No. 616,434. Patented Dec. 20, 1898.

W. COULTER.

CALENDER FOR RUNNING OUT SHEET INDIA RUBBER.

(Application filed Dec. 30, 1897.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

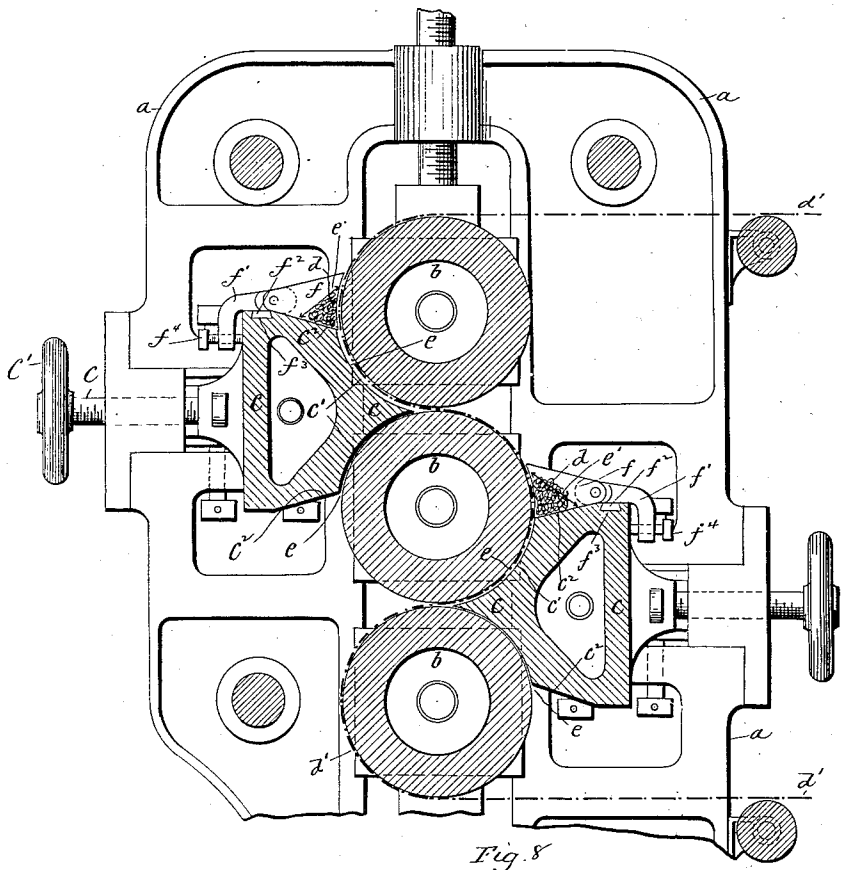


Fig. 8

Fig. 6

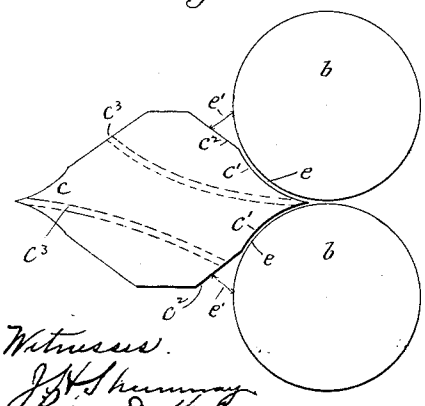
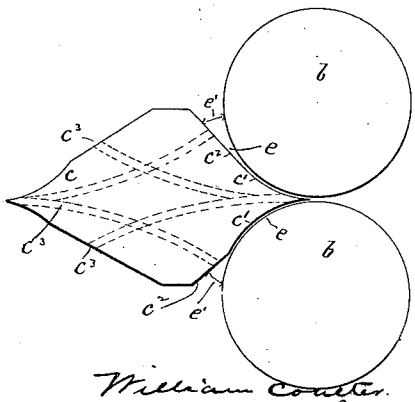


Fig. 7



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(No Model.) 3 Sheets—Sheet 2.

