No. 686,119. Patented Nov. 5, 1901.

E. O'BRIEN & C. D. WOOD.

BALL BEARING ROLLER.

(Application filed Oct. 29, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

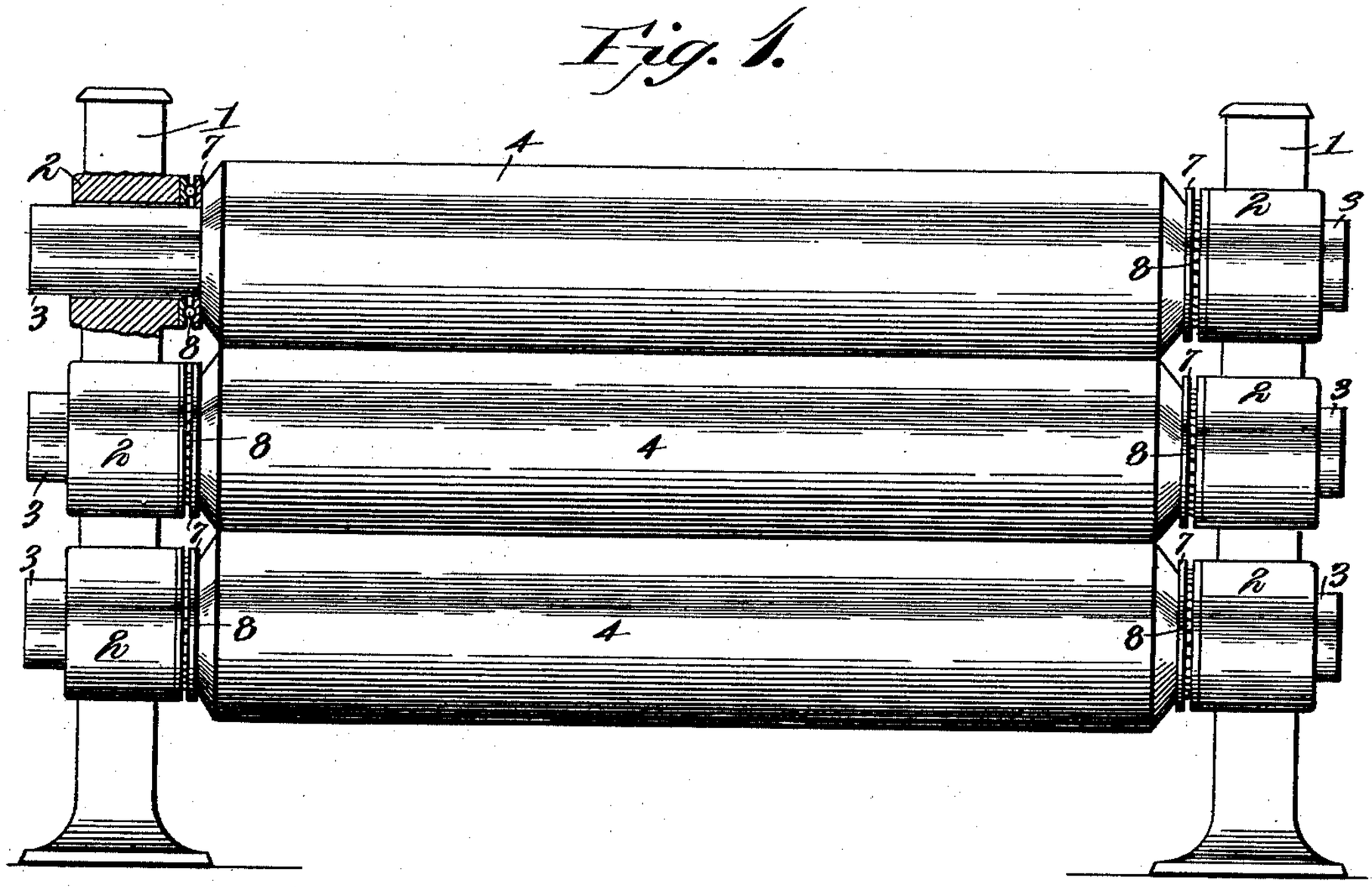


Fig. 2.

