

No. 886,998.

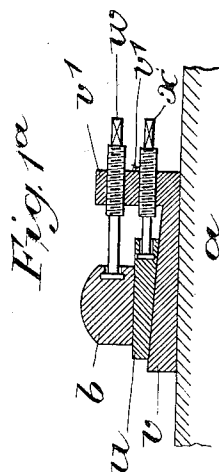
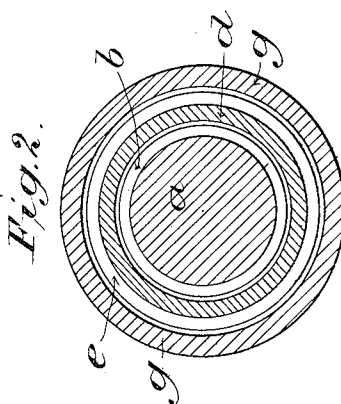
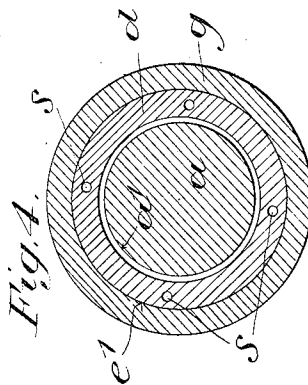
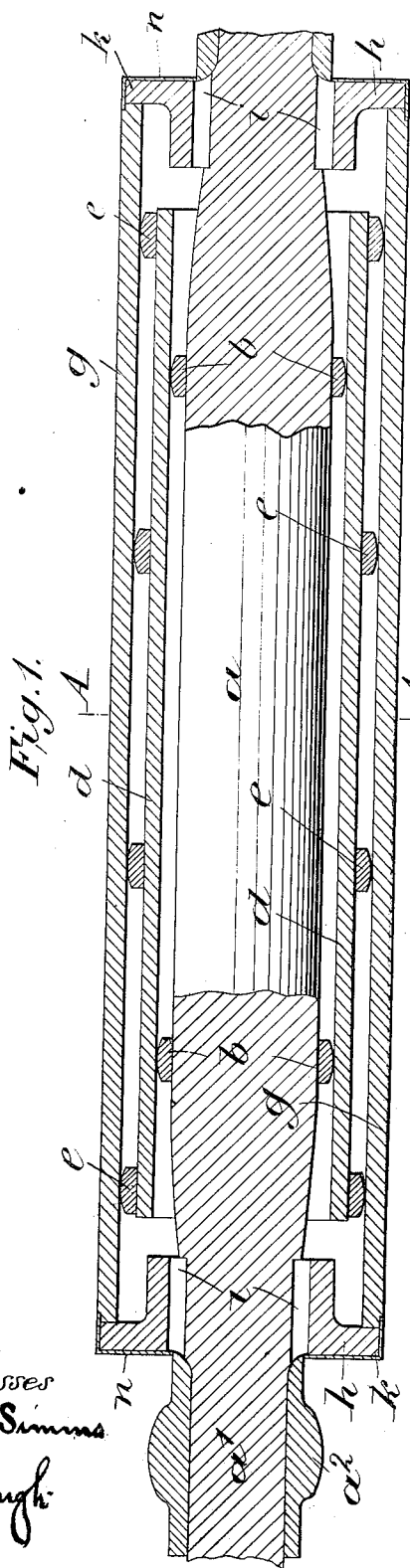
PATENTED MAY 5, 1908.

W. LOVE.

CYLINDER FOR PRINTING AND OTHER PURPOSES.

APPLICATION FILED JULY 22, 1907.

5 SHEETS—SHEET 1.



Witnesses
W. Henry Simms
S. Blough

Inventor
W. Love
New York, N.Y.
Attorney

W. LOVE.

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5 SHEETS—SHEET 2.

