

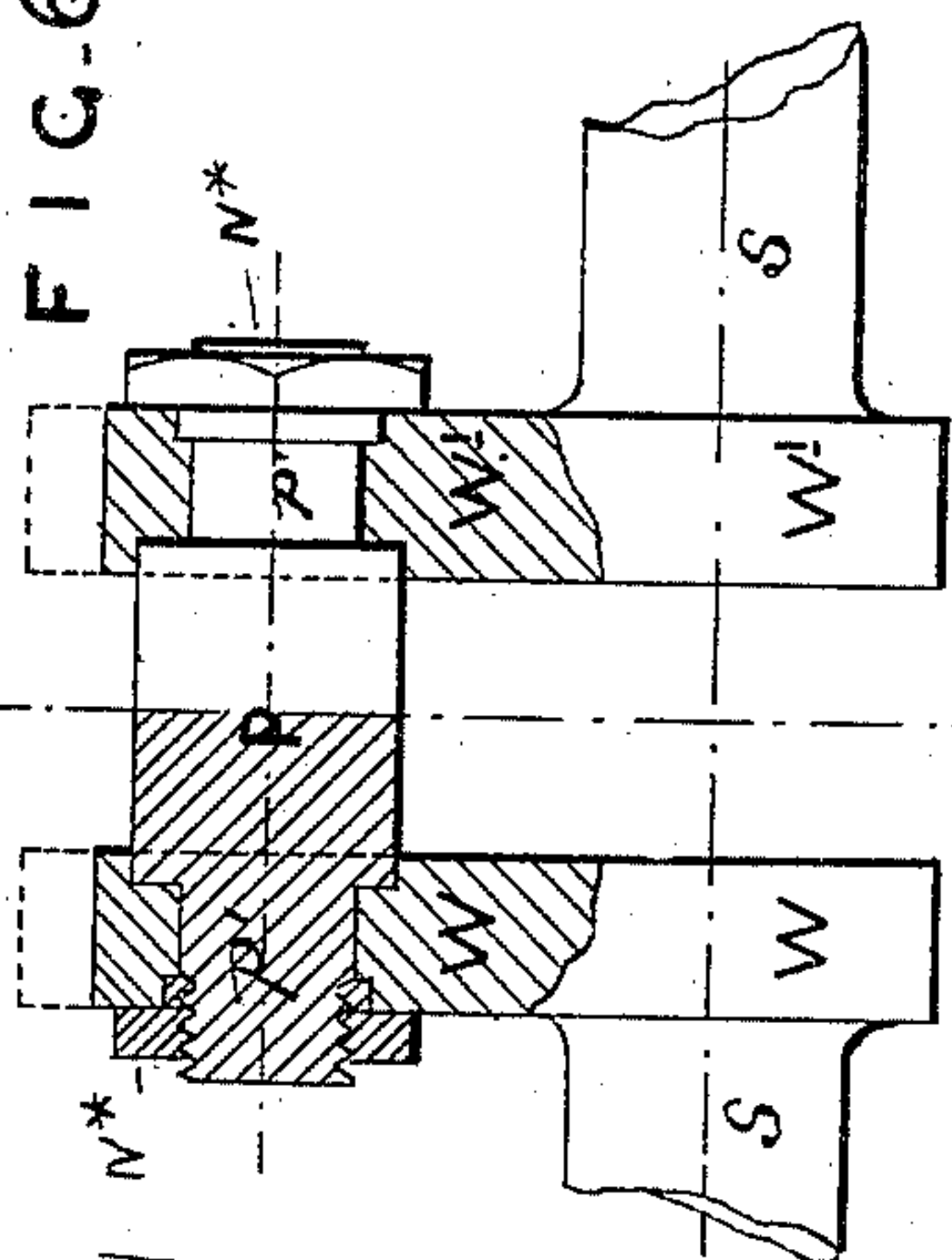
(No Model.)

H. & G. E. FOWNES.  
CRANK SHAFT.

No. 440,555.

Patented Nov. 11, 1890.

FIG. 6.



