W. L. SPOON.

BALE AND BALE TRUNK.

APPLICATION FILED SEPT. 10, 1901.

963,955.

Patented July 12, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

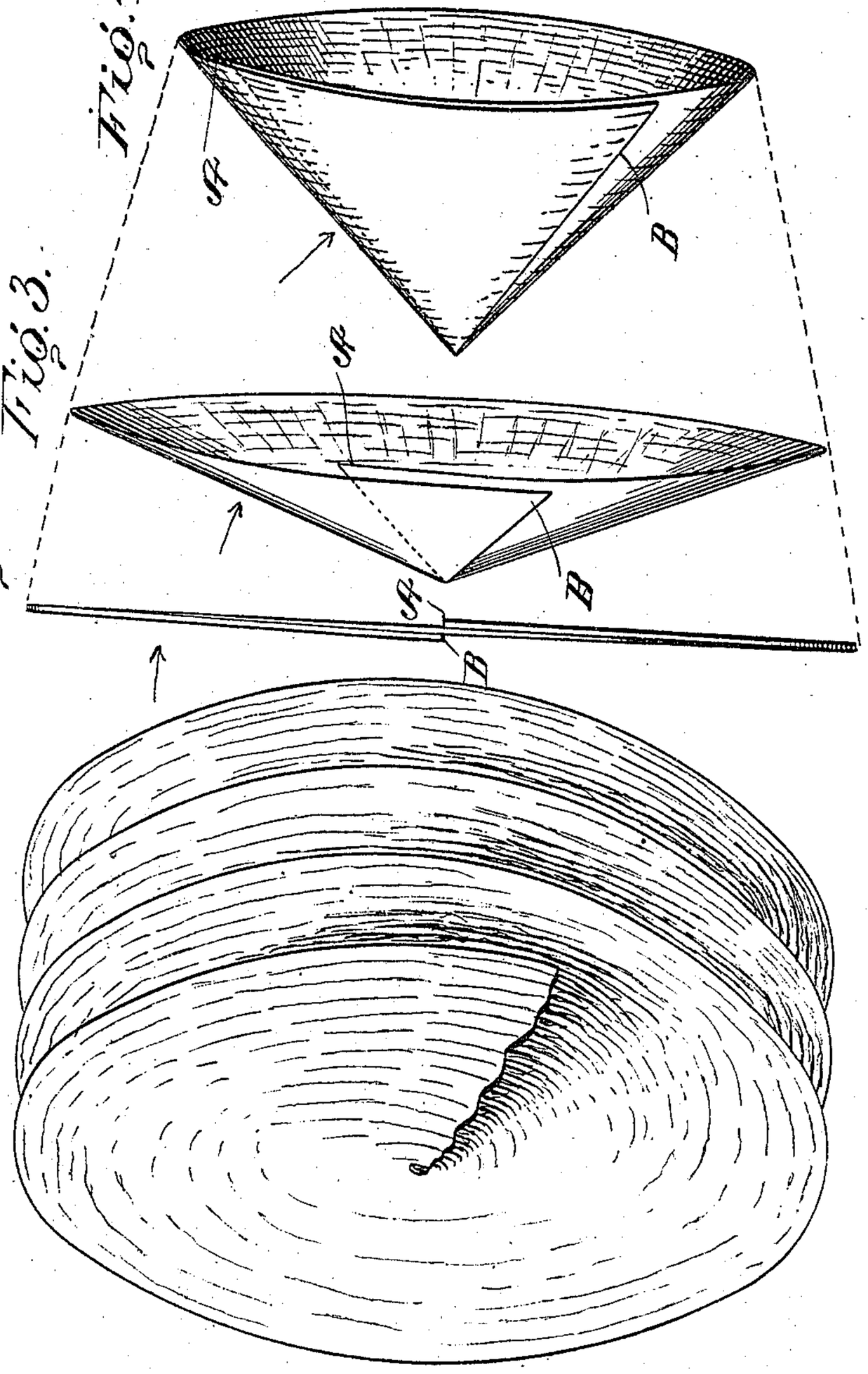

Fig. 2.

Fig. 3.

Fig. 4.