Fig. 2

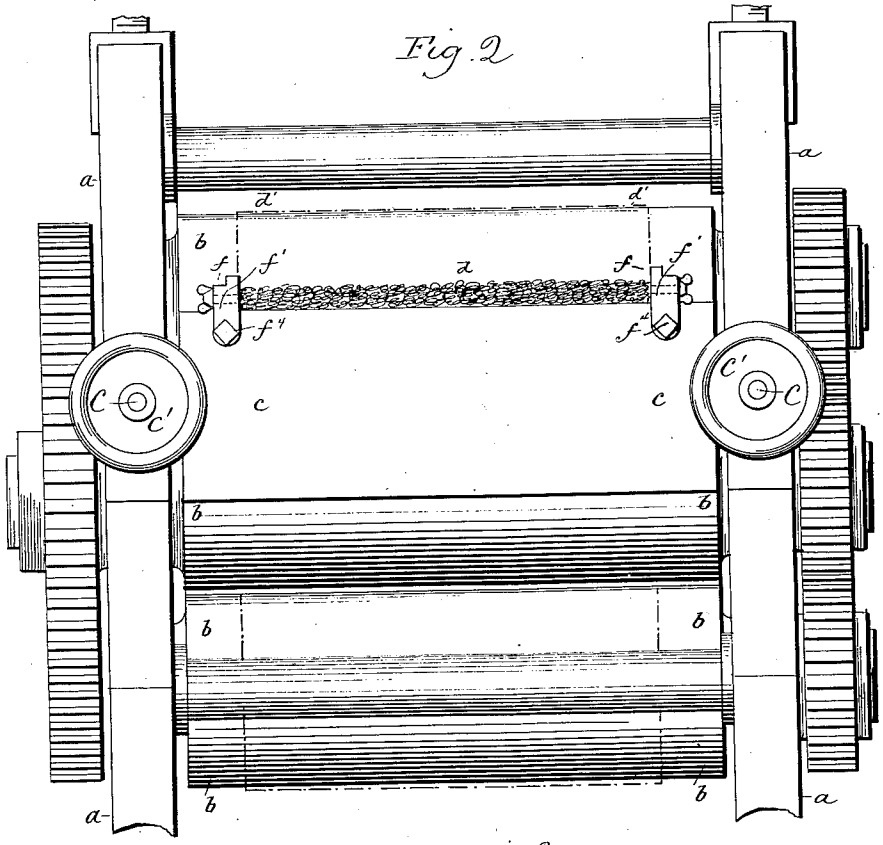
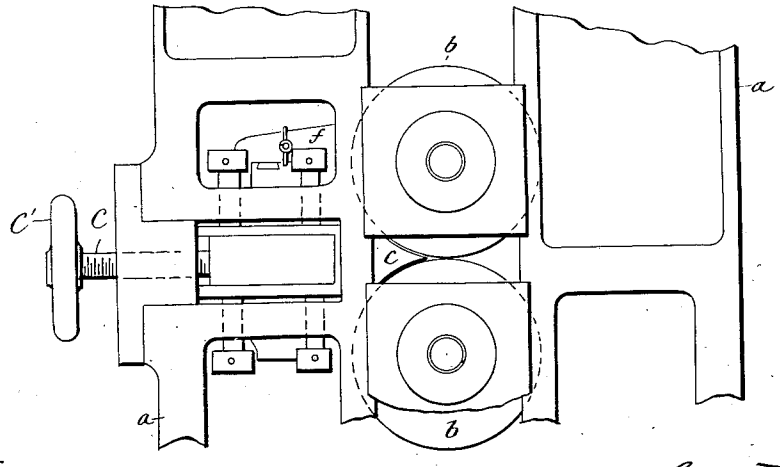


Fig. 3



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CALENDER FOR RUNNING OUT SHEET INDIA RUBBER.

(Application filed Dec. 30, 1897.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 4