Witnesses  
W. F. Woolard  
J. Mawdsley

FIG. 1.

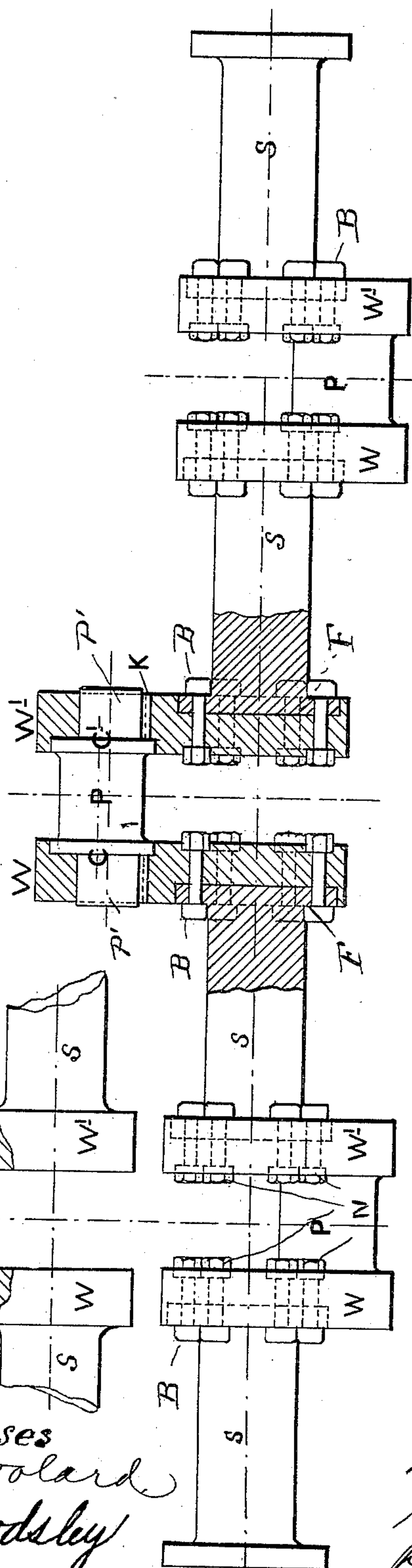


FIG. 3.

