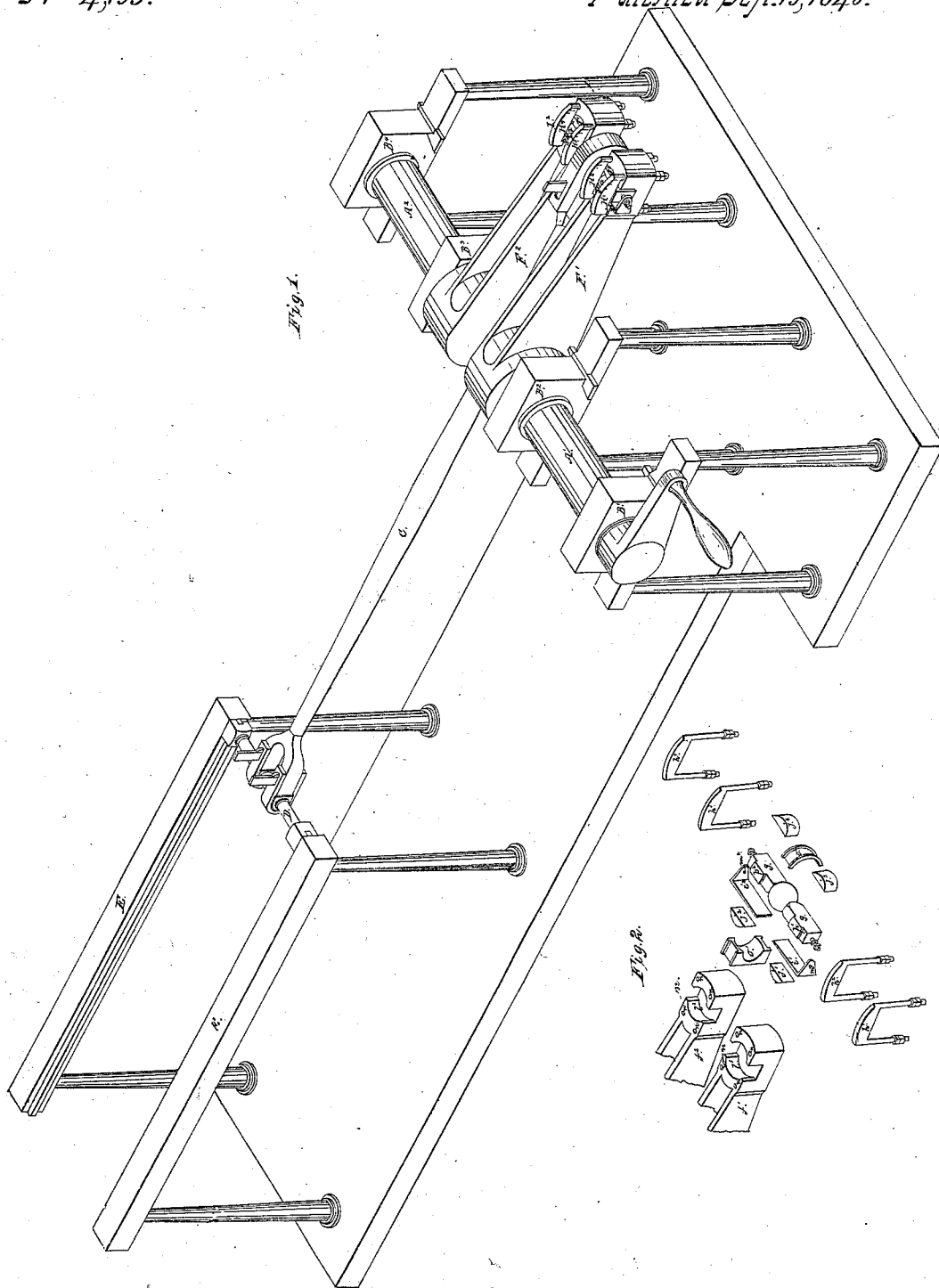


*F. E. Sickels,*  
*Crank Connection.*

*N<sup>o</sup> 4,199.*

*Patented Sep. 19, 1845.*



# UNITED STATES PATENT OFFICE.

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## MODE OF CONNECTING CRANKS BY CRANK-PINS.

Specification of Letters Patent No. 4,199, dated September 19, 1845.

