2 Sheets--Sheet 1.

J. ECCLES.

Frictionless Journals and Shaft-Bearings.

No. 141,129. Patented July 22, 1873.

Fig. 1.

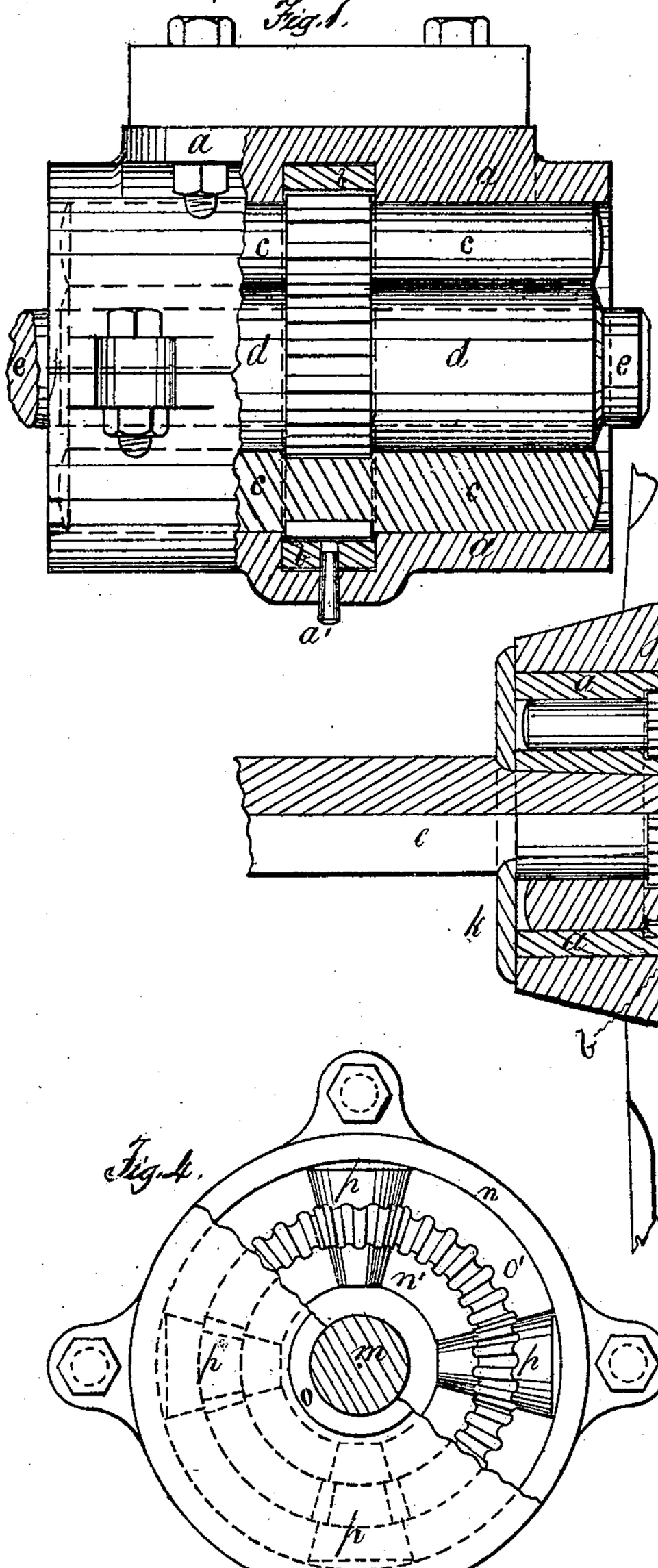

Fig. 2.