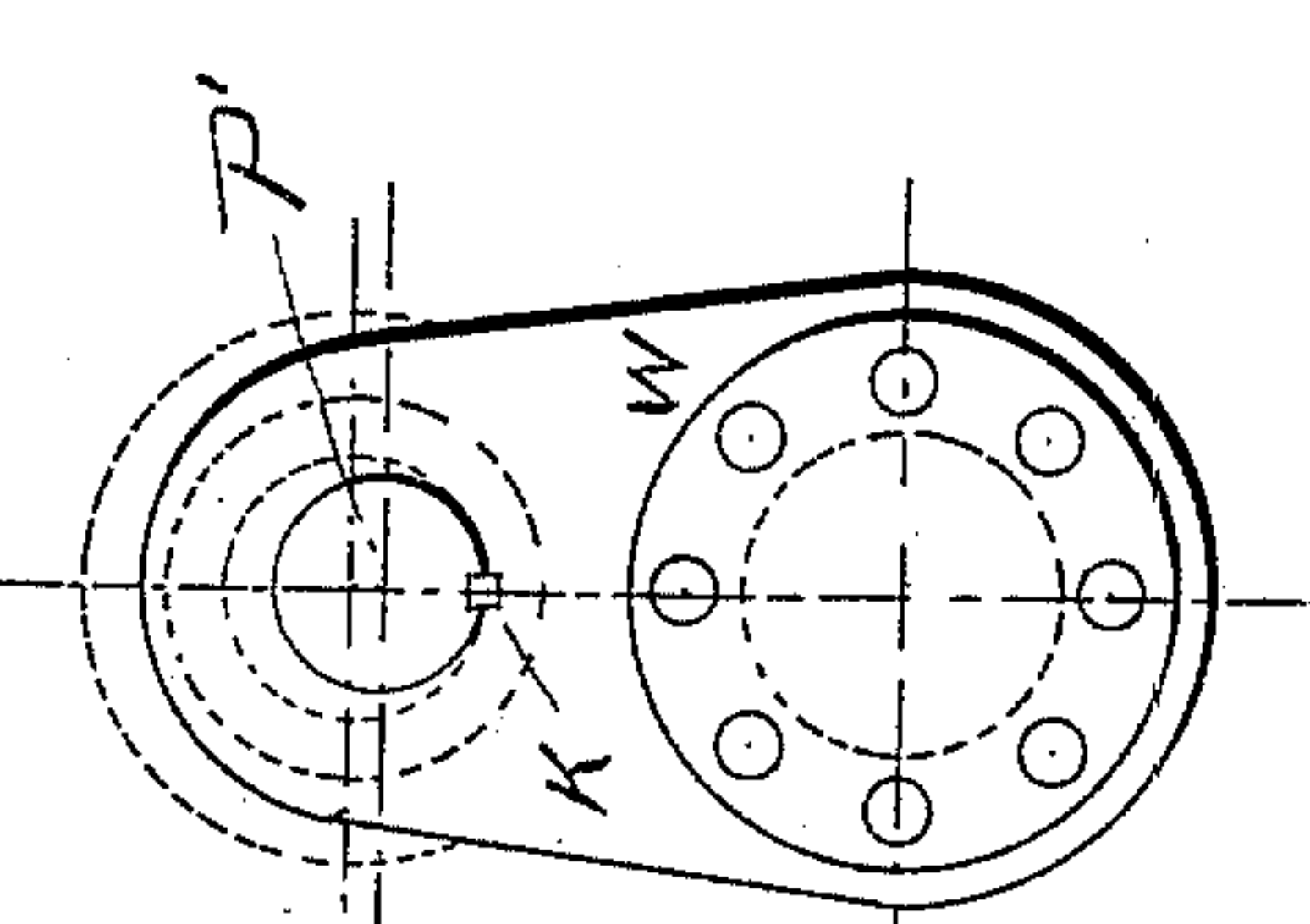


FIG. 2.

