

903,817.

M. HARVEY.
SYSTEM OF GEARING.
APPLICATION FILED MAY 26, 1904.

Patented Nov. 10, 1908.
3 SHEETS—SHEET 1.

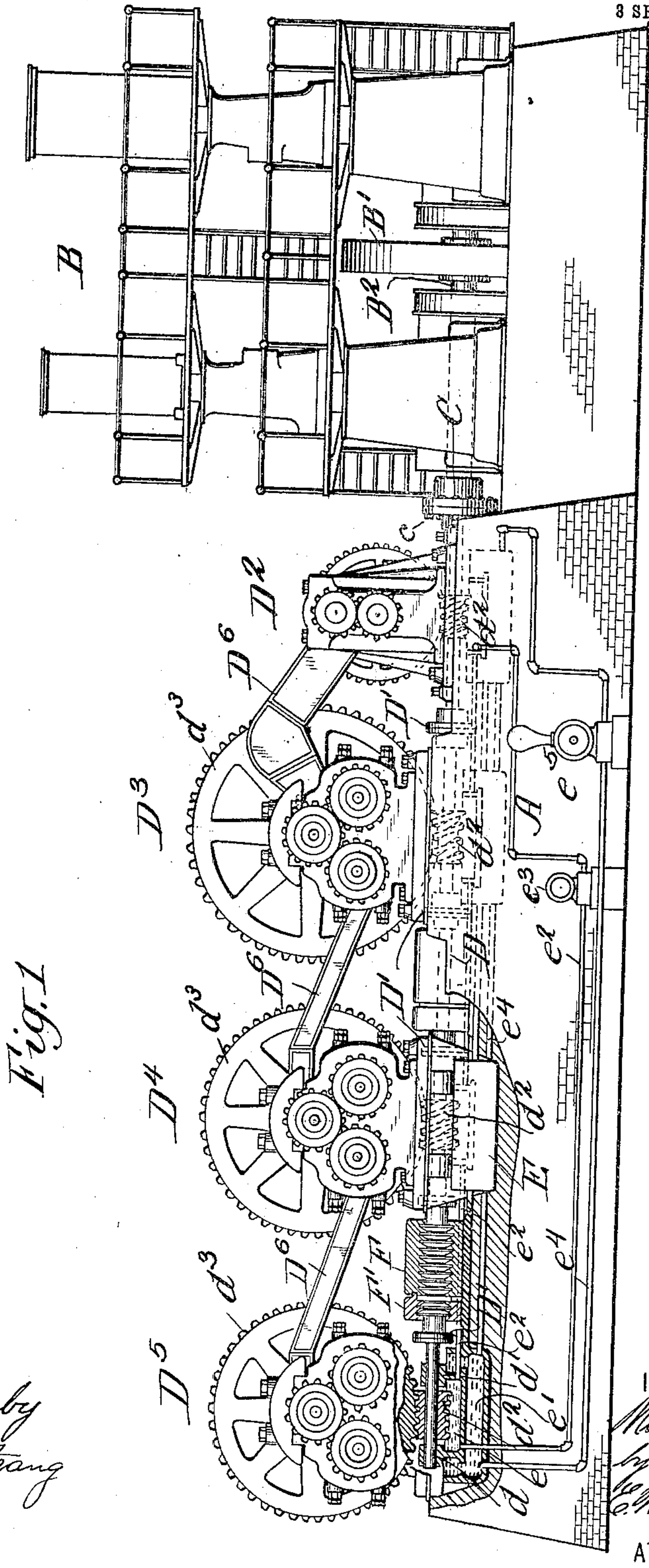


Fig. 1

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Fig. 2.