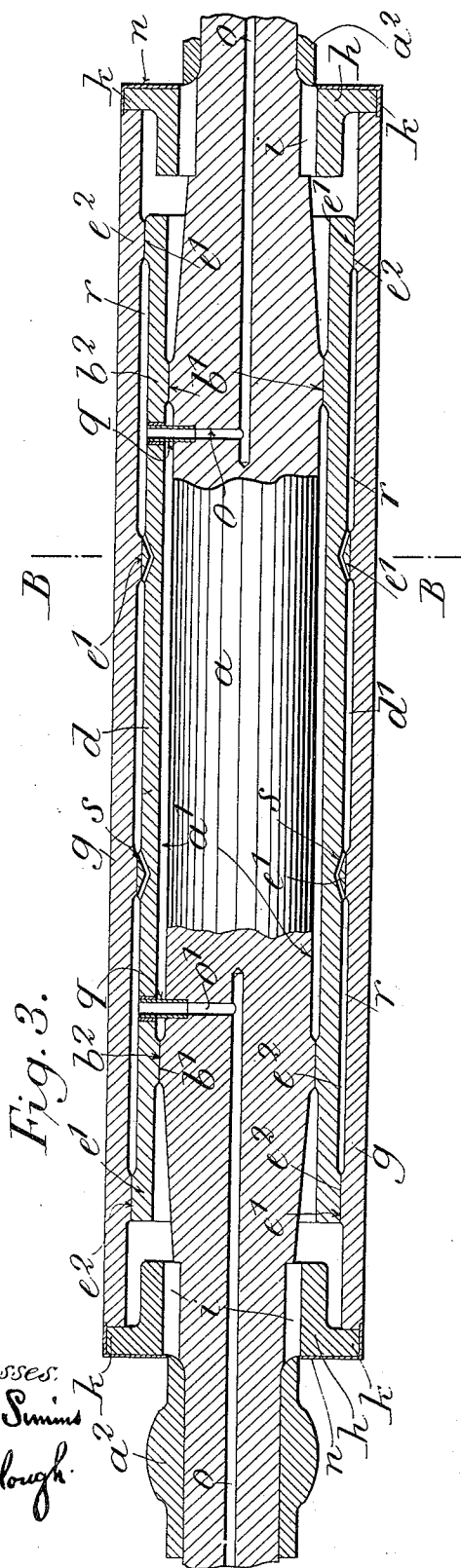


Fig. 3.

Witnesses:
Wm. J. Smith
L. Blough.

Fig. 4.

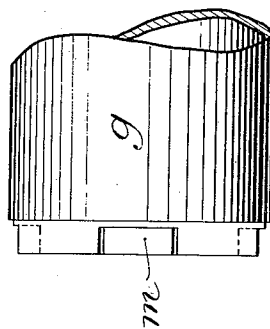


Fig. 5.

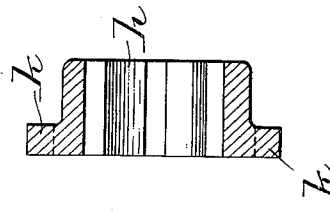
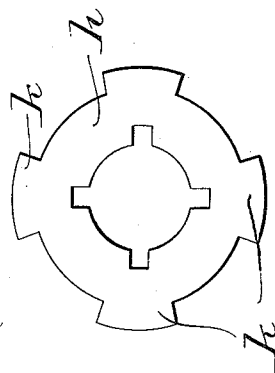


Fig. 6.



Inventor
W. Love
Wm. J. Smith
Attorney

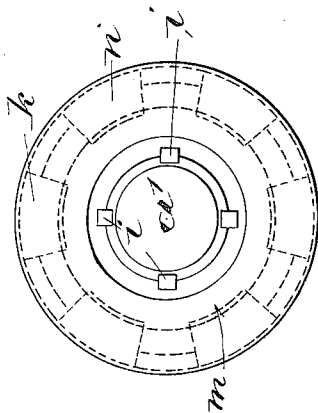
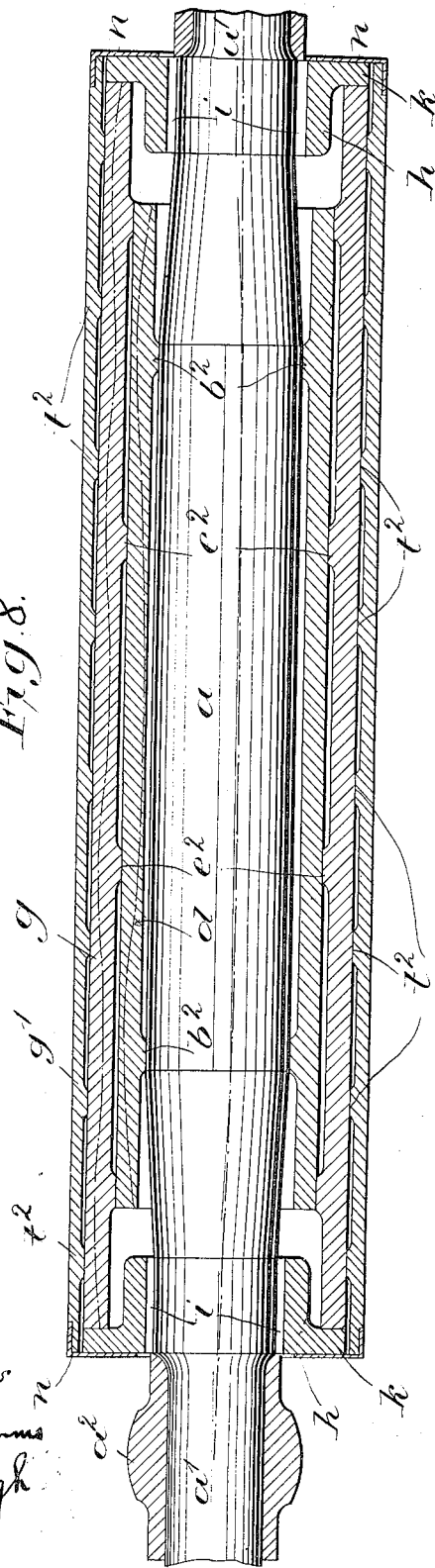
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5 SHEETS—SHEET 4.