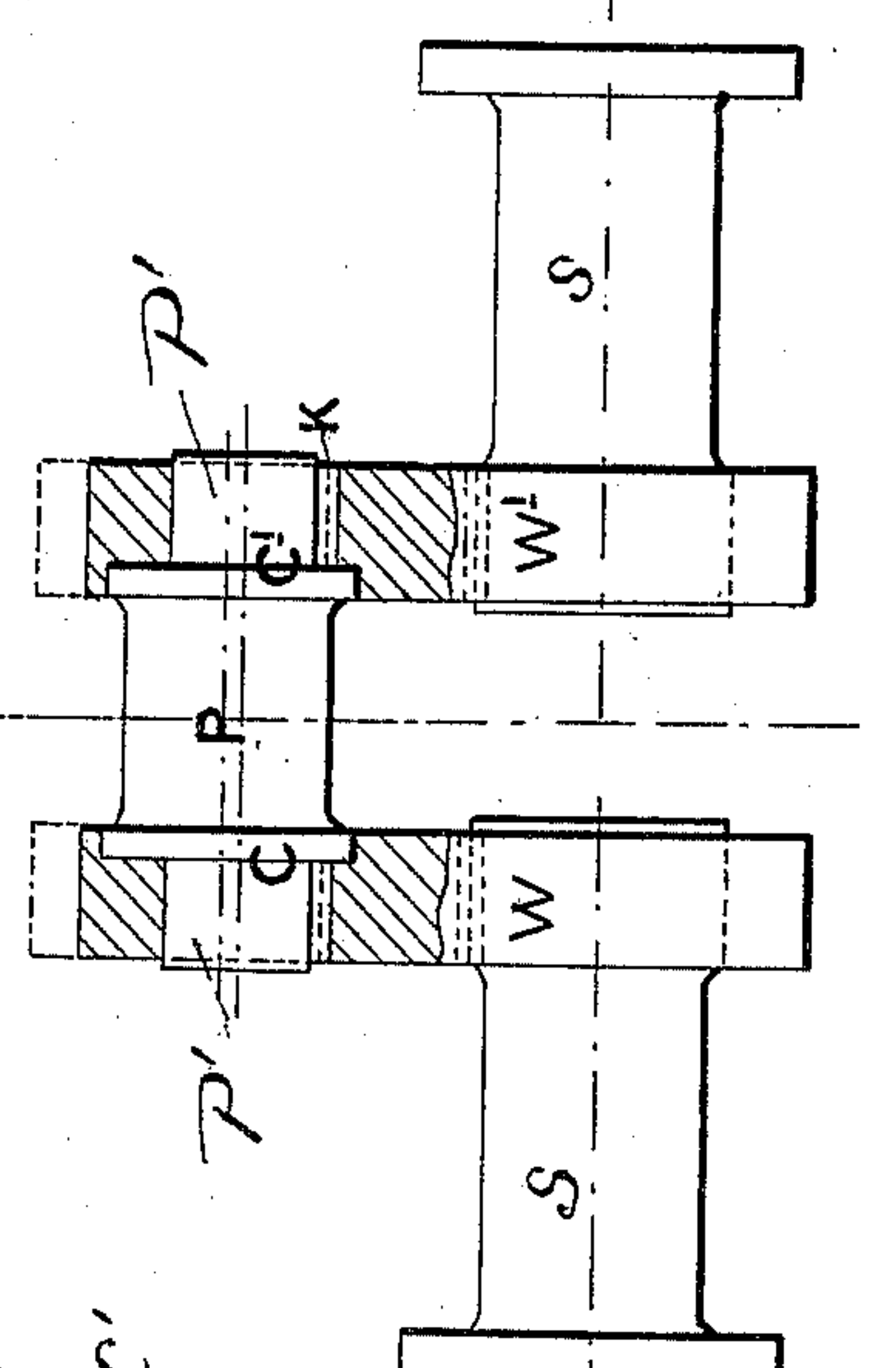


FIG. 5.