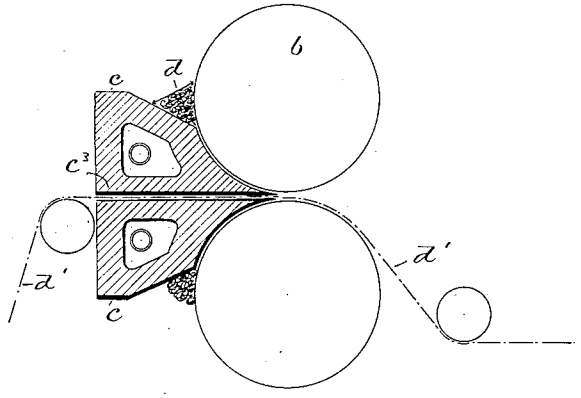
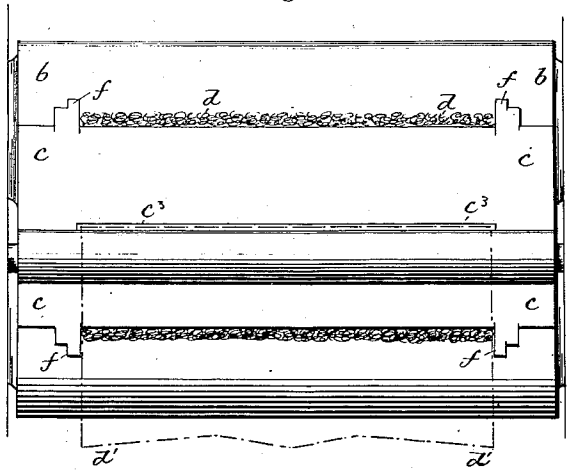


Fig. 5



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UNITED STATES PATENT OFFICE.

WILLIAM COULTER, OF MANCHESTER, ENGLAND, ASSIGNOR TO THE BIRMINGHAM IRON FOUNDRY, OF DERBY, CONNECTICUT.

CALENDER FOR RUNNING OUT SHEET INDIA-RUBBER.

SPECIFICATION forming part of Letters Patent No. 616,434, dated December 20, 1898.

Application filed December 30, 1897. Serial No. 664,633. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM COULTER, of Manchester, in the county of Lancaster, England, have invented a new Improvement in Calenders for Running Out Sheet India-Rubber, (for which I have obtained a patent in Great Britain, No. 17,145, bearing date August 4, 1896;) and I do hereby declare the following, when taken in connection with the accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification.

This invention relates to improvements in calenders used for running out sheet india-rubber, and has for its object the application of an angled gage or gages in the form of a V in the space of the nip of the calender bowls or rollers, between the face of which gage or gages and the face of the roller or rollers the masticated india-rubber is passed under control before going into the nip of the rollers to be run out into a sheet, whereby the india-rubber is spread more uniformly, smoothly, and is less porous, the air being squeezed out of the same before or during the process of running either onto a piece of tissue for waterproof, air-proof, or mechanical insertion or into a solid sheet of rubber for elastic thread, pneumatic or mechanical purposes.

In the accompanying drawings, Figure 1 represents a view in vertical section of one form which a machine containing my invention may assume; Fig. 2, a broken view thereof in rear elevation; Fig. 3, a broken end view thereof; Fig. 4, a sectional view showing one of the modified forms of gage that I may employ; Fig. 5, a rear view of the parts shown by Fig. 4; Figs. 6, 7, and 8, views showing still other modifications.

Referring to the figures generally, *a* is the frame; *b*, the bowls or rollers of the calender; *c*, the gage or gages; *d*, the india-rubber to be run out in sheet form, and *d'* a piece of tissue running between the rollers.

At present the usual practice is to feed the india-rubber direct into the nip of the rollers, which in my invention I may do in the first nip and apply the said gage in the second or third nip. However, by preference I feed the india-rubber between the face of the gage and the face of the top or first and second roller and use additional gages in connection with the remaining nips, if requisite, as shown in Figs. 1 and 2, according to the class of work to be produced or when running more than one coat or producing more than one piece at the time.

The face of the gage or gages *c* are formed in V fashion, the part *c'* next to the roller *b* being made to conform with the diameter or periphery of the same, similar to the ears hitherto used to control the rubber coil *d* in width, and forms a passage or slot *e* for the rubber to pass through under control, while the other part c^2 of the face is made straight and forms a space *e'* for the rubber coil *d* to revolve in. The said gage or gages may be applied either to the front or back of the calender and to one or more or all of the nips at the same time and be fed with the india-rubber either under or over the gage before going through the nip or the rollers.

In producing solid sheet-rubber I may use a gage or gages the face part *c'* of which is made comparatively broad, so as to thoroughly intermix the india-rubber and compounds when passing between the same and the rollers it is bearing upon, or a narrow one may be applied where pure rubber is used for coating fine work.