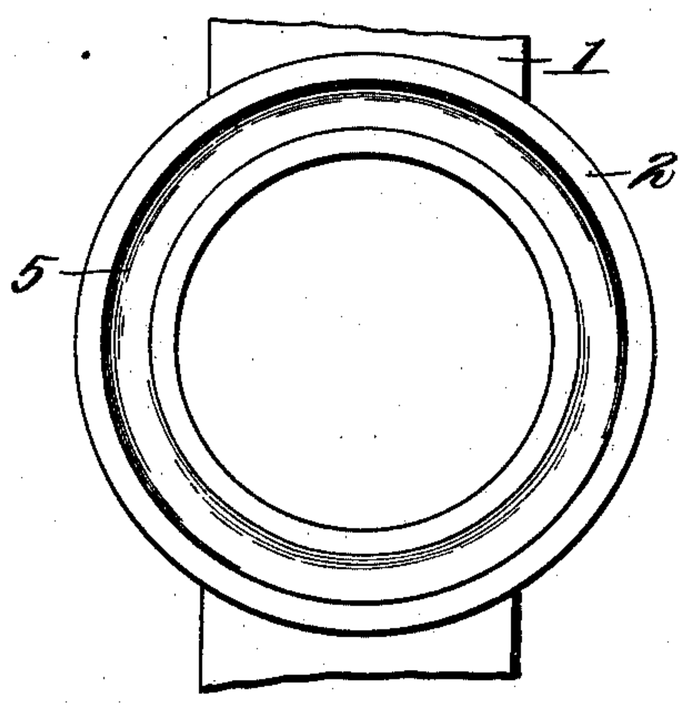
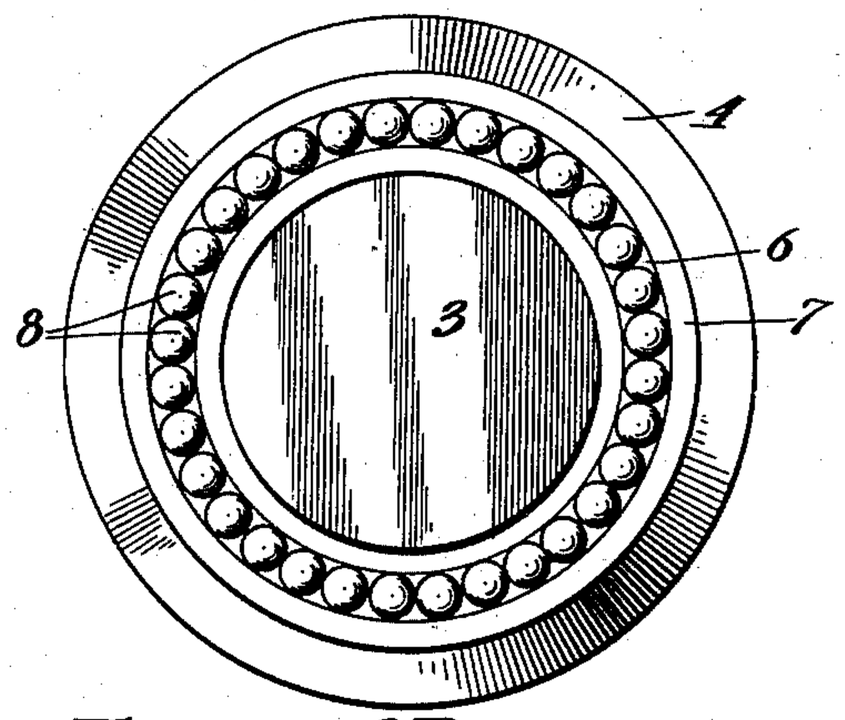


Fig. 3.



Witnesses
C. M. Walker
Chas. S. Hoyer.

Eugene O'Brien and C. D. Wood Inventors
by Church & Co.
Attorneys

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Fig. 4.