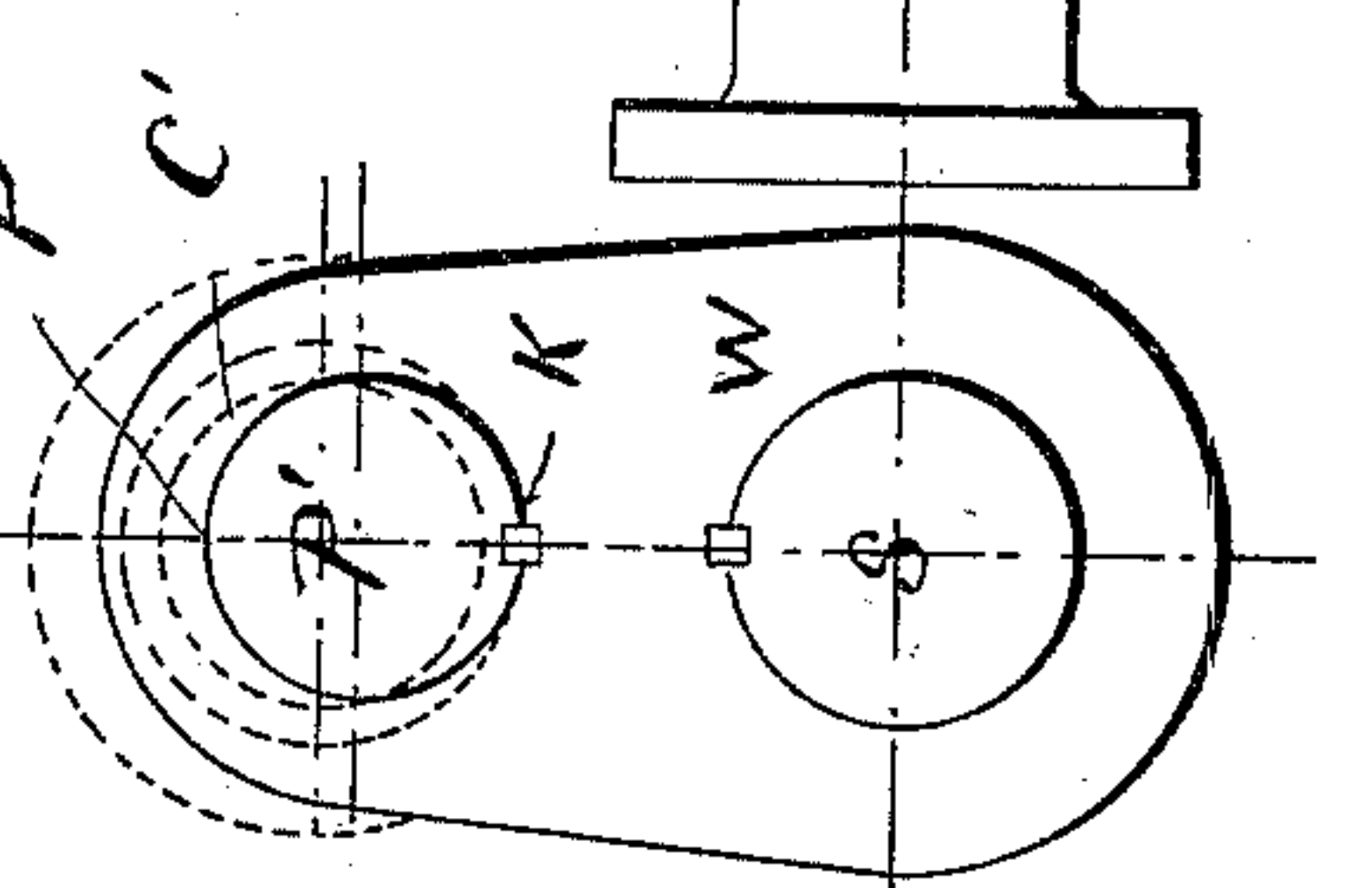
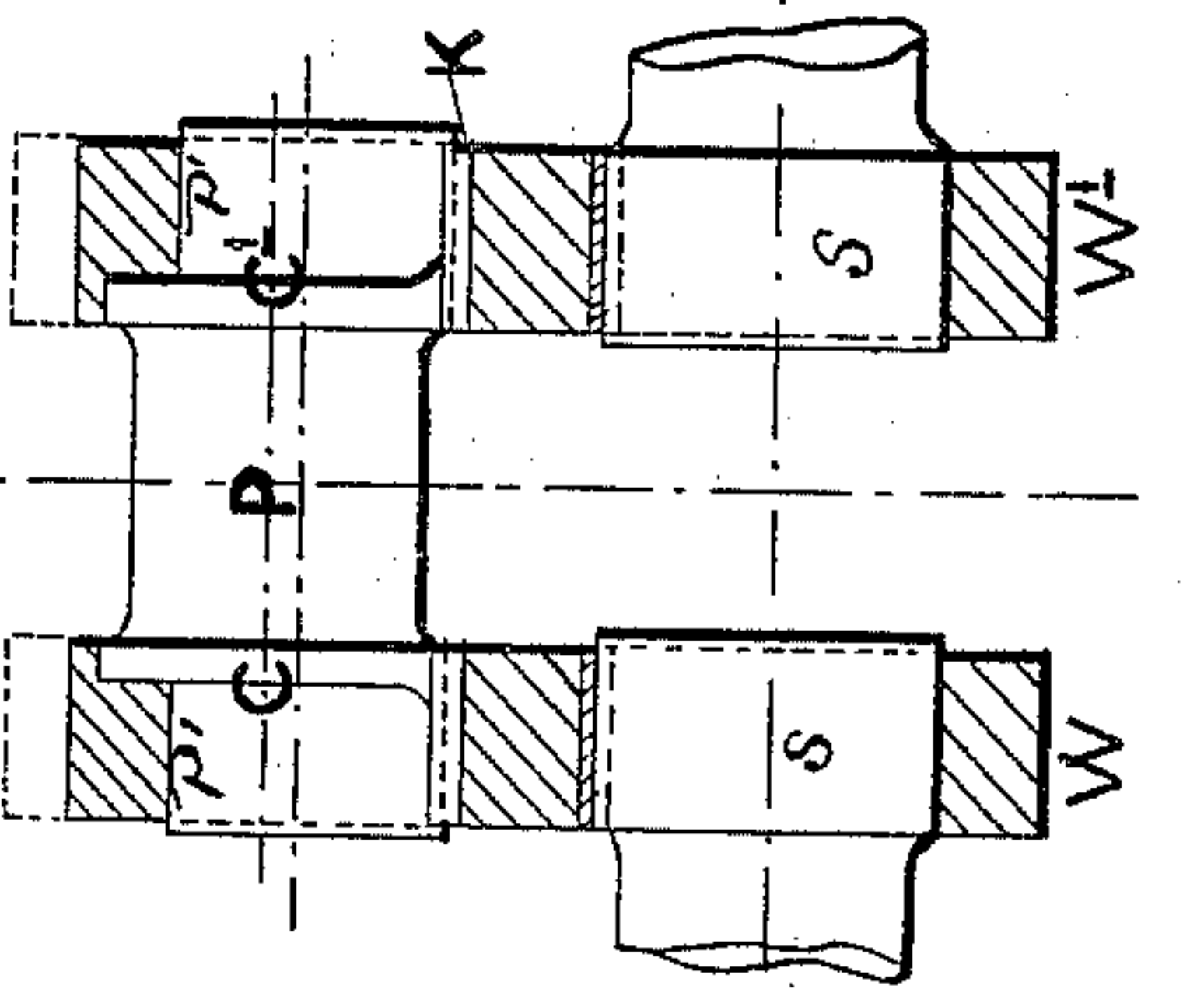