Witnesses

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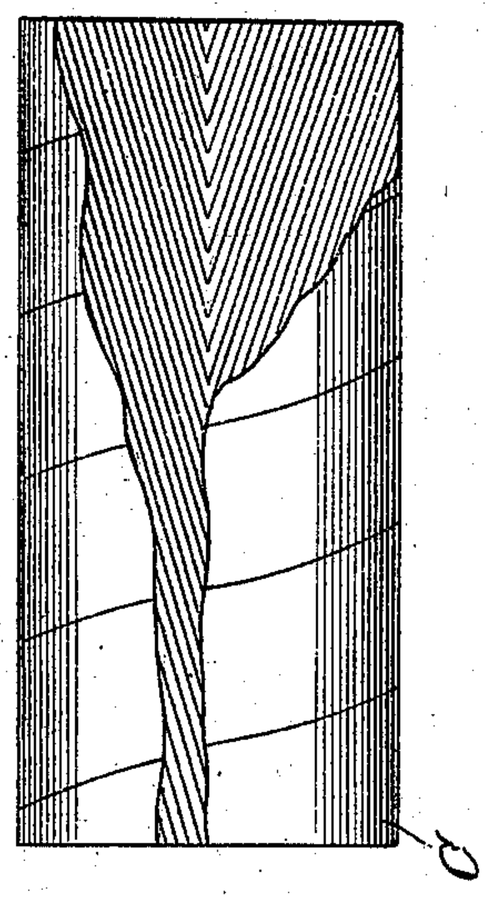
2 SHEETS—SHEET 2.

Fig. 7.



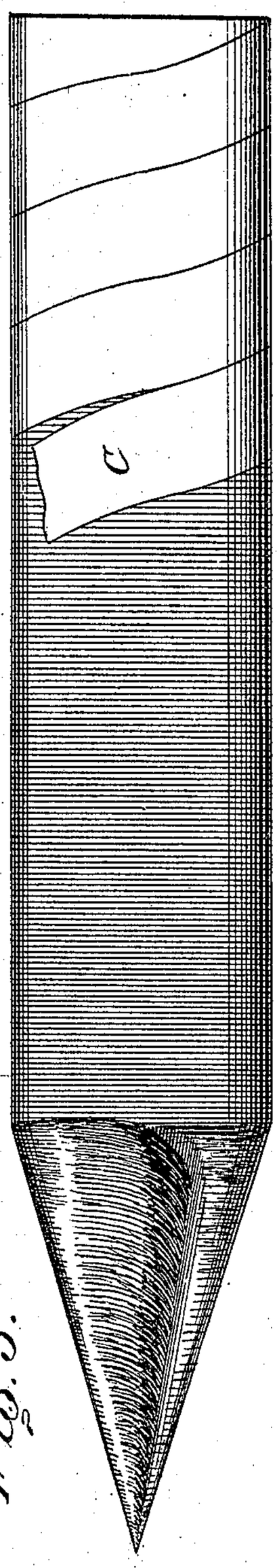


Fig. 10.

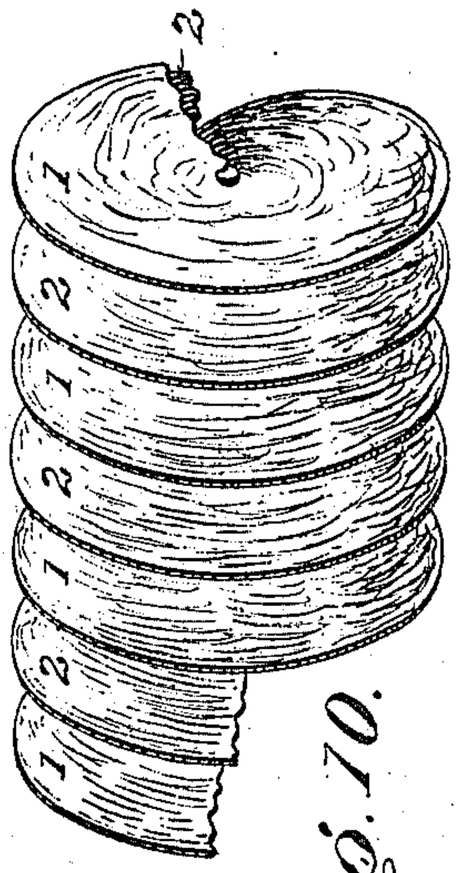


Fig. 8.