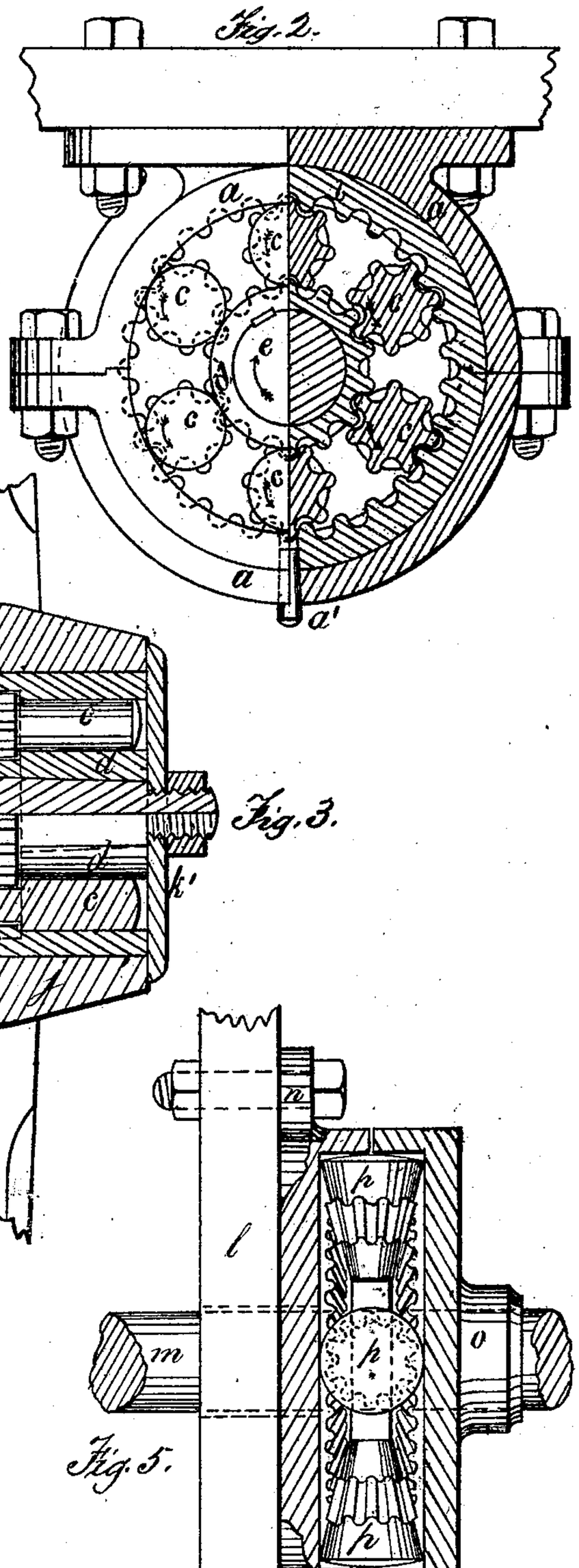

Fig. 3.

Fig. 4.

Fig. 5.

Witnesses:
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George Gosewey

Inventor:
James Eccles.

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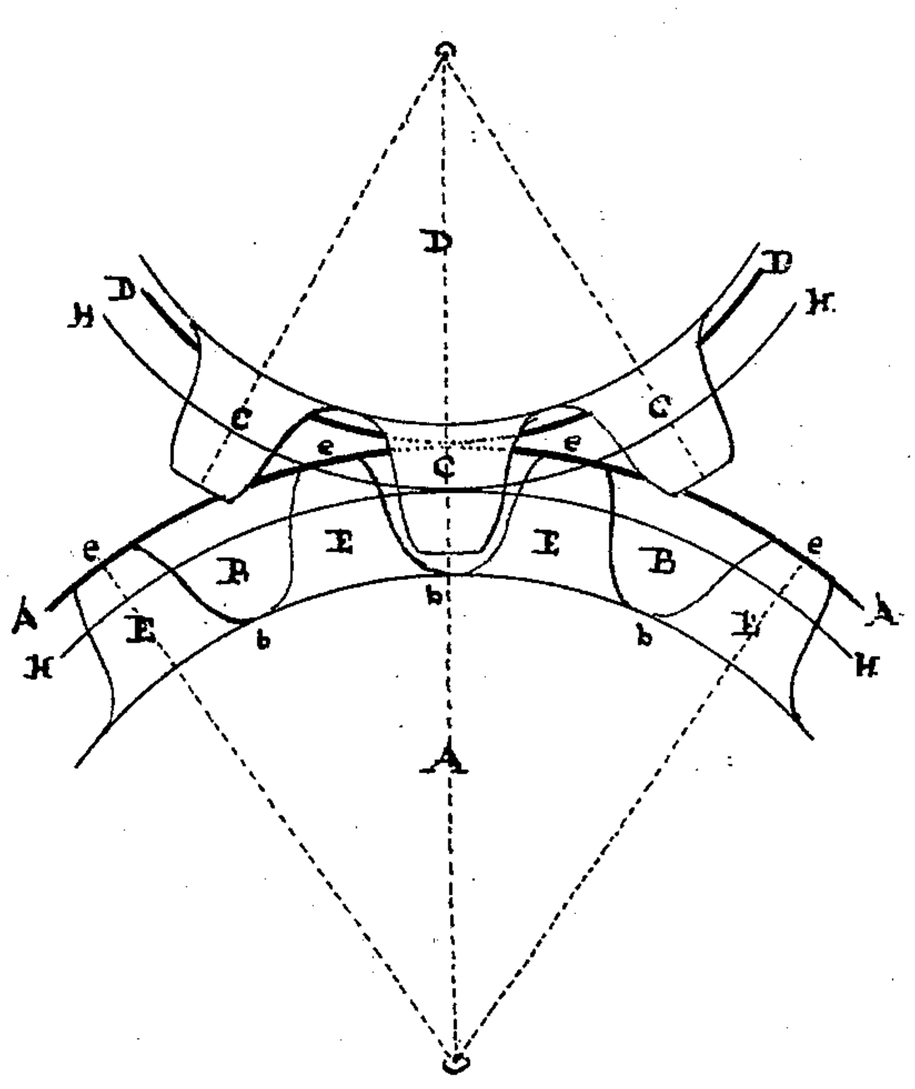

Fig. 6.