FIG. 4.



Inventors.  
Henry Fownes.  
Geo. Edward Fownes  
per J. E. Duff



# UNITED STATES PATENT OFFICE.

HENRY FOWNES, OF NEWCASTLE-UPON-TYNE, AND GEORGE EDWARD FOWNES, OF CARDIFF, ENGLAND.

## CRANK-SHAFT.

SPECIFICATION forming part of Letters Patent No. 440,555, dated November 11, 1890.

Application filed July 16, 1889. Serial No. 317,653. (No model.) Patented in England December 20, 1887, No. 17,513.

*To all whom it may concern:*

Be it known that we, HENRY FOWNES, engineer, and GEORGE EDWARD FOWNES, engineer, subjects of the Queen of the United Kingdom of Great Britain and Ireland, residing, respectively, at Newcastle-upon-Tyne, in the city and county of the same name, and at Cardiff, South Wales, both in the said Kingdom of Great Britain and Ireland, have invented new and useful Improvements in Built Crank-Shafts and in Repairing Solid Shafts, (for which we have obtained Letters Patent in Great Britain, No. 17,513, dated December 20, 1887,) of which the following is a specification.

Our invention relates to improvements in fitting and securing crank-pins in the webs of what are known as "built crank-shafts," in which the crank-pin forms a separate piece from the webs, and is designed specially to enable such shafts to be adapted to existing engines, in which provision as to clearance is provided only for solid shafts, and is not sufficient to allow for the introduction of a pin separate from the webs, as ordinarily fitted, but it is equally suitable for crank-shafts of new engines, in which it reduces the length over the end of web, and is also applicable in repairing a broken crank-pin of a solid shaft, thus securing the advantage of a built shaft, as to the separate pin, and facility for fitting a spare pin.

According to our invention we form the pin with a collar at each end, concentric to the axis of the pin, which collars are sunk or partially sunk into the inner faces of the webs, and beyond each collar the pin extends through the web with its axis eccentric to the main axis toward the center of the shaft.

Although we prefer, and propose generally to adopt, collars on the pin, as giving a better side bearing for the connecting-rod brasses, they may in some cases be dispensed with and the pin itself recessed into the webs. Thus the pin is firmly secured against turning round and the webs may be secured against spreading by keys or by nuts, or the webs may be shrunk onto the pin, while there is sufficient material in the web outside the pin to secure the requisite strength, and a crank

with a pin thus fitted into the webs is no longer from center of shaft over the webs than a solid crank.