Fig. 8.



Witnesses
W. H. Sumner
R. Blough

Inventor
W. Love
per W. H. Sumner
attorney

No. 886,998.

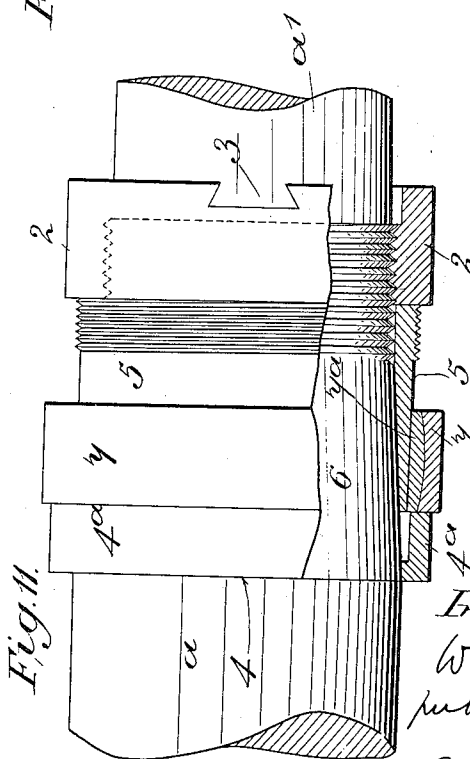
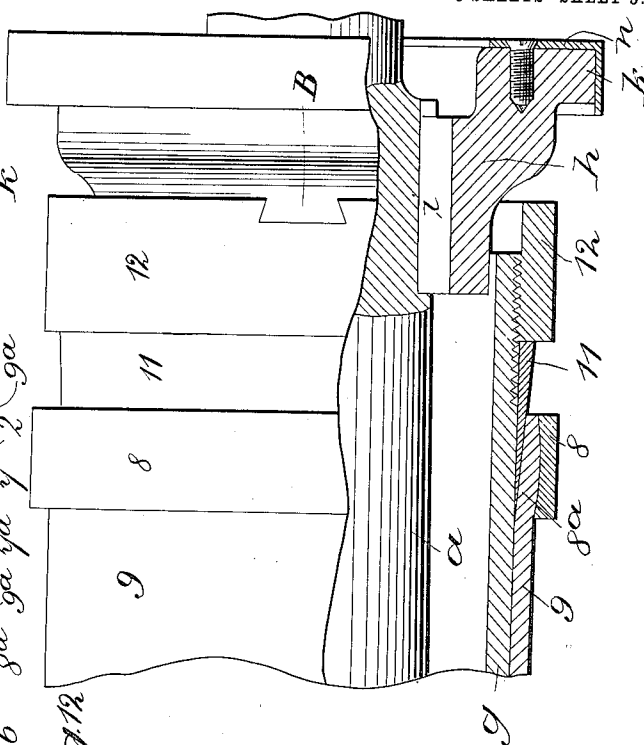
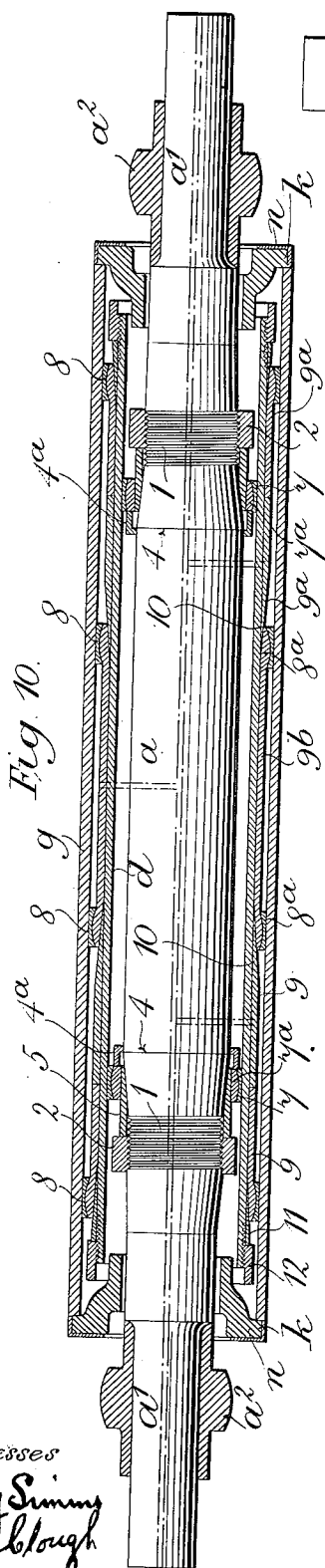
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CYLINDER FOR PRINTING AND OTHER PURPOSES.