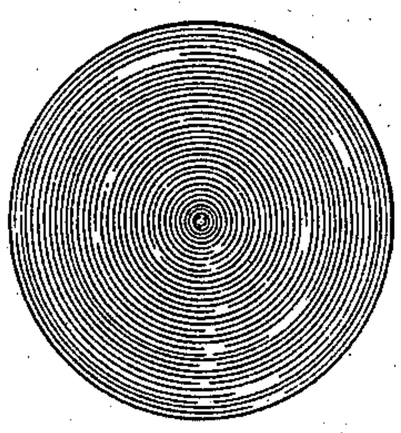


Fig. 6.

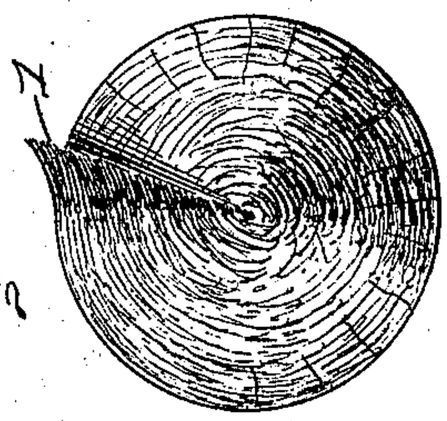
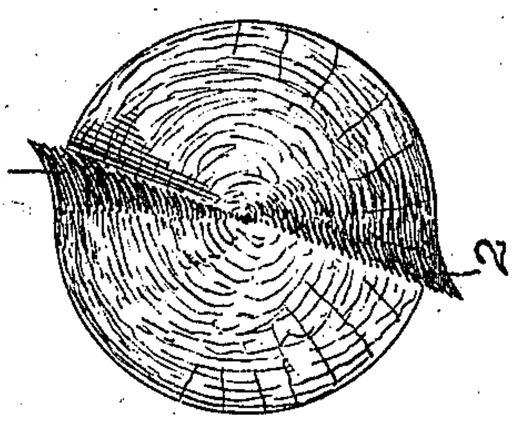


Fig. 5.

Fig. 9.



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WILLIAM L. SPOON, OF COBLE TOWNSHIP, ALAMANCE COUNTY, NORTH CAROLINA.

BALE AND BALE-TRUNK.

963,955. Specification of Letters Patent. **Patented July 12, 1910.**

Original application filed October 24, 1896, Serial No. 609,902. Divided and this application filed September 10, 1901. Serial No. 74,985.

To all whom it may concern:

Be it known that I, WILLIAM L. SPOON, a citizen of the United States, residing at Coble township, in the county of Alamance and State of North Carolina, have invented a new and useful Improvement in Bales and Bale-Trunks of Fibrous Material, of which the following is a specification, reference being had to the accompanying drawing.

My invention relates particularly to the baling of cotton and similar fibrous materials which have relatively high commercial values and require to be well preserved from the time and place of harvesting to the time and place of use in mill or factory. The most important of these fibrous materials is cotton.

My improved bale is a "round" or cylindrical bale having characteristics to be hereinafter described.

In the forming of my bale, the cotton is taken continuously, in small quantities (a thin sheet-form stream), from a loose or unorganized mass of cotton and formed, organized, or fabricated into a bat or sheet of substantial continuity and uniformity of thickness, and in organizing the sheet and applying it, the fibers are more or less "paralleled" and "drawn" or intertwined. And such sheet is made quite thin. And the operation of forming or organizing said sheet or bat varies gradually in rapidity from one edge of the sheet to the other, such variation being from substantially zero at one margin or edge to the maximum rapidity at the opposite edge. On account of such variation in rapidity, the sheet assumes a spiral form, with one edge directed toward the axis of the spiral. Such operation, as a whole, results in forming, organizing or fabricating a thin, spiral sheet, of substantial continuity and even thickness from edge to edge and from end to end and having its fibers paralleled and drawn or intertwined. For convenience, said sheet is hereinafter termed a "spiral sheet", and the stream of fibers from which said sheet is formed is termed a "sheet-spiral" stream. If the rapidity of formation at one edge of the sheet approximates zero, said edge will extend approximately to the axis of the spiral. Said edge may be termed the inner or "axial" edge, and the opposite edge may be termed the outer or "peripheral" edge. And as the sheet is being so formed and organized, it is preferably subjected to an initial or preliminary compression, whereby it is made dense and the air is expelled, and, subsequent to such initial compression, said sheet is, preferably, kept under tension, for the maintenance of such compression and exclusion of air and for the further "drawing" of the fiber and for the placing of the sheet or bat upon the forming bale or bale-trunk under tension. For the forming of the bale (or bale-trunk which may be severed into sections constituting bales), the convolutions of said spiral sheet are, as fast as the sheet is formed, laid closely or densely against each other by suitable pressure, the axial edge of the sheet extending approximately to the axis of the bale and the peripheral edge of the sheet extending to the perimeter of the bale. And the sheet is preferably laid against the preceding mass, increment by increment, in such manner and with such pressure as to at once attain the full density which it is sought to impart to the completed bale. For convenience in description, such density may be termed "complete" density. Usually "complete" density should be approximately the highest density which the cotton can endure without injury. As already stated, the bat or sheet is preferably given an initial compression for the attainment of density and expression of air. When this is done, on being laid against the end of the bale-trunk the pressue required for the final compression to attain "complete" density, may be much reduced on account of such initial compression.

