Sept. 27, 1949. H. L. McFEATERS 2,483,017

CONVERTER TILTING MECHANISM

Filed March 18, 1946 6 Sheets-Sheet 1

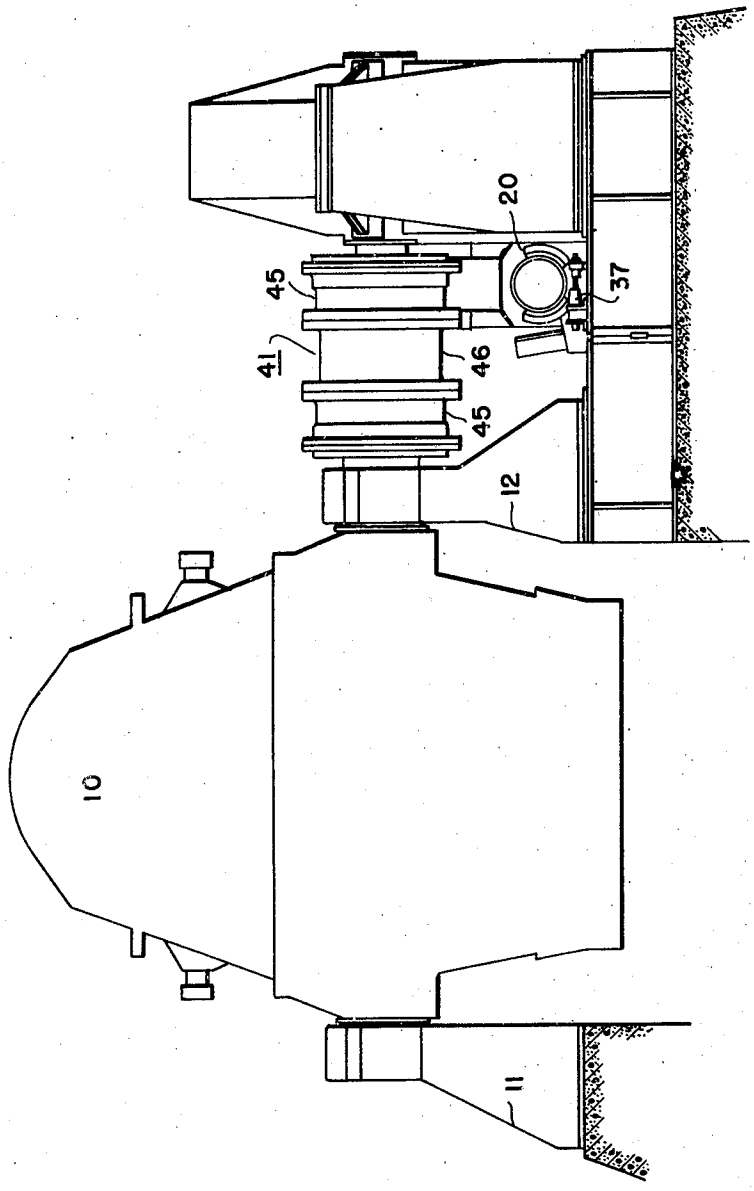


Fig. 1

Harry L. McFeaters INVENTOR