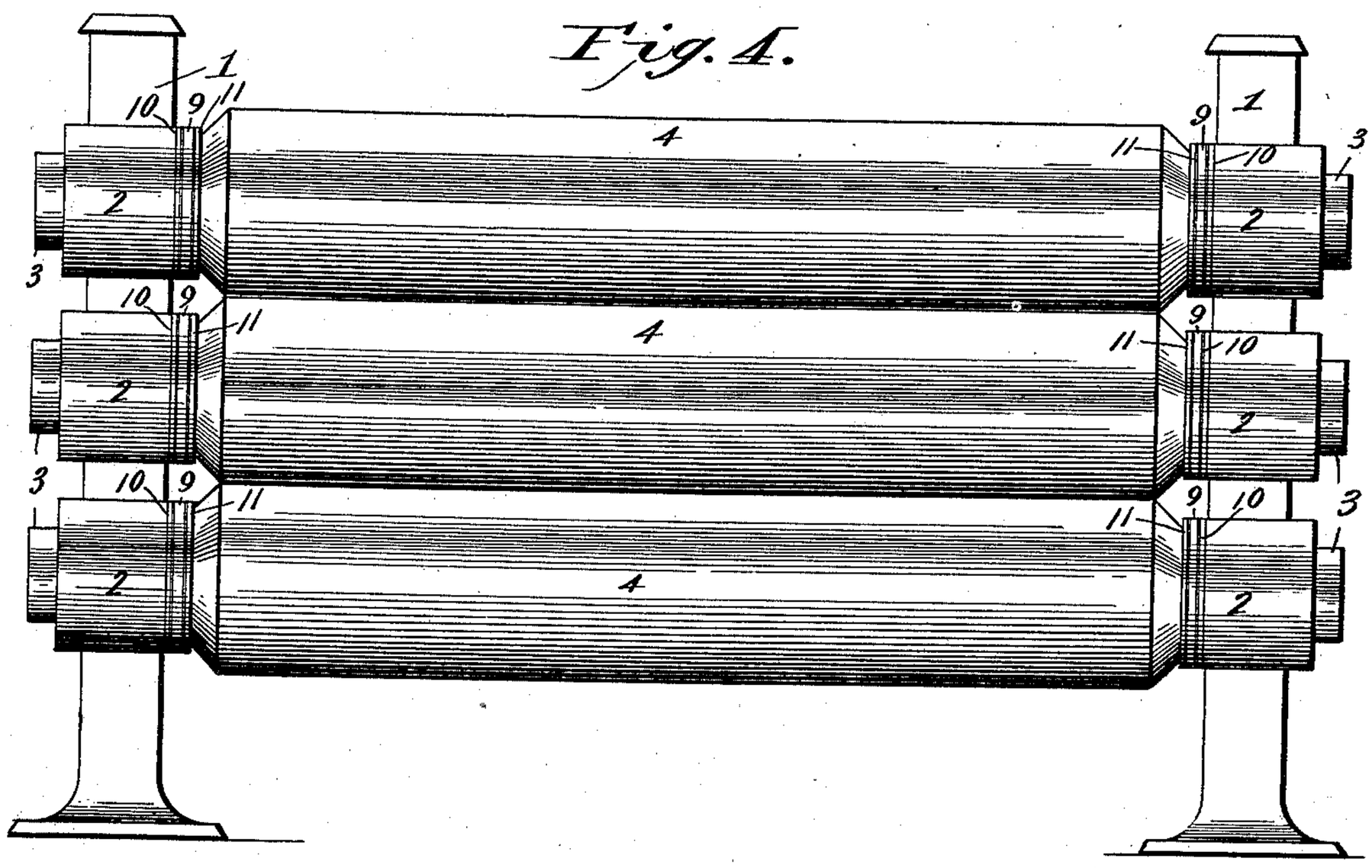


Fig. 5.