In the drawings, Figure 1 shows a crank-shaft with three cranks, the center crank being in section, made according to our invention, the webs  $W W'$  and the pin  $P$ , with concentric collars  $C C'$  and eccentric ends  $P'$ , forming separate parts. Fig. 2 shows one crank, partly in section, shrunk onto the main pieces of the shaft and a key inserted. Fig. 3 shows an end view of the outer face of one of the webs  $W$  with semicircular ends, the dotted lines indicating the outline of web required to receive a separate pin, according to the ordinary construction. Fig. 4 shows a section of the two webs  $W W'$ , with the pin  $P$ , having concentric collars  $C C'$ , and with its eccentric ends  $P'$ , of nearly the same diameter as the middle, as in cases where greater strength may be required; and Fig. 5 is an end view of the outer face of one of the webs  $W$ , also with semicircular ends, the dotted lines, as before, indicating the outline of an ordinary web with loose crank-pin  $P$ . Fig. 6 shows a shaft in which the webs  $W W'$  are solid upon the main shaft  $S$  with a pin  $P$  without collars, the body of the pin  $P$  being recessed into the inner faces of the webs  $W W'$  and the eccentric ends  $P'$  of the pin passing through the webs and being secured therein by nuts  $N$  with recessed necks, into which a set-bolt may be inserted to prevent them from working loose.

In Fig. 1 the webs  $W W'$  are secured to collars or coupling-flanges  $F$  on the main pieces of the shaft  $S$  by bolts  $B$ , the nuts  $N$  having collars recessed into the webs  $W W'$ , but except in combination with the mode of inserting the crank-pin  $P$ , we do not consider the securing of the webs on the shaft as any part of our invention, as the webs may even in some cases be formed solid upon the shaft. It will be seen that the pin  $P$  is perfectly secured against turning round in the webs  $W W'$ , and the keys  $K$ , Figs. 1, 2, 3, 4, and 5, are inserted merely to prevent any tendency of the outer ends of the webs  $W W'$  to spread laterally, the nuts  $N^*$  on Fig. 6 serving the same purpose.



The shortening of the cranks and consequent saving in weight is a considerable advantage, even if there is no question of clearances, and a solid crank with a broken pin  
5 can have a new pin fitted according to our invention without weakening the webs.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. In a built-up crank-shaft, the combination, with crank-webs, of a crank-pin having  
10 its two end portions integral with and arranged eccentrically to its central portion toward the main center line of the shaft, said crank-pin being secured in said webs, substantially as described.  
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2. In a built-up crank-shaft, the combination, with crank-webs each formed with a hole therethrough for a crank-pin, and with a circular recess eccentric to said hole, of a crank-  
20 pin having its end portions circular in cross-section, but arranged eccentrically to and integral with its central portion, said end portions being secured in the holes in said webs and the ends of the said central portion fitted  
25 in said recesses, substantially as herein described.

3. In a built-up crank-shaft, the combination, with crank-webs each formed with a hole therethrough for a crank-pin, and with a cir-

cular recess eccentric to said hole, of a crank- 30  
pin having its end portions circular in cross-section, but arranged eccentrically to and integral with its central portion, and provided with collars concentric with the central portion or body, said end portions being secured 35  
in the holes in said webs, and said collars being fitted in said recesses, substantially as herein described.

4. In a built-up crank-shaft, the combination, with crank-webs W W', each formed 40  
with a hole therethrough, and with a recess eccentric to said hole, of a crank-pin having a central portion P, the ends of which fit in said recesses, and end portions P', that are eccentric to the central portion and are se- 45  
cured in the holes in said web, the common axis of said eccentric end portions being arranged nearer the axis of the crank-shaft than that of the central portion, substantially as  
50 herein described, for the purpose set forth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses:

HENRY FOWNES.

GEORGE EDWARD FOWNES.

Witnesses:

HENRY ARTHUR PINCOMBE,  
EVAN RICHARD EVANS.