Green, McCallister & Miller BY

His ATTORNEYS

Sept. 27, 1949. H. L. McFEATERS 2,483,017

CONVERTER TILTING MECHANISM

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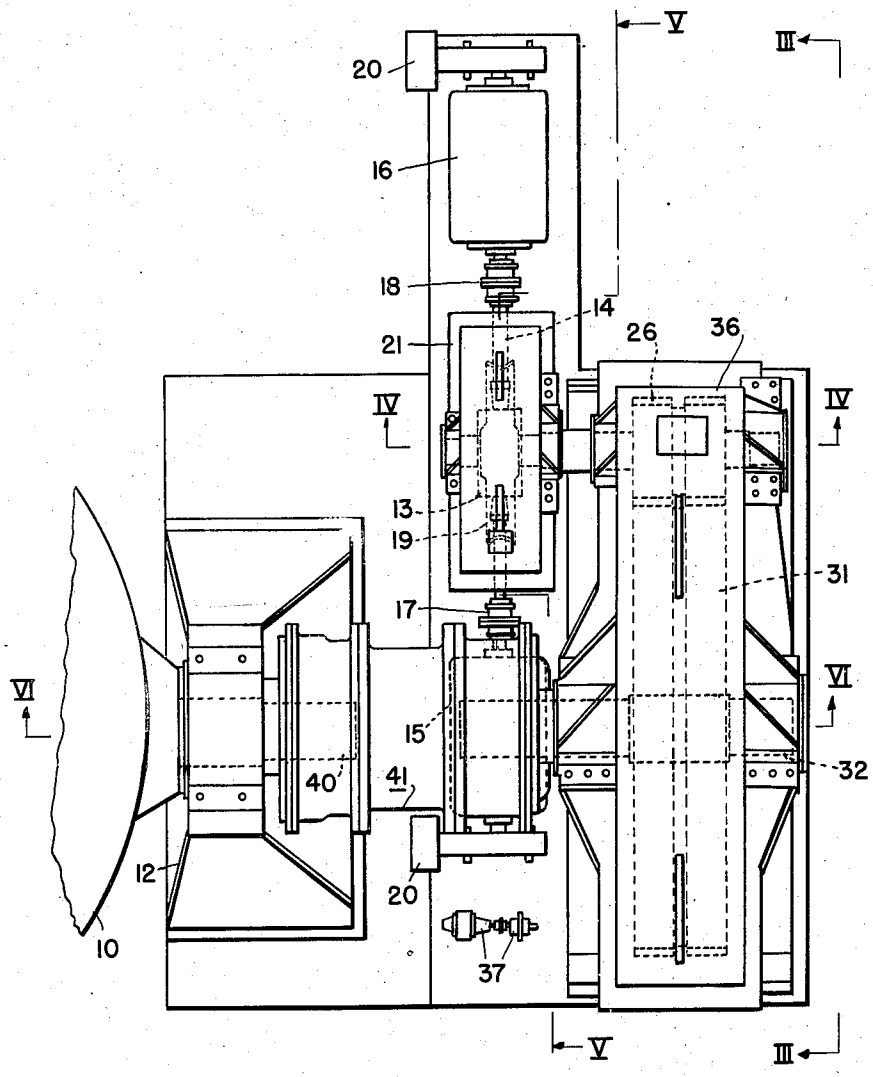