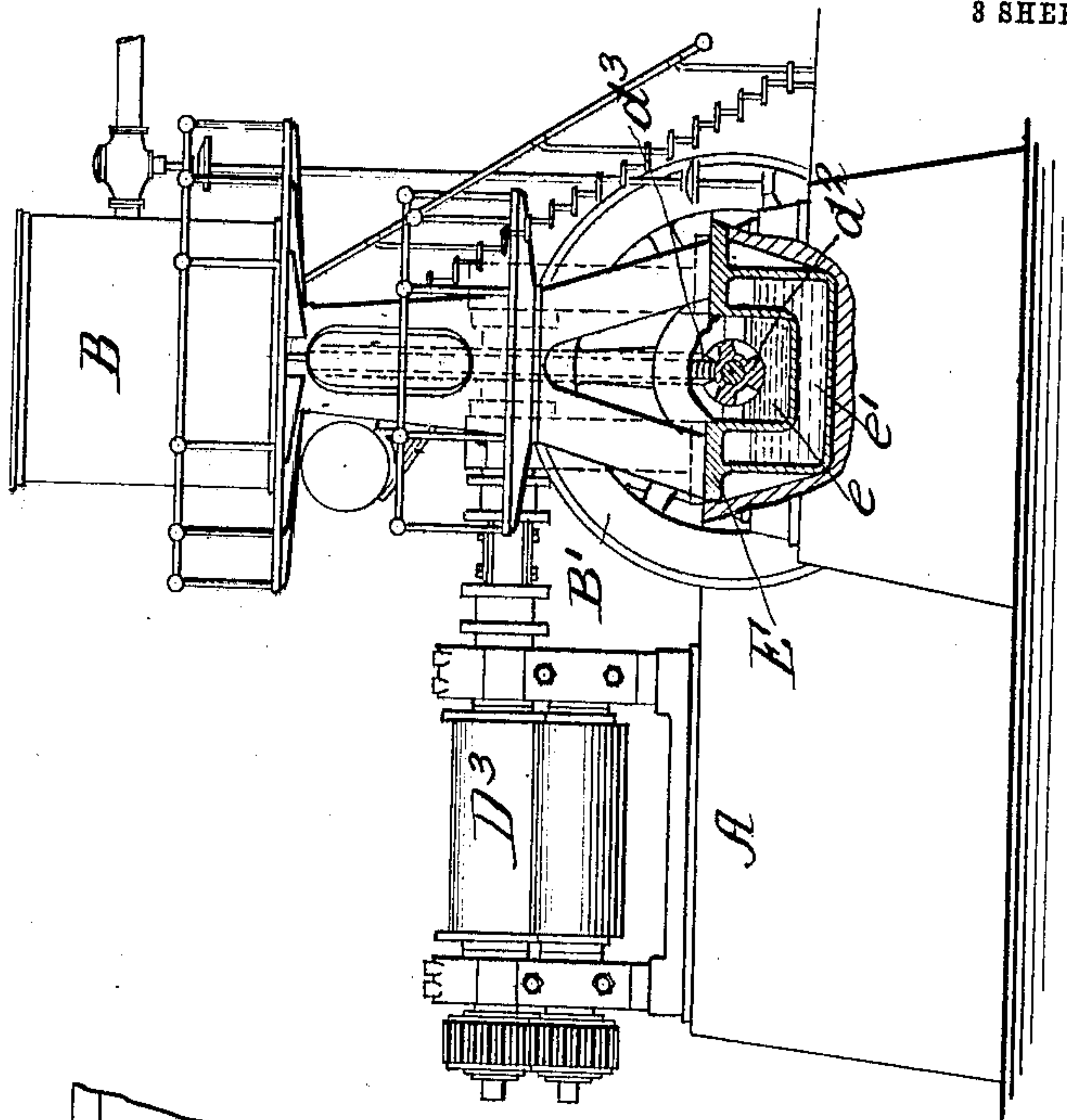
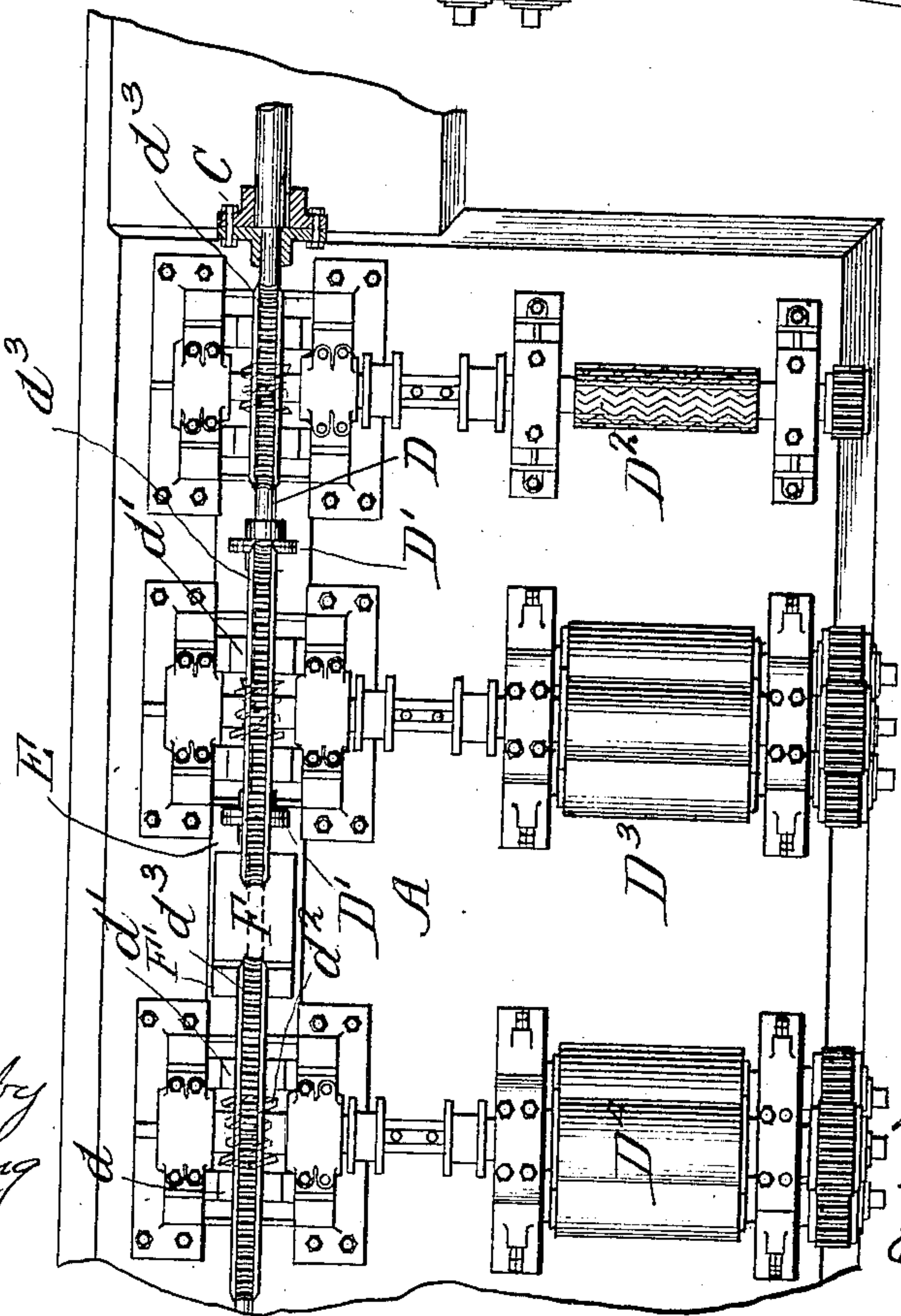