APPLICATION FILED JULY 22, 1907.

5 SHEETS—SHEET 5.



Witnesses
 Henry Simms
 J. Blough

Inventor
W. Lore
per W. Lydell
attorney

UNITED STATES PATENT OFFICE.

WILLIAM LOVE, OF LONDON, ENGLAND.

CYLINDER FOR PRINTING AND OTHER PURPOSES.

No. 886,998.

Specification of Letters Patent.

Patented May 5, 1908.

Application filed July 22, 1907. Serial No. 385,021.

To all whom it may concern:

Be it known that I, WILLIAM LOVE, a subject of the King of Great Britain and Ireland, residing at London, England, have invented
5 Improvements in Cylinders for Printing and other Purposes, of which the following is a specification.

This invention of improvements in cylinders for printing, embossing, calendering and
10 other like operations involving rolling pressure, has for its object to produce a cylinder of this kind, supported by end journals, which shall give a practically even pressure at all points of its line of contact with an op-
15 posing cylinder or surface, or to resist a pressure so applied, or so that two such cylinders working together shall give practically equal pressures or resistances at all points of their length notwithstanding variations in the
20 amount of pressure applied at their journals, or conversely at their contacting surfaces, and to secure these results notwithstanding that the said cylinder may be of great length proportionately to its diameter.

25 It also has for its object to make provision for securing unequal resistances or pressures in such a cylinder as may be desired.

For these purposes a cylinder according to the present invention is constructed as follows:—Upon a central axle or shaft, which
30 constitutes a beam and the ends of which are adapted to form the running journals of the cylinder, are mounted supports or fulera, conveniently in the form of rings or collars, carrying an outer beam which may be in the
35 form of a metal tube or hollow cylinder, enveloping the supports, or of joists of I section arranged longitudinally around the supports. Such a compound beam carries sec-
40 ondary supports which carry a further beam or beams, such construction being carried on to any extent required, the last beam being tubular and constituting the face or working cylinder. The supports in each se-
45 ries are so situated as to be at those points in the beam, the axle in the first instance, which, under an equally distributed load, recede an equal amount from a straight line parallel to the axis of the journals. The axle
50 itself being a beam of a preferably cylindrical section supported at both ends only, will have two such points only available, while other beams in the combination will

have more available points of equal flection, and may, according to the extent to which
55 the building up is carried on, have a great number of such points of equal flection.

In the accompanying illustrative drawings, Figure 1 shows in longitudinal section, and Fig. 2 in cross section on the line A A of
60 Fig. 1, one method of building up a cylinder having four bearing points according to the present invention. Fig. 1^a is a sectional detail view showing a modified construction. Fig. 3 shows in longitudinal section and Fig.
65 4 in cross section on the line B B of Fig. 3, a slightly modified construction of a cylinder having four bearing points. Figs. 3^a and 3^b are detail views of parts of Fig. 3. Figs. 5 and 6 show respectively in cross section and
70 end elevation, one of the driving plates used in the cylinder shown in Figs. 1 to 4 inclusive, and Fig. 7 shows in side elevation a portion of one end of the outer or working cylinder. Figs. 7^a and 7^b are similar views to Figs. 1
75 and 2 respectively, showing a slightly modified construction. Fig. 7^c is a diagram showing, to an exaggerated scale, the deflection curves which occur in a four point supported cylinder under a uniformly distrib-
80 uted load. Fig. 8 shows in sectional elevation and Fig. 9 in end view, a method of building up a cylinder with eight bearing surfaces. Fig. 10 shows in sectional elevation a further modified construction of cyl-
85 inder, and Figs. 11 and 12 are sectional elevations showing detached views of portions thereof to a larger scale.