Fig. 2

INVENTOR.
Harry L. McFeaters
BY
Green, McCallister & Miller
His Attorneys

Sept. 27, 1949. H. L. McFEATERS 2,483,017

CONVERTER TILTING MECHANISM

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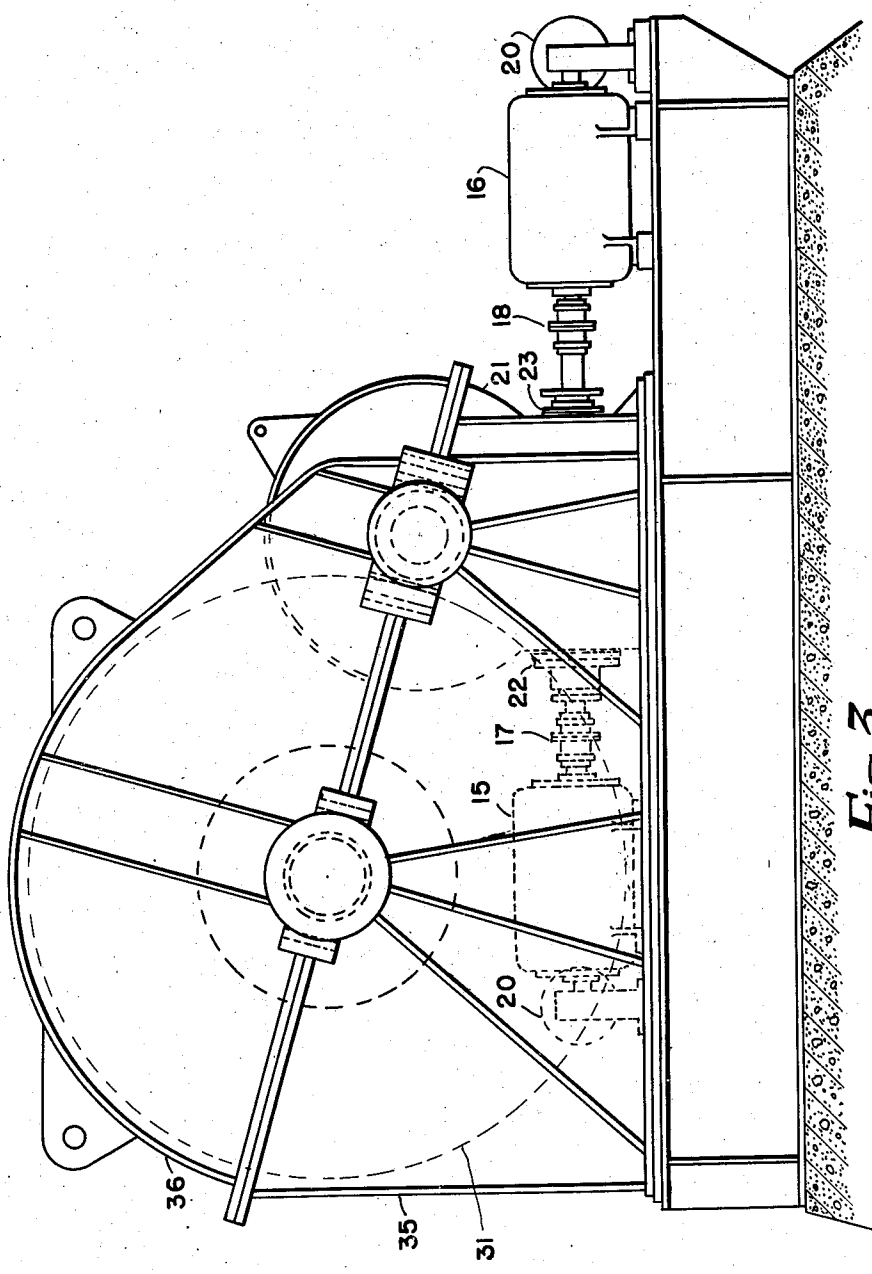