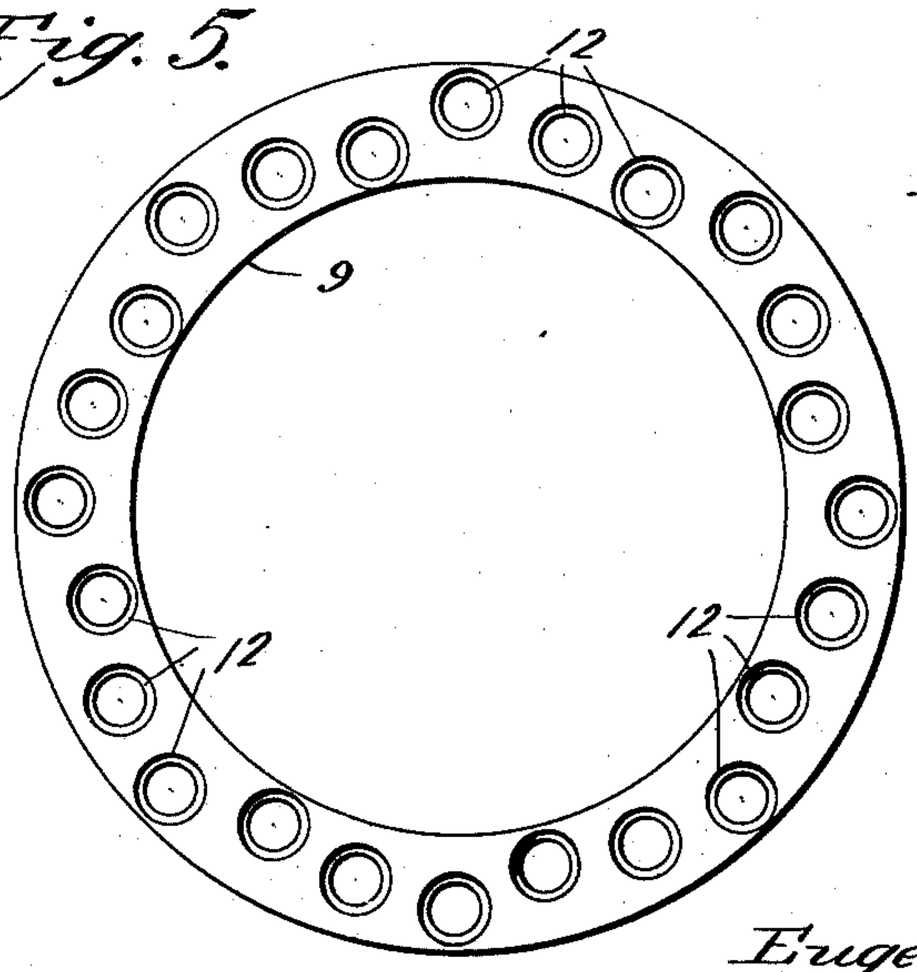
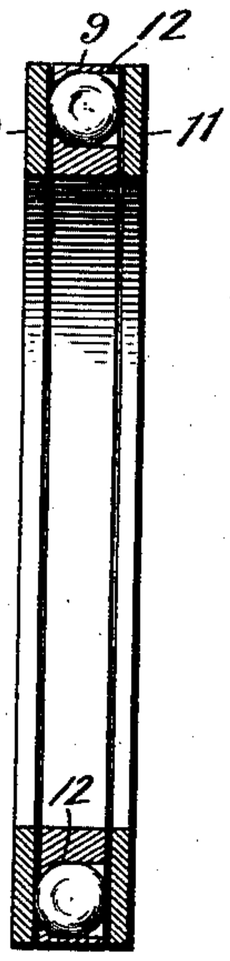


Fig. 6.



Witnesses
C. H. Walker.
Chas. S. Hoyer.

Eugene O'Brien
C. D. Wood 2d Inventors
by Church & Co.
Attorneys

UNITED STATES PATENT OFFICE.

EUGENE O'BRIEN AND CHARLES D. WOOD, OF EAU CLAIRE, WISCONSIN.

BALL-BEARING ROLLER.

SPECIFICATION forming part of Letters Patent No. 686,119, dated November 5, 1901.

Application filed October 29, 1900. Serial No. 34,840. (No model.)

To all whom it may concern:

Be it known that we, EUGENE O'BRIEN and CHARLES D. WOOD, citizens of the United States, residing at Eau Claire, in the county of Eau Claire and State of Wisconsin, have invented a new and useful Ball-Bearing Roller, of which the following is a specification.