Referring to Figs. 1 and 2, on a shaft *a* the ends *a'* of which project beyond the ends of
90 the cylinder to be supported and form the journals therefor, are secured two collars *b* having convex outer surfaces, the said collars being located on the shaft at points equidistant from its center and at a distance
95 apart equal to about one-half the length of the working face of the cylinder to be supported. The said collars form the bearing surfaces for a tube *d* which fits tightly over them and is secured in a position midway be-
100 tween the ends of the shaft. The effective length of the tube is about three quarters of the length of the working cylinder. Secured on the tube *d* are four collars *e* the outer surfaces of which are also convex.
105 These collars are arranged at those points

where the tube d would receive an equal amount of deflection through the collars by a load equally distributed along the surface of the working cylinder, the said collars forming the bearing surfaces for the outer tube g which constitutes the working cylinder the ends of which overlap the outside collars e by about one-eighth of its length.

In the modified arrangement shown in Figs. 3 to 7 inclusive, the two annular collars or supports b^1 which support the tube d are formed in one with the shaft a for which purpose the latter is reduced in diameter, as shown at a^1 . In like manner, the interior of the surrounding tube d is shown bored out to leave two internally projecting rings b^2 adapted to fit tightly over and correspond in positions with the collars b^1 when the parts are in their correct position as shown. The outer surface of the tube d is reduced as shown at d^1 to leave four bearing surfaces e^1 arranged equidistant from each other and at equal distances apart from the respective bearing surfaces b^1 when the tube d is in position thereon. The inner surface of the working cylinder g is bored out to leave four internally projecting annular supports e^2 adapted to fit tightly over and correspond in position with the collars e^1 .

In each case, the working cylinder g is driven from the shaft a by end driving plates h which are secured by keys i (Fig. 3) to the shaft and the outer peripheries of which are formed with teeth or projections k (Fig. 6) that engage with corresponding recesses m (Fig. 7) in the ends of the working cylinder g . Each end of the said cylinder and the corresponding driving plates h may be inclosed within an end cap such as n (Fig. 3).

The working cylinder g may be heated internally by steam. For this purpose each end portion of the shaft a may be formed with longitudinal and radial passages o , o^1 that communicate through a short tube q , screwed or otherwise fixed in the said shaft a and tube d , with the annular spaces r formed by and between the tube member d , the cylinder g and the interposed annular supports e^1 e^2 , the central annular space r being in communication with the outer ones through holes s formed through the two inner annular supports e^1 .

A method of fixing each tube g in the shaft a and of making a sliding joint between it and the tube d , consists in screwing the tube into the shaft a (see Figs. 3^a, 3^b), and in forming a recess in the tube d for the reception of packing q^1 and a gland q^2 which is formed with slots q^3 for enabling it to be screwed tightly onto the packing.

The clearance spaces between the respective members a , d and g are made sufficient to allow of the maximum load being supported without the deflection imparted there-

by to such members, causing their adjacent surfaces to touch each other except at the supporting points stated. The radial clearance space between the inner surfaces of the ends of the working cylinder g and the bottom of the recesses in the driving plates h is made rather more than equal to the sum of the required minimum clearance spaces between the aforesaid members.

In the modified construction shown in Figs. 7^a and 7^b, the collars b are surrounded by longitudinally arranged joists d^1 of I section in lieu of the intermediate tube d , and the bearings e for the outer tube g are formed on the latter and bear upon the joists d^1 .

A cylinder g supported in the manner above described has four bearing surfaces or supports e^1 e^2 , and, under an evenly distributed load, (see Fig. 7^c) assumes a more or less waved line according to the load, the high points formed by the bearings being in one plane and the low points formed between and on each side of the said bearings being in another plane, both planes being parallel to each other.

The curvature imparted to the axle a extends in a single curve from one end to the other thereof, and the collars b move equally therewith in proportion to the load.

It is obvious that the above described mode of construction can be extended to support a cylinder by a greater number of bearings, according to the length of the cylinder, or to the load which the cylinder has to carry or to resist, the principle being the same in all cases, the exact spacing of the bearings depending on finding in their supporting shaft or tube those points of deflection which are equal to one another under a load that is equally distributed along the enveloping tube or cylinder and is transmitted through the said bearings to the shaft or tube by which they are supported.