Fig. 3

Harry L. McFeaters INVENTOR

BY Green, McCallister & Miller

His ATTORNEYS

Sept. 27, 1949. H. L. McFEATERS 2,483,017

CONVERTER TILTING MECHANISM

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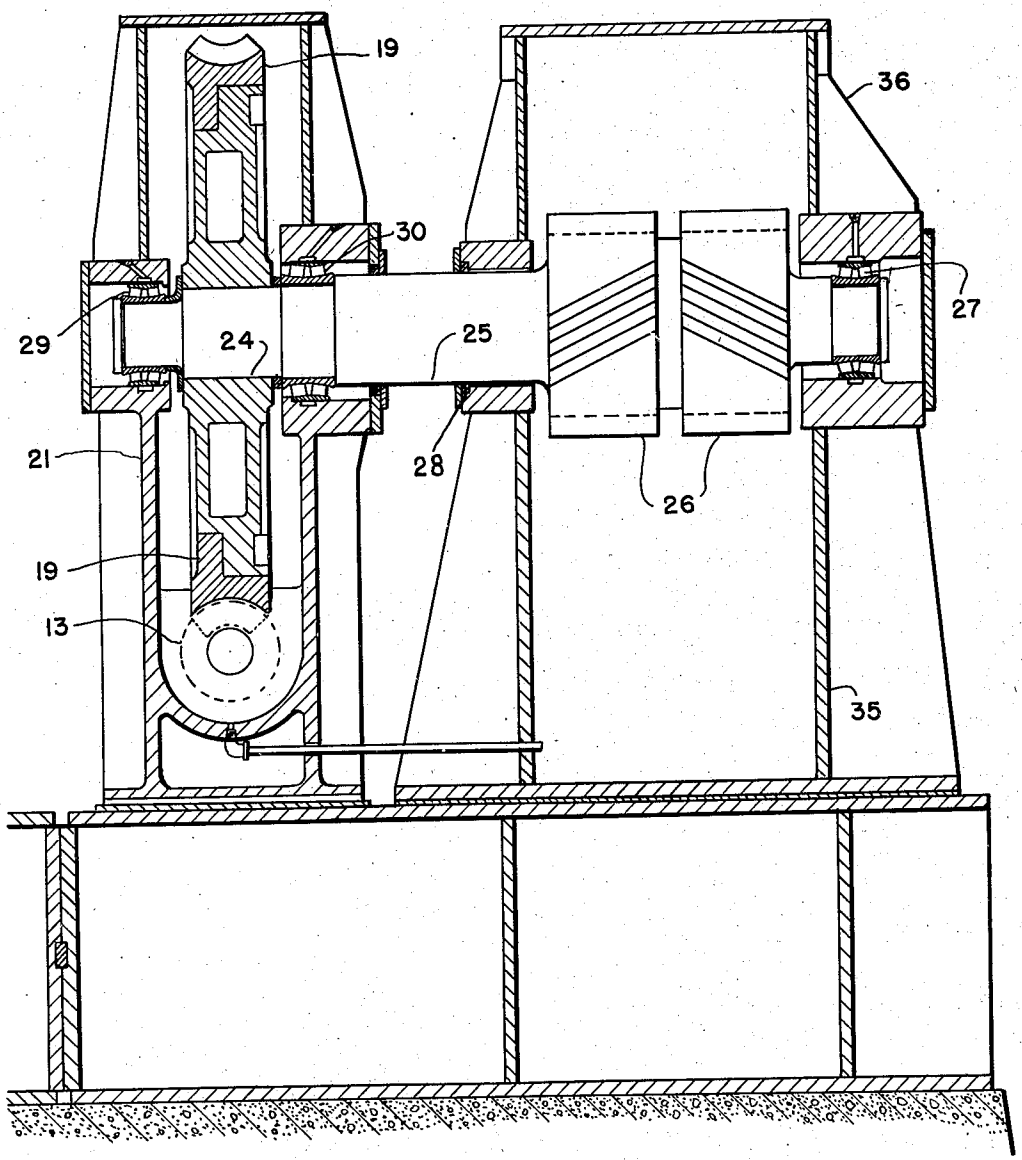