As already indicated, the spiral sheet is progressively applied to or built upon the end of the forming bale or bale-trunk. Hence the bale may be termed an "end-formed" or "end-built" bale.

For a form of press adapted to make my improved bale and bale-trunk, I refer to my application Serial No. 609,902, filed in the United States Patent Office, October 24, 1896, of which application this application is a division.

In the accompanying drawings, Figure 1 is a perspective view of a portion of the spiral sheet used in forming my bales; Fig. 2 is an edge elevation of a single convolution of said spiral sheet; Fig. 3 is the same convolution in obtuse conical form; Fig. 4 illustrates the same convolution in less obtuse conical form; Fig. 5 is a side elevation of a

bale-trunk embodying my improvement; Fig. 6 is an elevation of the left hand or forming end of the bale-trunk shown in Fig. 5; Fig. 7 is a sectional side elevation of a bale severed from the right hand end of the bale-trunk shown by Fig. 5; Fig. 8 is an end elevation of the bale shown by Fig. 7; Fig. 9 is an elevation of the forming end of a bale-trunk which is being formed by the simultaneous application of two spiral sheets or bats; Fig. 10 is a perspective view of sections of such two spiral sheets.

Since the nature of my bale may be best understood by considering the method of forming it, such method will be further described by reference to the drawings.

In Fig. 1 of the drawings, a spiral sheet or bat of which the bale is formed is illustrated in perspective, and Figs. 2, 3, 4, and 5 illustrate the placing of such sheet in the bale-trunk. The sheet is always placed at an angle to the axis of the bale-trunk (which is also the axis of the spiral sheet). It may be most readily placed at an angle of approximately 90 degrees to said axis as shown in Fig. 2. To form Figs. 2, 3, and 4, a single convolution of the sheet is cut from the section of the sheet shown by Fig. 1. Such convolution is substantially a circular disk whose radius equals the width of the spiral sheet. Such a disk-form section, if arranged at an angle of substantially 90 degrees to the axis of the bale-trunk, would stand as shown in Fig. 2. But if said angle is to be less than 90 degrees, the section would change from disk-form to obtuse, conical form, the edges, A, B, of said section overlapping, as shown by Fig. 3. And it will be observed that the diameter of the base of such cone will be less than the diameter of the disk form of the section was. If said angle is to be still less, the section is formed into a cone which is still less obtuse, the edges, A, B, overlapping to a greater extent. And it will be observed that this will still further reduce the diameter of the base of the cone. In the bale-trunk shown in Fig. 5, the angle of the sheet and the diameter of the cone are still further reduced. And it will now be apparent, that, for a bat or sheet of a given width, the diameter of the bale-trunk varies with the angle which the sheet sustains to the bale-trunk axis. In these several gradations, illustrated by Figs. 1, 2, 3, 4, and 5, the sheet is the same in organization, nature, and dimensions. It is the identical sheet in different positions. And in laying the sheet, the final compression is always perpendicular to the sheet, as indicated by the arrows, so that when the angle of the layer is changed, the direction of the final pressure is correspondingly changed. Any inclination of the sheet will answer if it is intended to maintain the form of the bale only by external mechanical means—bands or other stays. Indeed, for this purpose, an angle of approximately 90 degrees is, perhaps, the best, for then the stays need be so applied as to act in only one direction, namely lengthwise of the bale. But I have found it desirable to so construct the bale as to adapt it to resist expansion. In other words, I have found it preferable to place the sheet or bat at such an angle to the axis of the bale-trunk as to cause each convolution to bear upon or bind a number of preceding convolutions, whereby the bale is made "self-binding." In such form, the convolutions become conical—strictly speaking, conodial, nearly conical—and said conoidal convolutions or layers are nested closely within each other. The attainment of such result is facilitated by the laying of the forming bat upon the end of the bale-trunk under tension as well as pressure. Not only does such tension increase the self-binding characteristic, but it makes possible the attainment of complete density with less final pressure than would be needed if such density were to be attained by pressure alone. This self-binding form of the bale is shown in Figs. 5, 6, 7, 8, and 9 of the drawings. And, as above indicated, the fibers in the spiral sheet are to a large extent "drawn" parallel, and intertwined, this result being accomplished by the operation described in my aforesaid application; and when it is desired to make the bale self-binding, the spiral sheet is also under tension.