Witnesses
A. Sahorski
Harold G. Underwood

Inventor
James Eccles
by Munn & Co
his attorneys in fact

UNITED STATES PATENT OFFICE.

JAMES ECCLES, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO HIMSELF AND SAMUEL ECCLES, JR., OF BALTIMORE, MARYLAND.

IMPROVEMENT IN FRICTIONLESS JOURNALS AND SHAFT-BEARINGS.

Specification forming part of Letters Patent No. **141,129**, dated July 22, 1873; application filed April 22, 1873.

To all whom it may concern:

Be it known that I, JAMES ECCLES, of Philadelphia, Pennsylvania, have invented an Improvement in Frictionless Journal and Shaft Bearings, of which the following is a specification:

My invention consists in forming gear-teeth or cogs, as hereinafter described, on the journal itself, or on an outer bush placed thereon, and gearing these teeth with corresponding teeth formed on a series of rollers, which gear into an annular-geared wheel placed within the journal-box.

On the 22d February, 1848, Letters Patent of the United States were granted to Joseph Harris, Jr., for a new and useful improvement in anti-friction boxes and wheels, intended to obviate the difficulty of keeping apart the rollers in friction-roller boxes or gudgeons, where but few such rollers were used, by gearing them with the periphery of the axle and the interior periphery of the box; and, in describing this gearing, the inventor says: The face of the teeth are to project out only to the interior periphery, as shown in Fig. 2, the spaces between them being sunken from the same; and he directs that the teeth on the axle shall be made in the same way—the friction-rollers carrying projecting teeth to mesh and work with teeth sunk, as above described; and the drawings accompanying the specification correspond with the description accurately.

Now, my invention consists in an improvement upon the invention aforesaid, and relates to the gearing by which the friction-rollers are connected with the periphery of the axle and the inner periphery of the box.

In order to the better explanation of my improvement, it is necessary that I should show the effect and state the consequences of such a construction as is described in the Harris patent; and that I may be the better understood, I will refer to the illustrative drawing, Fig. 6, hereto annexed, where A A A represent a cross-section of an axle with the face of the teeth E *e* E *e* E *e* projecting out only to the periphery and the spaces between them, B *b* B *b*, sunken below it, while the teeth C C C C of the friction-roller D D project beyond the periphery and mesh and work into the sunken teeth aforesaid.

Now, it is apparent, on inspection, that, inasmuch as the radius A is greater than the radius D, if the two surfaces, D D and A A, are to be kept in contact by the action of the teeth, the larger periphery A A must rub or slip, upon the smaller periphery D D in each revolution, a space equal to the difference between the lengths of the portions of the two peripheries in contact, although the teeth are formed truly or upon mathematical principles.

To estimate the effect of this approximately by reference to the drawings of the Harris patent, which appear to have been made with more than common accuracy, the rubbing-surface at each tooth would be about one-twelfth of an inch, which would give, for the twenty-five teeth shown around the axle, say two inches of slip or rub between the surfaces of the axle and friction-rollers; and, for the same reason, four inches would be the amount of slip or rub between the friction-rollers and the interior periphery of the box, with its forty-eight teeth, making a total rubbing-surface of six inches at each revolution of the axle.

Now, my improvement obviates entirely the friction that necessarily attends the construction of the Harris patent, if the inventor's clearly-expressed instructions are followed, as it is evident he intended they should be; and to this end I so proportion the sizes of the friction-rollers and box, with reference to the size of the axle, that their respective surfaces, when in contact, shall correspond with the pitch-line or circle of the gearing that unites them, as is shown in Fig. 2 of the drawings hereto attached. Referring, for further explanation of this the leading feature of my improvement, to the illustrative drawing, Fig. 6, the surfaces of the rollers and axle, in place of being the dark lines A A and D D, as they are required to be in the Harris patent, would be at the pitch-line or circle H H H H; when, if the teeth are truly formed on mathematical principles, rubbing or slipping, of any kind or in any degree, between either the axle and friction-rollers, or the latter and the inner periphery of the box, may be regarded as impossible.

The object which the patentee had in view in the Harris patent was to keep the friction-rollers apart; but the means adopted lessened

the peculiar value of the rollers by causing another friction, which he does not seem to have appreciated or provided for. This defect my improvement remedies in a way which is not only not suggested by anything that the specification contains, but, with which, the construction he requires is absolutely inconsistent.