This invention relates to a ball-bearing attachment for rollers, particularly for the stack calender-rollers on paper-machines; and the objects in view are to absolutely do away with and prevent friction caused by the end thrust of the rollers, to keep the rollers perfectly square, to reduce the amount of necessary driving power and materially save in the use of lubricants, to give a perfect and uniform tension on the paper, to prevent breaking of paper at calenders, for when tension is once set it remains invariable as set until changed by the machine-tender, to save calender-cut paper, which causes a great deal of trouble to a machine-tender and serious loss to a manufacturer, and to have a strong and durable bearing, as a set of the improved devices will run for a number of years without repair, whereas the life ordinarily of the common brass ring now employed is only from three to six months.

The invention consists in the construction and arrangement of the several parts, which will be more fully hereinafter described and claimed.

In the drawings, Figure 1 is a sectional side elevation of a stack of calender-rollers embodying the features of the invention. Fig. 2 is an elevation of a portion of one of the end bearing-uprights, showing one of the members of the improved bearing. Fig. 3 is an end elevation of one of the rollers, showing the companion member of the improved bearing. Fig. 4 is a side elevation of a stack of calender-rollers embodying a different and preferred form of the invention. Fig. 5 is an elevation of one of the ball-carrying rings embodied in the form of the device shown by Fig. 4. Fig. 6 is a section through one of the rings as shown by Fig. 5 with balls therein and the opposite annular bearing-plates.

Similar numerals of reference are employed to indicate corresponding parts in the several views.

The numeral 1 in all the figures of the drawings designates uprights having vertically-alined seats or apertures surrounded by enlargements 2 to receive the reduced journals 3 at the opposite ends of rollers 4. These rollers represent a stack of calender-rollers, with which it is preferred to use the improved bearings, though it will be understood that the improved device is equally well adapted to any other kind of rollers where uniform support and avoidance of endwise thrust is desired. It will be observed by inspection of the broken-out portion of Fig. 1 that the journals 3 do not touch the seat-aperture walls, and thereby friction and the use of lubricants are materially reduced. In the form of the improved structure shown by Figs. 1, 2, and 3 the inner face of each seat enlargement 2 is formed with a circular ball race or groove 5 to aline and conjunctively coact with a similar ball race or groove 6, constructed in a flange 7, surrounding each journal 3 at its point of emanation from the roller. These races or grooves receive a plurality of anti-frictional balls 8, as clearly shown, and the races or grooves in each instance are less in depth than one-half the diameter of the balls, and thereby the contiguous devices carrying the said races or grooves are prevented from having bearing-contact, and the support for the rollers is instituted between the balls and the races or grooves solely.

In the preferred form of the device, as shown by Figs. 4, 5, and 6, each journal 3 extends through a ring 9, loosely located between annular bearing-plates 10 and 11, respectively, carried by or connected to the enlargements 2 and the said journals. Each ring 9 has a series of ball-seat openings 12 extending therethrough, which are slightly reduced at one side to keep the balls that are placed therein in positive relation to the ring, the said openings 12 being regularly run from the inner to the outer edge portion of each ring in series, so as to have the balls therein extend over a greater surface to preserve a firm contact with the plates and prevent irregular wear or grooving of the latter in one line therearound and also to make the several bearings stable. The thickness of each ring 9 is less than the diameters of the balls located in the seat-openings thereof, and consequently said balls are caused to project

equally from opposite sides of the plate and contact uniformly with the plates 10 and 11.

It will be seen that by the use of either of the forms of the improved structure the rollers 4 will be held perfectly square, because there is no part to wear down, and a uniformity of revolution will also result, with material benefit to the treatment of paper in a calender-stack, as well as render positive the operation of closely-arranged rollers of any other type of machine to which the improved bearings may be applicable. By having the rollers maintained continuously at the same square relation from end to end the pressure on the material passing between the several rollers will be uniform throughout the length of the rollers.