Figs. 8 and 9 show an arrangement in which there are three tubes or cylinders d , g and g^1 concentric with the shaft a , the additional outer cylinder g^1 being supported by eight bearings. The compound cylinder shown in this arrangement embodies a slightly modified form of construction inasmuch as the tubes d , g , g^1 are supported respectively by the annular bearings b^2 , e^2 and f^2 formed on the inner surfaces of the said tubes. The bearings f^2 are arranged equidistant from each other and at equal distances on each side of the four bearings e^2 on the tube g , the latter bearings being in like manner arranged equidistant from each other and at equal distances on each side of the two bearings b^2 on the tube d . As the shaft a is the primary beam and has to bear the whole load or offer the whole resistance, it should be made strong enough to enable it to do so.

To admit of the collars or bearings being readily arranged at the required positions, they may in some cases be made endwise adjustable on the shaft or tube carrying them, as shown for example in the detail view Fig. 1^a, wherein the collar *b* surrounds two rings *u* and *v* that are of wedge shape in axial section and whereof *v* is rigidly fixed to the shaft *a*, the collar *b* and ring *u*, which are split axially, being endwise adjustable by means of screws *w* and *x* respectively that engage them and work through a flange *v'* on the ring *v*. Also the collars may be split and provided with means such as adjustable cones, wedges or other like devices, to secure a tight connection between each tube or cylinder and the supporting axle or tube therefor. Figs. 10, 11 and 12 show an arrangement of this kind. In this case, each of the two end portions of the shaft *a* in proximity to the two bearings *b* to be supported thereon is screw threaded at 1 and fitted with a nut 2 which may have recesses 3 therein to facilitate its rotation. Between each nut 2 and a shoulder 4 on the shaft *a* is a split ring 5 that is coned internally to fit a correspondingly cone-shaped portion 6 of the shaft and has a cylindrical outer surface so that it is of wedge shape in axial section. Surrounding each of these rings 5 are two concentrically arranged split bearing rings 7 and 7^a the engaging surfaces of which are respectively concave and convex. Between the rings 7, 7^a and the shoulder 4 on the shaft, is a distance ring 4^a that is recessed internally to accommodate the ring 5.

The intermediate tube *d* is placed in its correct position over the bearing rings 7, 7^a while the same are contracted after which the nuts 2 are rotated to force the wedge-rings 5 between the bearing rings 7—7^a and the cone portions 6 of the shaft *a* whereby the said rings are expanded and a tight connection produced between the tube *d* and the shaft *a*.

The bearings for the working cylinder *g* comprise four split rings 8 each of which has a concave inner surface and is sprung over a correspondingly shaped outer collar 8^a on the adjacent longitudinally split end of one or other of three sleeves 9, 9^a, 9^b which are made a sliding fit on the tube *d*. The intermediate sleeve 9^b has a collar 8^a at each end thereof while each of the two outer sleeves 9 and 9^a has a collar 8^a on its outer end only. The inner surface of the central sleeve 9^b, within each collar 8^a thereon, is of cone-shape for the reception of a wedge-like surface formed by the tapered end portion 10 of the adjacent outer sleeves 9 or 9^a, and the outer end portion of each sleeve 9, 9^a is also coned internally within the collar 8^a thereon for the reception of the coned inner end of a tightening up sleeve 11 that is arranged to be forced endwise by suitable means such as a nut 12

screwed onto the corresponding end of the tube *d* and which nut has recesses 13 therein to facilitate its being readily rotated. The working cylinder *g* is placed in its proper position over the bearing rings 8 while the latter are in their contracted condition, after which the nuts 12 are tightened up simultaneously so as to force the coned ends of the sleeves 9, 9^a into the coned split ends of the sleeve 9^b and the coned ends of the rings 11 into the coned split ends of the sleeves 9, 9^a and thereby force the split bearing rings 8 into firm engagement with the inner surface of the cylinder *g*, thereby firmly connecting the said cylinder to the tube *d*.

Means, such as the well known method of keying, may also be provided, irrespective of hereinbefore described frictionally operating devices, for causing the working cylinder *g* or *g'* to revolve with the shaft *a*, and also for preventing any endwise movement of the said cylinder in relation to such shaft, without interfering with the free deflection of the latter and the other supporting beams. The axle journals *a'* should be supported in bearings *a''* mounted so as to keep in alinement with the shaft notwithstanding bending of the latter.

By the construction described any want of homogeneity in the materials used in the construction of the compound cylinder can be compensated for, and the parallelism of the working surface of the working cylinder *g* or *g'* under the action of a load, can be carried to and maintained at any desired degree of accuracy notwithstanding variations in the amount of the load, so that an even pressure, or conversely an even resistance, can be produced or offered at any desired number of points in the line of contact or working part of the face of the cylinder, although the cylinder may be of great length in proportion to its diameter.