In the drawings, Fig. 1 is a front elevation, partly in section, of my invention, as applied to a revolving journal or axle. Fig. 2 is an end view of the same, also partly in section. Fig. 3 is a sectional view of an ordinary carriage-axle with my improvement added. Fig. 4 is an end elevation, partly in section, of my invention, as applied to thrust-bearings, to the support of vertical shafts, to turn-tables, pivot-bridges, and other similar uses. Fig. 5 is a front view of the same, partly in section.

In Figs. 1 and 2, *a* represents a journal-box in two parts; *b* represents an annular gear-wheel or ring, also in two parts, placed in a recess formed in box *a*, at about the middle of its length, and kept from turning by a pin, *a'*. *c* represents a series of geared rollers, the teeth or cogs of which are located about the middle of the length of the rollers and caused to mesh into the cogs of the annular wheel *b*, and also into the gear-teeth formed around the bush *d*, which is keyed onto the journal or axle *e*. In some cases the teeth or cogs are cut out or formed on the journal or axle itself, dispensing with the bush *d*.

When the journal *e* revolves the bush *d* rolls on the bearing-surfaces of rollers *c*, which then roll around the inner periphery of box *a*. The teeth or cogs of the annular wheel *b*, rollers *c*, and bush *d* project nearly one-half their depth beyond the bearing-surfaces of such wheel, bush, or rollers, and, being geared together, enter into corresponding spaces below the said bearing-surfaces, as shown, the cogs and their spaces forming corresponding shoulders, which prevent lateral motion of the rollers.

The width of all the teeth should be about equal to one-third the length of the journal, as, when thus constructed, the teeth retain the rollers in line with box *a* and journal *e* without the use of the double rings, cages, or framing heretofore employed.

In Fig. 3, *e* represents an ordinary carriage-axle. *d* is a bush, bored out to fit the axle *e* and secured to the same by a screw and nut, as shown. On the outer circumference of the bush *d*, and about the middle of the length thereof, there is formed a toothed gear-wheel, *b*. *c* represents two similar geared rollers, which bear against the outer surface of the bush *d* and the inner surface of the box *a*, which is fitted in the hub *j* of the wheel.

In practice, not less than three rollers can be used on one such bearing, and six or even more rollers are at times preferable. An annular toothed ring or wheel is formed or placed on the inside of box *a*. The several parts referred to are held in place by washers *k* and *k'* and the screw and nut last mentioned. In this case the axle *e* does not revolve. The inner periphery of box *a* rolls on the smooth bearing-surfaces of rollers *c*, which roll around the circumference of the bush *d* without friction.

In Figs. 4 and 5, *l* represents the stern-post of a propeller-steamship; *m*, a part of a propeller-shaft; *n*, an iron thrust-bearing plate bolted to the stern-post *l*. *o* is the outer part of a thrust-bearing plate firmly keyed onto shaft *m*. Between the two plates *n* and *o* are placed the conical rollers *p*, around the middle of each of which rollers gear-teeth are formed, as shown, which teeth gear and work into corresponding gear-teeth that form part of the inner surface of each of the plates *n* and *o*. *n'* and *o'* indicate the conical bearing-surfaces of the plates *n* and *o*, on which surfaces the plain-turned parts of the conical rollers *p* press and roll.

To simplify the drawings, I have shown but four rollers, *p*, in Fig. 4. In most cases, however, a greater number is required.

Motion being given to the shaft *m*, all the pressure produced by the propeller is transmitted to the stern-post, through the above-described combination, without friction and without the aid of lubricating matter.

The rollers, wheels, and bushes above described may be made of steel or other metal.

My improvement is adaptable, without material changes, to a great variety of cases, and therefore I do not desire to limit myself to the specific applications herein mentioned.

To whatever purpose my improvement is applied, its distinguishing characteristic is the correspondence between the several surfaces at the point of contact with the pitch-line or circle of the gearing.

I do not claim the keeping a part of the rollers in a friction-roller box by gearing; but

I do claim—

1. Making the surfaces of the interior periphery of the box, the rollers, and the axle, where in contact, correspond with the pitch-line of their respective gearing, in place of sinking the teeth so that their faces shall project out only to the inner periphery of the box and of the axle, respectively, as required by the specification of the patent granted to Joseph Harris, Jr., February 22, 1848.

2. In the case of end-thrust, or pressure, so to construct the plates, whose friction otherwise is to be obviated by the use of conical geared rollers, that their surfaces, where in contact with the surfaces of said rollers, shall correspond with the pitch-lines, respectively, of the gearing, by which said plates and gearing are united.

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Witnesses:
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J. E. SHAW.