*To all whom it may concern:*

Be it known that I, FREDERICK ELSWORTH SICKELS, of the city, county, and State of New York, have invented a new and useful mode of connecting and combining cranks and crank-pins of steam-engines, so as to more practically and efficiently equalize the application of the power to each crank and to cause the cranks and crank-pin to move and compensate for any error in the relative position of the crank-shafts than has been done by any means heretofore adopted.

To enable others skilled in the art to make and use my invention I will proceed to describe its construction, combination and operation reference being had to the accompanying drawing, in which—

Figure 1 represents my improvement and some of the parts of the steam engine most nearly connected therewith.

A', A<sup>2</sup>, are the crank shafts.

B', B<sup>2</sup>, B<sup>3</sup>, B<sup>4</sup>, are the pillow blocks for the shafts.

C is the connecting rod.

D is the cross head.

E', E<sup>2</sup>, are the guide rods.

The foregoing mentioned parts may be of the usual mode of construction.

F', F<sup>2</sup> are my improved cranks, showing them connected and combined with the other improvements, many parts of which are necessarily hidden from view in Fig. 1, but are represented in detail in Fig. 2 of same drawing, as f', f<sup>2</sup>, exhibiting that part of the crank upon which the improvement is made, and G, Fig. 1, representing the crank pin as connected with the other improvements, g, g, Fig. 2, representing the said crank pin separate from any of its connections.

H', H<sup>2</sup>, H<sup>3</sup>, H<sup>4</sup>, Fig. 1 are the dragglings represented as they are combined and connected with crank to hold the pin, h', h<sup>2</sup>, h<sup>3</sup>, h<sup>4</sup>, Fig. 2 showing them as disconnected from such combination.

I', I<sup>2</sup>, Fig. 1 are keys placed between the crank pin and portions of a segment of a circle J', J<sup>2</sup>, two other similar portions of a segment of a circle being placed on the opposite side of the crank pin. The keys I', I<sup>2</sup>, in Fig. 1 are represented by i', i<sup>2</sup>, in Fig. 2. The segments of a circle J', J<sup>2</sup>, J<sup>3</sup>, J<sup>4</sup>, of Fig. 1 are shown by j', j<sup>2</sup>, j<sup>3</sup>, j<sup>4</sup>, respectively in Fig. 2, Fig. 2 being the representation of the parts of my improvement separated which are shown in Fig. 1 as I connect and combine them.

The several parts and portions of my im-

provement represented in Fig. 2 are combined and connected in this manner, that is to say, the segments j', j<sup>2</sup> are placed in the circular recess l' l<sup>2</sup>, of the cranks f' f<sup>2</sup> and the segments j<sup>3</sup>, j<sup>4</sup>, are placed on the opposite side of such recesses in such a manner as that the flat sides of all such segments will be parallel to each other, and that their circular sides may fit closely the circular portions of the recess, and in the position as they respectively stand in the drawing to the cranks f', f<sup>2</sup>, and in the unoccupied portion of such recess the keys i', i<sup>2</sup>, and the pin g, g, are placed, the key i' being placed between the segment j' and the pin g, and the key i<sup>2</sup>, being placed between the segment j<sup>2</sup>, and the pin g, the segments j<sup>3</sup>, j<sup>4</sup>, being on the opposite sides of the pin, there being on the head of the keys i', i<sup>2</sup>, ears m', m<sup>2</sup>, through which each small end of the pin passes, with nuts on each side to secure the keys in their place. The dragglings h', h<sup>2</sup>, h<sup>3</sup>, h<sup>4</sup>, are placed through the holes n, and nuts on the under surface of the crank to secure the whole together, there being two dragglings to each crank.

The brasses O', O<sup>2</sup> of the connecting rod which encompass and are directly connected with the ball of the pin g, are made to turn on the said ball as the pin g changes its position in the crank. The whole when thus combined and connected will assume the appearance represented at the end of the cranks F', F<sup>2</sup>, in Fig. 1 of the drawing, as far as the same can be seen thereupon the projections p', p<sup>2</sup>, on the pin g, in Fig. 2 are placed so as to prevent the crank from slipping too much on either end of the crank pin, the dragglings being on either side of these projections, and at a greater distance apart than the length of the projections to give the required play.