Fig. 4

INVENTOR
Harry L. McFeaters
BY
Green, McCallister & Miller
ATTORNEYS

Sept. 27, 1949. H. L. McFEATERS 2,483,017

CONVERTER TILTING MECHANISM

Filed March 18, 1946 6 Sheets-Sheet 5

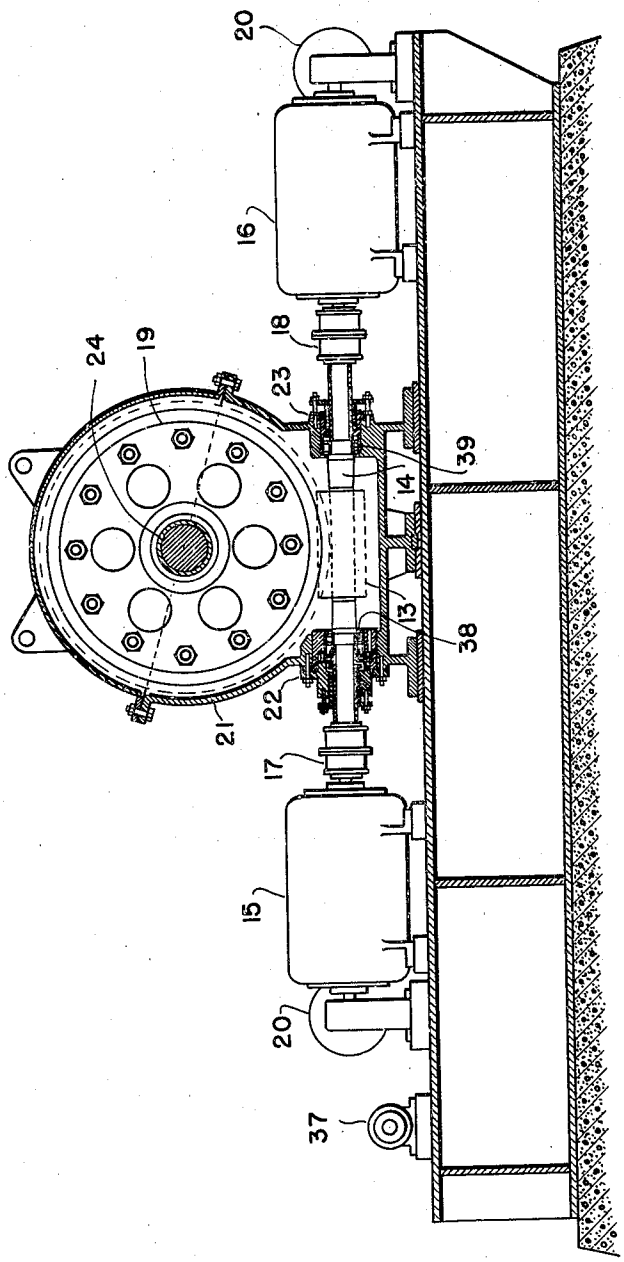


Fig. 5

Harry L. McFeaters INVENTOR

BY Green, McCallister & Miller

His ATTORNEYS

Sept. 27, 1949. H. L. McFEATERS 2,483,017

CONVERTER TILTING MECHANISM

Filed March 18, 1946 6 Sheets-Sheet 6

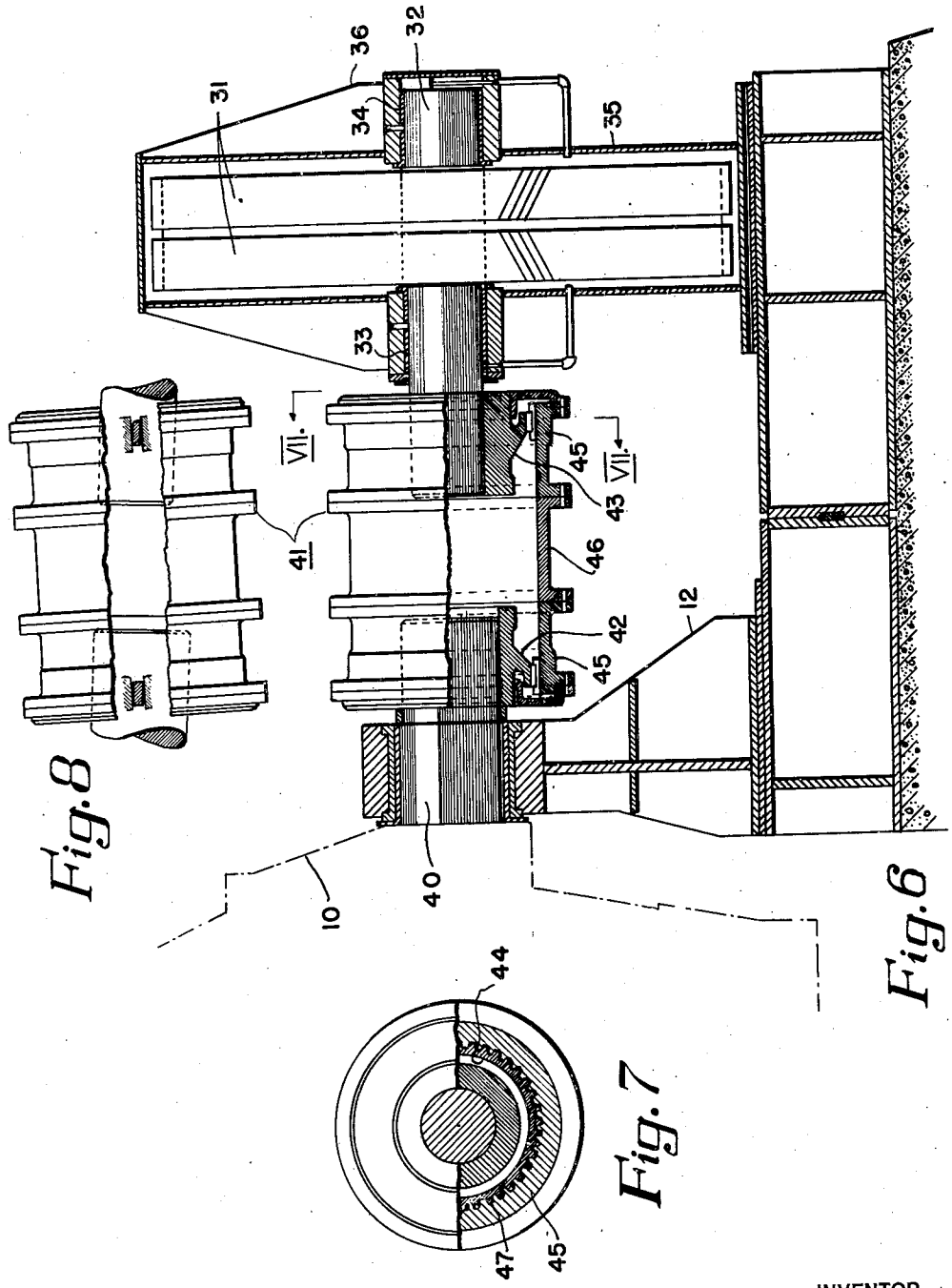


Fig. 8

Fig. 6

Fig. 7

INVENTOR
Harry L. McFeaters
BY
Green, McCallister & Miller
His ATTORNEYS

Patented Sept. 27, 1949 2,483,017

UNITED STATES PATENT OFFICE

2,483,017

CONVERTER TILTING MECHANISM

Harry L. McFeaters, New Castle, Pa., assignor to Pennsylvania Engineering Corporation, a corporation of Pennsylvania

Application March 18, 1946, Serial No. 655,320

4 Claims. (Cl. 266—36)

1

This invention relates to Bessemer converters of the tilting type and more particularly to an organized mechanism for tilting or revolving such a converter about its short axis.

Since the Bessemer converter has regained its place in the steel-making art, the mechanism used for tilting or revolving such converters is still more or less crude, inefficient and uneven or jerky in its operation.

An object of this invention is to produce an improved mechanism for tilting or revolving a Bessemer converter about its short axis.

Another object is to produce a Bessemer converter tilting or revolving mechanism which is rugged, efficient, is free from lost motion and has a relatively long life.

A further object is to produce a converter tilting mechanism by means of which a smooth and uniform rate of turn-down can be obtained regardless of balance-changing conditions in the converter lining due to kidney build-up, nose erosion and bottom changes.