Fig. 3



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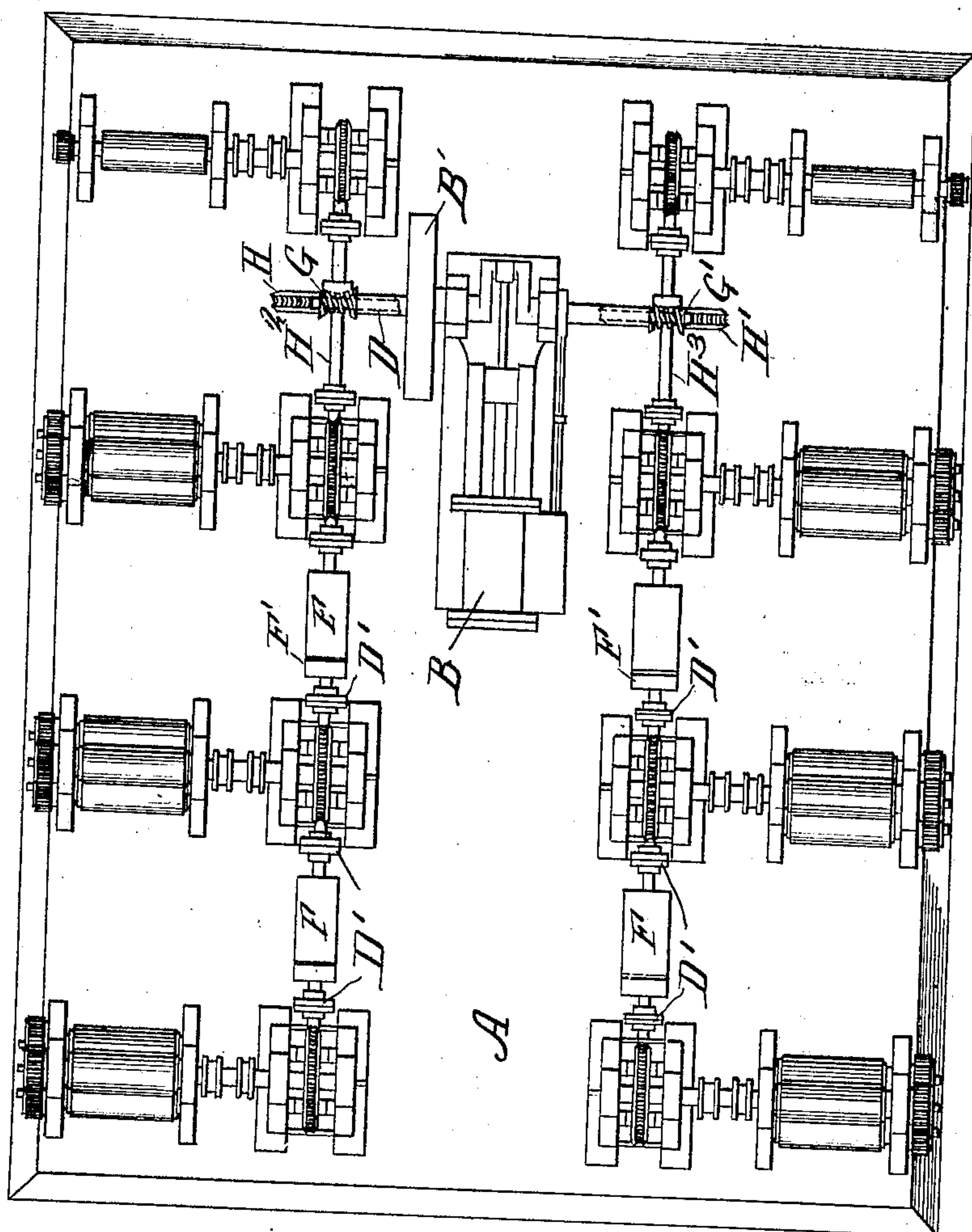
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Fig. 4.