I will now describe the operation of my improvements as combined, connected, and attached in the manner hereinbefore particularly described, the parts of Fig. 1 assuming the position in the drawing that they would be in when the engine is, what mechanics would term, on the center. As the force of the steam is transmitted by the connecting rod C to the crank pin G, the power is applied to each crank alike by reason of the crank pin having an equal bearing in each crank, and as the cranks move off the center should either shaft A' A<sup>2</sup> be out of the proper position with regard to each other, or as engineers would term, out of line, the pin G can move or slide in either

crank either toward or from the connecting rod, and the portions of the segments  $J'$ ,  $J^2$ ,  $J^3$ ,  $J^4$ , and the pin  $G$  can turn or move in the circular recesses of the cranks. The ball of the pin  $G$  at the same time can move in the brasses  $O'$ ,  $O^2$ , of the connecting rod, and thus compensate for any error in the relative position of the crank shafts. Thus for instance should the inner end of the shaft  $A^2$  be too low with regard to the other, as the outer end of the cranks turn down from the position in the drawing, the crank  $F^2$  would slide outward in the direction from the middle of the pin  $G$ , and the pin would turn upward in the crank turning with it the segments  $J^2$ ,  $J^4$ , in the recess of the crank  $F^2$ , and the other end of the pin turning in the crank  $F'$  and with it the segments  $J'$ ,  $J^3$ , in the circular recess of the crank  $F'$ ; the ball of the pin moving in the connecting rod brasses, and as the cranks turn up toward the other center of the engine, a reverse motion will be gradually taking place in the cranks by reason of the pin  $G$  having a like bearing in the cranks as before stated, the crank  $F^2$  sliding in toward the middle of the pin  $G$  and the crank pin and segments moving in the recesses of the cranks so as to bring them in the position which they were in relatively to the pin when on the opposite center, or the center from which they started, and in going up and around from the center (not represented in the drawing) to the center represented in the drawing, the crank  $F^2$  will slide first in and then out on the pin, the crank pin and segments working in the cranks until they reach and assume the position in Fig. 1 of the drawing, thus compensating for the error of the inner end of the shaft  $A^2$  being too low, and should any part of either or both shafts  $A'$ ,  $A^2$ , be out of line, the cranks can move on the pin and the pin and segments at the same time turn in the recess of the cranks so as to allow for such error of any part of either or both shafts being out of line, and they will move more or less and in such direction as is required to compensate for such error.

Having described the construction, combination, connection, and operation of my improvements, I will now describe the distinction between my mode and the usual mode of constructing, connecting and combining crank pins and cranks.

In my mode of construction circular recesses are made in each crank similar to those in  $f'$ ,  $f^2$  in Fig. 2 so as to allow the pin to move and be fastened alike in and to each crank, whereas by the usual mode one of the cranks is constructed so as to hold the crank pin firmly, the other crank being so constructed as to allow it to slip on the crank pin, or otherwise, the cranks are made to be firmly fastened to the crank pin so that

neither crank can move in any direction without moving the other.

My improved mode of constructing the crank pin is that each end of the pin is made square with parallel sides so as to allow it to slip, work and be fastened alike to each crank. Whereas by the usual method of constructing the crank pin it is either made so as to fasten permanently in one crank and move on the other, or it is made to fasten to both cranks permanently and not to move on either. And my improved mode of connecting them is the holding of the crank pins in the cranks in connection with keys on one side at each end, and segments, by means of the dragglings which hold the segments, keys and pin together in the recess at the end of each crank as seen in the accompanying drawings Figs. 1 and 2.

My improvement in the mode of combining crank pins and cranks consist in giving to the crank pin in the cranks turning and sliding motions, while the usual mode is to connect and combine the pin to both or one crank fixedly, the distinctive features of my improvement and the principle thereof being the connection and combination of the crank pin and cranks by means of sliding and turning joints in both cranks to equalize the strain of the engine on each crank and at the same time to allow them to move and compensate for any error in the relative position of the crank shafts, while the usual method of constructing, connecting, and combining them is to either unequally bring the strain of the engine on the cranks or not to allow them to move and compensate for any error in the relative position of the crank shafts. It will be obvious that the same effect may be produced on the same principle by connecting the pin to one crank by a turning joint only and in the other by a turning and sliding joint, and that the construction of the parts and the manner of making these joints may be varied without affecting in any manner the principle or character of my invention, although I have described that mode of construction which I deem to be the most effective and best adapted to the end in view.

What I claim as my invention and desire to secure by Letters Patent, is—

Connecting a crank pin with two cranks by means of turning and sliding joints combined, whether the pin be made to slide in both cranks or only in one, so as to equalize the strain of the engine on each crank and allow them to move and compensate for any error in the relative position of the crank shafts, as herein described.

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Witnesses:

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