These and other objects which will be apparent to those skilled in this particular art, I attain by means of the organized mechanism or apparatus described in the specification and illustrated in the drawings accompanying and forming part of this application.

In the drawings:

Figure 1 is an elevational view of a Bessemer converter (shown more or less diagrammatically) and an organized mechanism (shown in end elevation) embodying this invention for tilting such converter;

Fig. 2 is a top plan view on an enlarged scale of such tilting mechanism with the converter omitted but including a portion of the converter stand;

Fig. 3 is a side elevational view of the mechanism of Fig. 2 and is taken from line III—III associated with Fig. 2;

Fig. 4 is a sectional view on a greatly enlarged scale and is taken on line IV—IV of Fig. 2;

Fig. 5 is a view partially in section and partially in elevation and is taken on line V—V of Fig. 2 with parts of the mechanism omitted for the sake of clearness;

Fig. 6 is a sectional view on a somewhat enlarged scale and is taken on line VI—VI of Fig. 2. This view includes a dot and dash outline of a portion of the converter;

Fig. 7 is a detail view of a portion of the coupling device included in Figs. 1 and 6; and is taken on line VII—VII of Fig. 6; and

Fig. 8 is a more or less diagrammatic view

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illustrating the operation of the coupling device under shaft misalignment conditions.

The organized mechanism of this invention comprises a worm and worm gear reduction unit, a pair of electric motors coupled to opposite ends of the shaft of the worm of such unit, a herringbone gear and pinion reduction unit driven by said worm and worm gear unit and a self-aligning coupling connecting the shaft of the herringbone gear to one of the trunnions of the converter.