The above mode of construction can be employed in connection with a cylinder the load upon which is unequally distributed along the working surface thereof, by adjusting the collars or bearings along their supporting shaft and tube or shaft and tubes, or equivalents, to those points which receive an equal deflection under such load.

What I claim is:—

1. A cylinder suitable for printing or other purposes requiring equally distributed rolling pressure, comprising a central beam or axle adapted to be supported at both ends, a plurality of outer beams arranged around the said central beam, the outermost beam having a cylindrical surface, and a plurality of bearings arranged between said beams and between the respective ends thereof so as to form fulcra for each enveloping beam and leave the latter free to deflect on each side of said bearings.

2. A cylinder suitable for printing or other purposes requiring rolling pressure, comprising a central beam, a plurality of tubular beams arranged concentrically to each other and to the central beam, and groups of bearings between the several beams, the bearings in each group being arranged at those parts of their respective carrying beams which, by reason of the relative position of its bearings, are free to deflect under the action of a load transmitted from the working surface of the cylinder.

3. A cylinder suitable for printing or other purposes requiring rolling pressure, comprising a central beam adapted to be supported at both ends, a second beam surrounding said central beam and supported thereby at points arranged between its ends and equidistant from its center but not at its center, and a tubular beam surrounding said second beam and supported thereon at a plurality of points of its length that are arranged out of line with those points at which the second beam is supported and so as to leave the ends of said tubular beam unsupported.

4. A cylinder suitable for printing or other purposes requiring rolling pressure, comprising a central beam adapted to be supported at both ends, a second beam surrounding said central beam and supported thereby at two points only arranged equidistant from its ends and a third beam surrounding the second beam and supported thereon at points intermediate and outside of the supports for the second beam.

5. A cylinder suitable for printing or other purposes requiring rolling pressure, comprising a central beam adapted to be supported at both ends, a plurality of beams surrounding said central beam and carried thereby and the outer of which is of cylindrical shape, and bearings between said beams, the bearings between the outermost and next inner beam being arranged at those parts of the latter which are not directly supported by bearings.

6. A cylinder suitable for printing or other purposes requiring rolling pressure, comprising a central member adapted to be supported at both ends, an intermediate member surrounding the central member and supported thereon at two points arranged at equal distances from the center thereof, and a tube surrounding the intermediate member and supported thereby at four points arranged at equal distances from and at opposite sides of the bearing points for the intermediate member.

7. A cylinder suitable for printing or other purposes requiring rolling pressure, comprising a central beam adapted to be supported at both ends, a plurality of beams arranged around the central beam, and groups of bearings between the several beams, the number of bearings in the successive groups increas-

ing in a direction from the central beam outwardly and the bearings in each group being arranged out of line with those in an adjacent group or groups.

8. A cylinder suitable for printing or other purposes requiring rolling pressure, comprising a central shaft, a plurality of concentrically arranged tubes around said shaft, and groups of bearings between said shaft and tubes, the number of bearings in the successive groups increasing in a direction from the shaft outward, and the bearings in each group being arranged at those parts of the shaft or tube carrying them which receive equal portions of the whole of the load on the cylinder and move equally under the action of such load.

9. A cylinder suitable for printing or other purposes requiring rolling pressure, comprising a central beam adapted to be supported at both ends, a plurality of beams arranged around the central beam, and groups of bearings between the several beams, the number of bearings in the successive groups being in geometrical progression.

10. A cylinder suitable for printing or other purposes requiring rolling pressure, comprising a central beam adapted to be supported at both ends, a plurality of concentric beams arranged around the central beam, and groups of bearings between the successive beams, the group of bearings between the central beam and the next outer beam comprising two bearings arranged symmetrically with reference to the center of the central beam and the bearings in each outer group being double in number to the next adjacent inner group and arranged symmetrically to such inner bearings, but always so as to leave the ends of each supported concentric beam projecting beyond its outermost bearings.

11. A cylinder suitable for printing or other purposes requiring rolling pressure, comprising a central beam adapted to be supported at both ends, a cylinder surrounding said beam, means for supporting said cylinder from said beam at points intermediate the length of said cylinder and at those points in the length of said beam having equal moments of resistance, and driving means between said central beam and the ends of said cylinder.

12. A cylinder suitable for printing or other purposes requiring rolling pressure, comprising a central beam adapted to be supported at both ends, a cylinder surrounding said beam, means for supporting said cylinder from said beam at two points arranged between the ends of said cylinder and equidistant from the center of said cylinder, and driving plates fixed to said central beam and arranged to engage the ends of said cylinder, and drive the same without preventing movement thereof toward said central beam.