The gage or gages *c* are adjustably secured to the frame *a* at each end, so as to allow of setting the same nearer to or farther away from the roller *b*, and thereby vary the size of the passage or slot *e* in accordance with the thickness of the sheet of rubber to be run out or required gage or count of same. As shown, adjusting-screws C, provided with hand-wheels C', are connected with the ends of the gages *c* for the purpose indicated.

In lieu of passing the tissue *d'* between the surface of the gage *c* and surface of the roller *b* I may pass the same through a slot c^3 formed through the body of the gage *c*, and thus coat both sides of the tissue *d'* simultaneously, which enables me to produce insertion-work with a calender having two rollers only. I may here mention that when the rubber or composition being worked is fed both from the upper and lower concave sur-

faces of the gage the strains imposed upon the gage and tending to bend it are equalized. The said gage or gages may be formed with two or more V's or angles, as shown in Figs. 6 and 7, and be adapted to be reversed so as to bring the requisite angle into action. To avoid the said gage or gages springing in the center, I may back it up with a cross-bar and bring screw-pressure to bear upon the middle, preferably from the frame of the calender, to stay it during the running out of the india-rubber, as will be readily understood. By preference I make the said gage or gages hollow, so as to allow of heating or cooling the same, as may be required for certain classes of work.

If deemed necessary, the rollers *b* may be covered with paper or india-rubber composition, and it will be obvious that when running out a solid sheet of rubber the tissue *d'*, running between the rollers *b*, will be dispensed with.

In order to control the rubber coil *d* in width, I employ ears or side pieces *f*, forming width-gages which are rendered longitudinally adjustable, preferably upon the gage *c*, as shown in Figs. 1 and 2.

As herein shown, the parts *f* are pivotally attached to slides *f'*, formed upon their lower faces with dovetail ribs f^2, which run in dovetail grooves f^3 formed in the upper faces of the gages, on which the slides may be moved toward and away from each other, as desired, being secured in any desired positions of adjustment by means of set-screws mounted in the depending outer ends of the slides and impinging againt the outer faces of the gages, as clearly shown in Fig. 1.

By corrugating or grooving the face part *c'* of the gage *c*, as shown in Fig. 8, corrugated, grooved, or ribbed sheets of rubber with or without tissue backing may be produced, in which case the nips of the rollers will remain open, so as not to destroy the pattern produced. Gages grooved as just suggested may be employed to great advantage in producing the rubber employed to face corrugated pneumatic bicycle-tires.

Although I have entitled my invention as an "Improvement in calender-rolls for rubber-mills," I would like to add that I conceive that my invention may be used in the production of sheet metal from ingots, for it is obvious that metal in a fluid or plastic condition would be unified and solidified and freed from air in the same way that rubber or other compositions would be.

In view of the modifications shown and described and of others which may obviously be made, I would have it understood that I do not limit myself to the constructions herein shown, but hold myself at liberty to make such changes and alterations as fairly fall within the spirit and scope of my invention.

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

1. A gage for use in conjunction with the rolls of mills, the said gage having concave upper and lower faces, and adapted to enter into the "nip" of two coacting rolls to form narrow passages between the concave faces of the gages and the surfaces of the rolls.

2. A gage for use in conjunction with the rolls of mills, the said gage having concave upper and lower faces, and adapted to enter into the "nip" of two coacting rolls to form narrow passages between the concave faces of the gage and the surfaces of the rolls, and means for adjusting the gage toward and away from the rolls for increasing or decreasing the size of the said passages.

3. A gage for use in conjunction with the rolls of mills, the said gage having concave upper and lower faces, and adapted to enter into the "nip" of two coacting rolls to form narrow passages between the concave faces of the gage and the surfaces of the rolls, and width-gages adjustably applied to the said gage, and set thereupon to conform to the width of the sheet to be produced.

4. In a rubber-mill, the combination with the calender-rolls thereof, of one or more gages having their upper and lower faces concaved in conformity with the curvature of the rolls, to adapt them to enter into the "nips" of the rolls, and form narrow passages between the surfaces of the rolls and their concave surfaces, the material being worked by the mill passing through the said passages and being therein unified, solidified and freed from air.

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

WILLIAM COULTER.

Witnesses:
FERD. BOSSHARDT,
STANLEY V. BRAMALL.