As disclosed in the drawings, the converter, more or less diagrammatically shown at 10, has its trunnions journaled in bearings at the top of standards 11 and 12.

The worm and worm gear reduction unit comprises a worm 13 cut as part of a shaft 14 and to the opposite ends of this shaft electric motors 15 and 16 are connected by means of flexible couplings 17 and 18. Worm 13 meshes with a worm gear 19 and the shaft of each of the motors 15 and 16 is equipped with an electromagnetic brake 20.

Motors 15 and 16 are arranged to operate in synchronism in driving the worm in either direction.

The worm and worm gear are preferably of the self-locking type in which the helix angle is less than the friction angle in order to reduce the load on the brakes when it is desired to lock the converter in any certain position.

The worm and worm gear are enclosed within an oil-tight housing 21 equipped with packed joints 22 and 23 for the worm shaft 14 and which is split on the center line of a shaft 24 upon which the worm gear is mounted as disclosed in Fig. 5.

As disclosed in Figure 4, shaft 24 for the worm gear is formed as an extension of a shaft 25, the shaft of herringbone pinion 26. Shafts 24 and 25 and pinion 26 are preferably formed from a single unitary forging. Shaft 25 on the offside from worm gear 19 is provided with an anti-friction bearing 27 and on the side adjacent the worm gear is equipped with an oil retaining means 28. Extension 24 of shaft 25 is equipped with anti-friction bearings 29 and 30 which are carried by the lower part of housing 21 for the worm gear.

Herringbone pinion 26 meshes with a herringbone gear 31 mounted on a shaft 32 which is journaled in bearings 33 and 34 carried by the lower part 35 of a casing 36 which houses the herringbone gear and pinion unit and which is oil-tight.

A motor driven pump 37 supplies oil to bearings 38 and 39 for worm shaft 14 bearings 33 and 34 for the shaft of the herringbone gear and bearing

27 as well as bearings 29 and 30 for the worm gear.

Shaft 32 for herringbone gear 31 is connected to trunnion 40 of the converter by means of a heavy duty self-aligning coupling which as an entirety is numbered 41. While different types of suitable heavy duty self-aligning couplings can be used for connecting one of the converter trunnions to the shaft of the herringbone gear, I prefer a coupling of the type disclosed in Fast's U. S. Patent 1,356,860 of October 26, 1920. As disclosed in Fig. 6, one hub 42 of this coupling is keyed to trunnion 40, while the other hub 43 is keyed to gear shaft 32. Each of these hubs has a series of external splines 44 cut therein. Surrounding each of these hubs is a sleeve or casing 45. The inner ends of these casings or sleeves are bolted to a spacer element 46 as shown in Fig. 6. The splines on the hubs engage internal splines 47 which are cut in sleeves 45.

By using a self-aligning coupling in my organized mechanism, I am able to compensate for the wear of the converter trunnion bearings thereby securing a smooth, uniform rate of turn down even after such bearings wear to an extent such that a conventional drive employing a large ring gear keyed to one of the converter trunnions could no longer be used.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. The combination with a Bessemer converter having trunnions and being mounted for tilting movement about the common axis thereof, of a converter tilting mechanism comprising a herringbone gear so arranged that the axis of its shaft is in alignment with such common axis, a shaft having as a unitary part thereof a herringbone pinion which meshes with such gear, a worm

wheel mounted on an extension of the shaft of such pinion, a worm meshing with such worm wheel, two axially aligned electric motors arranged to rotate such worm in either direction, and a self aligning coupling connecting the shaft of such herringbone gear to one of the converter trunnions.

2. A structure as defined in claim 1 in which said electric motors are coupled to the opposite ends of the shaft of said worm.

3. A structure as defined in claim 1, in which each of the electric motors is provided with an electro-magnetic brake.

4. A structure as defined in claim 1, in which the shaft carrying the pinion and the worm wheel is mounted in three anti-friction bearings, two located adjacent opposite sides of the worm wheel and the third arranged to support the end of the shaft remote from the worm wheel.

HARRY L. McFEATERS.

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