13. A cylinder suitable for printing or

other purposes requiring rolling pressure, comprising a central beam adapted to be supported at both ends, a plurality of beams arranged concentrically around said central beam, the outer of which is of cylindrical shape, and groups of bearings arranged between said beams, the bearings in each group being arranged at those points in the supporting beam or beams having equal moments of resistance.

14. A cylinder suitable for printing or other purposes requiring rolling pressure, comprising concentrically arranged beams the outer of which is of cylindrical shape, bearings arranged at intervals between said beams at those points of the supporting beams having equal bending moments under the action of a load distributed along said cylinder, and means for adjusting said bearings to insure a tight connection between them and their supporting and supported members.

15. A cylinder suitable for printing or other purposes requiring rolling pressure, comprising a central shaft adapted to be supported at both ends, an outer cylinder, an intermediate tubular member, bearings between said parts, and means for adjusting the positions of said bearings and insuring a tight connection between them and their supporting and supported members.

16. A cylinder suitable for printing or other purposes requiring rolling pressure, comprising concentrically arranged beams the outer of which is of cylindrical shape, interposed split annular bearings, split wedge rings adapted to enter said annular bearings, and means for forcing such wedge rings between said bearings and their supporting members.

17. In a cylinder suitable for printing or other purposes requiring rolling pressure, a central beam adapted to be supported at both ends, an outer tubular member, interposed split fulcrum and wedge rings, and means for causing said wedge rings to contract upon their supporting members and the said fulcrum rings to expand against their supported members.

18. A cylinder suitable for printing or other purposes requiring rolling pressure, comprising a central supporting shaft adapted to be supported at both ends and having at opposite sides of its center screw-threaded portions fitted with nuts, coned portions fitted with split wedge rings, and shoulders between which and said wedge rings are distance rings, a cylinder surrounding said shaft, and split bearing rings supported on said wedge rings and supporting said cylinder at two points, said bearing rings being arranged to be forced against said cylinder by said wedge rings, by adjustment of said nuts.

19. A cylinder suitable for printing or

other purposes requiring rolling pressure, comprising a central supporting shaft adapted to be supported at both ends and having at each side of its center screw threaded portions fitted with nuts, coned portions fitted with split wedge rings, and abutments between which and said wedge rings are distance rings, an outer cylinder, and pairs of inner and outer split bearing rings, supported on said wedge rings and supporting said cylinder at two points equidistant from its center, each pair of bearing rings having convex and concave engaging surfaces and being adapted to be expanded by axial movement of said wedge rings.

20. A cylinder suitable for printing or other purposes requiring rolling pressure, comprising a central supporting shaft having at opposite sides of its center screw threaded portions fitted with nuts, coned portions fitted with split wedge rings and abutments between which and said wedge rings are distance rings, a tubular member surrounding said parts, pairs of inner and outer split bearing rings having convex and concave engaging surfaces and arranged to support said tubular member at two points equidistant from its center, an outer or working cylinder, and four bearings arranged between said tubular member and outer cylinder and so as to be equidistant from each other and at equal distances on each side of the bearing rings between said shaft and tubular member.

21. A cylinder comprising a central shaft adapted to be supported at both ends, an intermediate tubular member, bearings arranged to support said tubular member from said shaft at two points equidistant from the center thereof, an outer working cylinder, split bearing rings arranged between said tubular member and outer working cylinder and carried by sleeves that are endwise adjustable on said intermediate member and have internally coned split ends, wedge rings arranged to move endwise on said intermediate member and to enter the coned ends of said sleeves, and means for forcing the wedge rings into the coned ends of said sleeves so as to expand the same and the bearing rings thereon.

22. A cylinder comprising a central shaft adapted to be supported at both ends, an intermediate cylinder having externally screw threaded end portions, bearings arranged to support said cylinder from said shaft at two points equidistant from the center thereof, an intermediate and two outer sleeves mounted to slide endwise on said cylinder and having internally coned split ends, split bearing rings mounted on the split ends of said sleeves, cone shaped rings mounted to slide endwise on said cylinder and having coned ends extending into the coned ends of said sleeves, an outer working cylinder surround-

ing said intermediate cylinder and bearings,
and nuts screwed onto the screw threaded
portions of said intermediate cylinder and
adapted to force the coned rings into the
5 coned ends of the sleeves and expand the
same and thereby force the bearing rings
into position against the outer cylinder.

Signed at 42 Claremont Square London
E. C. this twenty eighth day of June 1907.

WILLIAM LOVE.

Witnesses:

AUBER CRAWLE PEARSON,
GEORGE COCKERELL.