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UNITED STATES PATENT OFFICE.

MINOR HARVEY, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO MORSE, WILLIAMS AND COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

SYSTEM OF GEARING.

No. 903,817.

Specification of Letters Patent.

Patented Nov. 10, 1908.

Application filed May 26, 1904. Serial No. 209,870.

To all whom it may concern:

Be it known that I, MINOR HARVEY, a citizen of the United States, and a resident of the city and county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Systems of Gearing, of which the following is a specification.

My invention relates to gearing, and although it is particularly adapted to sugar mills, it may have a general application.

The object of the invention is to provide simple and efficient gearing of the character referred to.

Other objects of the invention will appear hereinafter, the novel combinations of elements being set forth in the appended claims.

In the accompanying drawings, Figure 1 is a view partly in vertical section and partly in side elevation of a sugar mill embodying my invention; Fig. 2 is an end elevation thereof; Fig. 3 is a partial top plan view; and Fig. 4 is a top plan view of a modification of the sugar mill.

Similar letters of reference designate corresponding parts in the various views.

A designates a foundation which may be of any suitable material, such as brick.

B designates an engine or motor of any suitable type, and B' a fly or balance wheel rotated or driven by the engine or motor. The wheel B' is mounted on a driving member or driving shaft B² which, through a special coupling C, is connected to a line of driven shafting D, from which motion and power are transmitted to the rolls of the mill. The line of shafting D is preferably in sections, one section being provided for each set of rolls, and the several sections all united by couplings D' of any suitable form. These couplings permit the several parts of the mill being easily set up in position or removed for repairs. Each section of shaft is suitably journaled in bearings d, d' supported on the foundation, as more clearly indicated in Fig. 2. Each section of shaft is provided with a worm d² which is preferably of the form of worm known as the "Hindley spiral." The worms d² are all alike, which is a convenience for manufacturing purposes, and they are capable of meshing with worm gears d³ of different sizes. The sizes of the worm gears d³ depend upon the speed desired, such a worm gear being provided

for each set of rolls as shown. Each gear wheel d³ is connected to rotate with a shaft which carries a roll, and at its other end another gear wheel which meshes with similar gear wheels to which are connected other rolls of the corresponding set.

Intermediate the couplings D' of the shaft sections are thrust blocks F and F', the former being larger than the latter. These thrust blocks are employed in the usual operation of the mill. The thrust blocks F' are provided with reverse steps with respect to those of the thrust blocks F, so as to permit reverse operation of the mill. These thrust blocks may be included in the lubricating and cooling systems hereinafter described.

The coupling C may be of any desired construction. The two parts of the coupling are held together by means of copper bolts. This method of holding the two parts of the coupling together is preferable, for the reason that the copper bolts will easily shear should any of the sets of rolls be prevented from rotating from any cause.