One of the greatest difficulties encountered in calender-machines as heretofore constructed is to have the rollers run uniform; but practical usage of the improved bearings heretofore set forth has resulted in overcoming the previous troublesome disadvantage noted. By keeping the rollers perfectly "square" is meant that they are properly held endwise in place, and thereby the ends are even, which permits operation on a sheet of paper full width of the machine. This is a very important point in a calender-machine, for if the rollers are permitted to crowd endwise, say, one inch, which they would do with the old brass ring, it would mean two inches less capacity on the machine, for the roller crowding to one side the distance of one inch would leave an inch of paper uncalendered on the opposite side, and as the rollers running in stack take an opposite lean the roller next to the one so crowded would itself crowd to the opposite side, and consequently it would mean two inches of uncalendered paper. The effect of this crowding after the paper is wound on reels is that the paper would be so much thicker on the edges as to cause it to crack and make it unfit for use. Consequently the paper in this condition would have to be cut down to a smaller size at a loss, and if made to run on roll-printing presses could not be used, for as soon as one of these cracks on the edge came along it would snap or break. In other words, if the paper breaks the roll as an entirety is condemned and returned to the mill from which it was shipped.

The paper is to be drawn according to the amount of finish required, and some stocks or grades of paper are very tender. This requires the tension on a sheet to be very accurately set in order to have the sheet run safe; but with the old form of brass rings it was impossible to set the tension for any given length of time, for as the end thrust would vary under the old construction the draw would correspondingly vary and was either too slack or too tight, with loss in either case. If the tension is too tight, the sheet will break, and if too slack the sheet will be cut in the calenders, and consequently it must be worked over with material loss, which will be obvious. Another important advantage is the large increase in production by the use of the improved form of bearing as compared to the output from machines having the old form of construction. The calenders are heated by the web of paper passing through or over them, and there being no end friction in the improved construction the rollers will all expand alike, and a sheet treated under such conditions will be smooth, uniform, and free from calender cuts and cracked edges. A saving along the lines explained would be material in a large mill, and by obviating the numerous disadvantages heretofore encountered in the old construction will reduce the attention and expense relatively to each machine to a minimum and decrease the cost of paper production.

Having thus described the invention, what is claimed as new is—

1. The combination with supports having bearings, of a series of closely-arranged rollers having terminal journals extending into said bearings, the inner extremities of the bearings and the emanating portions of the journals having contiguously-arranged ball-contacting devices held thereby, and a plurality of balls between the opposing faces of said contacting devices, the working faces of the rollers having a greater diametrical extent than said contacting devices.

2. The combination with a series of closely-arranged rollers having terminal journals, of supports having bearings for the reception of the journals, ball-holding devices loosely surrounding the journals, a plurality of balls in the said devices and annular members also loosely engaging the journals and bearings and loosely contacting with opposite portions of the balls in said holding devices between the inner ends of the bearings and the points of emanation of the journals from the rollers.

3. The combination with a series of rollers closely arranged and having terminal journals, of bearings for said rollers, rings loosely surrounding the journals having balls held therein and projecting equally from opposite sides thereof, and loosely-mounted movable annular plates on the bearings and journals contacting with the said balls and disposed on opposite sides of the rings.

4. The combination with a series of rollers closely arranged and having terminal journals, of supports having bearings to receive said journals, ball-holding devices mounted on the journals and having ball-seat openings slightly reduced at one extremity to keep the balls in position therein, a series of balls in said devices and contacting members contiguous to opposite sides of said ball-holding devices in engagement with opposite portions of the balls and respectively loosely located between the inner ends of the bearings and the points of emanation of the journals from the rollers.

5. The combination with a series of rollers having terminal journals, of supports having bearings to receive said journals, annular

ball-holding devices on the journals having ball-receiving seats therethrough in planes parallel with the latter, a plurality of balls in said seats and exposed on opposite sides of said holding devices, and loose members in operative relation to the said journals and bearings and in contact with the opposite portions of the balls.

6. The combination with a series of rollers having terminal journals, of supports having bearings to receive said journals, annular ball-holding devices on the journals having ball-receiving seats therethrough extending in angularly-arranged series from the inner to the outer portions of said devices, a plurality of balls in said seats exposed at opposite portions for contact, and contacting members engaging opposite portions of said balls.

In testimony that we claim the foregoing as our own we have hereto affixed our signatures in the presence of two witnesses.

EUGENE O'BRIEN.
CHAS. D. WOOD.

Witnesses:
T. B. KEITH,
E. J. LENMARK.