From the completed end of the bale-trunk—the end opposite the end to which the forming bat or sheet is applied—sections of proper length to constitute bales are severed periodically by cutting in a plane to which the bale-trunk axis is perpendicular. And in so severing the bale-trunk, the spiral sheet is cut slantwise, so as to leave a tapering end in the sheet at each side of the cut, wherefore each severed section or bale is composed of a sheet which is tapering at each end, or the bale is composed of convolutions or layers of the sheet; the end layers being tapering in form.

The completed bale-trunk or bale may be surrounded by any suitable extraneous binding or wrapping material or means for the sake of preserving the structure of the bale and for the sake of keeping the fibrous material of the bale from being bruised and soiled during handling or storage. I prefer to apply to such bale-trunk or bale a covering of cloth, C, as shown in Figs. 5 and 7, the cloth being an elongated sheet extending spirally and under tension, with the meeting edges overlapping, around the bale-trunk or bale.

I claim as my invention:

1. A bale of fibrous material composed of nested, self-binding layers.

2. A bale of fibrous material composed of nested self-binding layers, the layers at each end being tapering in form.

3. As an article of manufacture, a bale of fibrous material composed of a thin, spiral sheet of such material, said sheet being substantially continuous and of uniform thickness and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and the sheet being oblique to the bale axis, so that the convolutions of the sheet are of conoidal form and nested, substantially as described.

4. As an article of manufacture, a bale of fibrous material composed of a thin, spiral sheet of such material, said sheet being substantially continuous and of uniform thickness and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and the sheet being oblique to the bale axis, so that the convolutions are of conoidal form and nested, and said convolutions being closely compressed against each other and approximately free from air, substantially as described.

5. As an article of manufacture, a bale of fibrous material composed of a thin, spiral sheet of such material, the fibers being paralleled or drawn and said sheet being substantially continuous and of uniform thickness and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and the sheet being oblique to the bale axis so that the convolutions of the sheet are of conoidal form and nested, substantially as described.

6. As an article of manufacture, a bale of fibrous material composed of a thin, spiral sheet of such material, the fibers being paralleled or drawn, and said sheet being substantially continuous and of uniform thickness and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and the convolutions being conoidal and compressed against each other and under tension, substantially as described.

7. As an article of manufacture, a bale of fibrous material composed of a thin, spiral sheet of such material, said sheet being substantially continuous and of uniform thickness and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and the sheet being at such angle to the bale axis and under such tension as to render the convolutions of the sheet nested and the bale self-binding, substantially as described.

8. As an article of manufacture, a bale of fibrous material composed of a plurality of parallel, thin, spiral sheets of such material, each of said sheets being substantially continuous and of uniform thickness and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and each such sheet being oblique to the bale axis, so that the convolutions of the sheet are of conoidal form and nested, substantiallly as described.

9. As an article of manufacture, a bale of fibrous material composed of a plurality of parallel, thin, spiral sheets of such material, each of said sheets being substantially continuous and of uniform thickness and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and such sheets being oblique to the bale axis so that their convolutions are conoidal and nested, and said sheets being closely compressed against each other and approximately free from air, substantially as described.