D², D³, D⁴ and D⁵ designate sets of rolls, the first of which is termed the crushing rolls, while the remaining sets are termed grinding rolls. These rolls may be of any desired construction and arrangement. Intermediate the sets of rolls are chutes D⁶, or they may be conveyers, for carrying the canes from one set of rolls to another.

E designates what may be termed a bed-plate. It is set in a suitable support in the foundation A, and may be in a single piece or in sections. It comprises a plurality of chambers e, e' set one within another and in pairs, one pair being provided for each worm. This is clearly shown in Figs. 1 and 2. The chambers e which contain lubricating oil, are suitably connected together by means of a pipe or conduit e², and a pump e³ is provided for forcing the oil to circulate from one chamber to another. The chambers e' which contain water for cooling purposes are similarly connected by means of a pipe or conduit e⁴, and a pump e⁵ is provided for causing the water or other cooling liquid to circulate from one chamber to another. The chambers e, conduit e² and pump e³ constitute a lubricating system, and the chambers e', conduit e⁴ and pump e⁵ constitute a cooling system. Obviously if there is only one set of rolls, there will be only one cham-

ber *e* and one chamber *e'* in such lubricating system and cooling system, respectively.

In Fig. 4 the engine or motor occupies a central position with respect to the rolls, the fly wheel *B'* being connected to the driving shafts *D*. Worms *G*, *G'* are provided at the ends of the shafts *D* and mesh with worm wheels *H*, *H'* carried by the driven shafts *H*², *H*³, on which worms may be placed to drive worm gears carried by one of the rolls in each set. Lubricating and cooling systems may be employed in this arrangement in the same manner as described in connection with the sugar mill shown in Figs. 1 and 3. Separate couplings *D'*, *D'* and thrust blocks *F* and *F'* may be employed between each worm *d*² and the succeeding one.

It will be evident to those skilled in the art that by reason of the worm gearing for driving purposes and the connections between the same, a smoother operation of the rolls with less vibration is obtained, and a minimum amount of wear results, irrespective of the speed of the engine or motor. All of the driving parts of the mill are located below the floor level, or nearly so, thereby economizing in space and having all driving parts out of the way of attendants.

Obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of my invention as defined by the claims, and I wish therefore not to be limited to the precise construction herein disclosed.

Having thus described my invention, what I claim and desire to have protected by Letters Patent of the United States is:—

1. The combination with a driving member, of a sectional line of shafting connected thereto; a plurality of couplings connecting together said sections of shafting, a pair of thrust blocks between each pair of couplings, a plurality of worms, one for each section of shafting, and a plurality of worm gears meshing respectively with said worms and connected to the parts to be actuated.

2. The combination with a driving member, of a sectional line of shafting connected thereto, a plurality of couplings connecting together said sections of shafting, a double thrust bearing between each pair of couplings, a plurality of worms, one for each sec-

tion of shafting, and a plurality of worm gears meshing respectively with said worms and connected to the parts to be actuated.

3. The combination with a driven line of shafting, of a suitable foundation therefor, a plurality of worms carried by said shafting, a plurality of worm gears, one meshing with each of said worms and connected to the parts to be operated, a circulating lubricating system associated directly with said worms, and a cooling system associated with said lubricating system.

4. The combination with a driven line of shafting, of a plurality of worms connected thereto, a plurality of worm gears respectively in mesh with said worms, a circulating lubricating system for said worms and gears, and a circulating cooling system for said lubricating system.

5. The combination with a driven shaft, of a worm carried thereby, a worm wheel in mesh with said worm and connected to the parts to be operated, means for circulating the lubricating material to effect a lubrication of said worm and worm wheel, and means for circulating a cooling liquid in proximity to the lubricating-material-circulating-means to cool the lubricant.

6. The combination with a driven shaft, of a worm carried thereby, a worm wheel in mesh with said worm and connected to the parts to be moved, means for circulating the lubricant to effect an immersion of the lower portion of said worm, and means for circulating a cooling liquid in proximity to the lubricating-circulating-means to lower the temperature of the lubricant.

7. The combination with a horizontal shaft, of means for driving the same, worms carried by the shaft, worm wheels in mesh with the worms and connected to the parts to be operated, means for maintaining the lubricant in position to partially immerse the worms, and means for circulating the lubricant.

In witness whereof I have hereunto set my hand in the presence of two subscribing witnesses.

MINOR HARVEY.

Witnesses:

W. H. STOKES,
HENRY E. KIRBY.