10. As an article of manufacture, a bale of fibrous material composed of a plurality of parallel, thin, spiral sheets of such material, the fibers being paralleled or drawn, and each such sheet being substantially continuous and of uniform thickness inclined to the bale axis and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and said sheets being compressed against each other, substantially as described.

11. As an article of manufacture, a bale of fibrous material composed of a plurality of parallel, thin, spiral sheets of such material, the fibers being paralleled or drawn, each of said sheets being substantially continuous and of uniform thickness and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and the convolutions of said sheets being conoidal and compressed against each other and under tension, substantially as described.

12. As an article of manufacture, a bale of fibrous material composed of a plurality of parallel, thin, spiral sheets, each of said sheets being substantially continuous and of uniform thickness and the axial edge thereof extending to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and said sheets being at such angle to the bale axis and under such tension as to render the convolutions of the sheet nested and the bale self-binding, substantially as described.

13. As an article of manufacture, a bale of fibrous material composed of a thin, spiral sheet of such material, said sheet being usbstantially continuous and of uniform

thickness and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and the sheet being oblique to the bale axis, so that the convolutions of the sheet are of conoidal form and nested, and an extraneous binding member, substantially as described.

14. As an article of manufacture, a bale of fibrous material composed of a thin, spiral sheet of such material, said sheet being substantially continuous and of uniform thickness and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and the sheet being oblique to the bale axis, so that the convolutions are of conoidal form and nested, and said convolutions being closely compressed against each other and approximately free from air, and an extraneous binding member, substantially as described.

15. As an article of manufacture, a bale of fibrous material composed of a thin, spiral sheet of such material, the fibers being paralleled or drawn and said sheet being substantially continuous and of uniform thickness and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and the sheet being oblique to the bale axis so that the convolutions of the sheet are of conoidal form and nested, and an extraneous binding member, substantially as described.

16. As an article of manufacture, a bale of fibrous material composed of a thin, spiral sheet of such material, the fibers being paralleled or drawn, and said sheet being substantially continuous and of uniform thickness and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and the convolutions being conoidal and compressed against each other and under tension, and an extraneous binding member, substantially as described.

17. As an article of manufacture, a bale of fibrous material composed of a thin, spiral sheet of such material, said sheet being substantially continuous and of uniform thickness and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and the sheet being at such angle to the bale axis and under such tension as to render the convolutions of the sheet nested and the bale self-binding, and an extraneous binding member, substantially as described.

18. As an article of manufacture, a bale of fibrous material composed of a plurality of parallel, thin, spiral sheets of such material, each of said sheets being substantially continuous and of uniform thickness and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and each such sheet being oblique to the bale axis, so that the convolutions of the sheet are of conoidal form and nested, and an extraneous binding member, substantially as described.

19. As an article of manufacture, a bale of fibrous material composed of a plurality of parallel, thin, spiral sheets of such material, each of said sheets being substantially continuous and of uniform thickness and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and such sheets being oblique to the bale axis so that their convolutions are conoidal and nested, and said sheets being closely compressed against each other and approximately free from air, and an extraneous binding member, substantially as described.

20. As an article of manufacture, a bale of fibrous material composed of a plurality of parallel, thin, spiral sheets of such material, the fibers being paralleled or drawn, and each such sheet being substantially continuous and of uniform thickness inclined to the bale axis and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and said sheets being compressed against each other, and an extraneous binding member, substantially as described.

21. As an article of manufacture, a bale of fibrous material composed of a plurality of parallel, thin, spiral sheets of such material, the fibers being paralleled or drawn, each of said sheets being substantially continuous and of uniform thickness and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and the convolutions of said sheets being conoidal and compressed against each other and under tension, and an extraneous binding member, substantially as described.

22. As an article of manufacture, a bale of fibrous material composed of a plurality of parallel, thin, spiral sheets, each of said sheets being substantially continuous and of uniform thickness and the axial edge thereof extending to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and said sheets being at such angle to the bale axis and under such tension as to render the convolutions of the sheet nested and the bale self-binding, and an extraneous binding member, substantially as described.

23. A bale of fibrous material composed

of nested, self-binding layers, and an extraneous binding member, substantially as described.

24. A bale of fibrous material composed of nested, self-binding layers, the layers at each end being tapering in form, and an extraneous binding member, substantially as described.

25. As an article of manufacture, a bale of fibrous material composed of a thin, spiral sheet of such material, said sheet being substantially continuous and of uniform thickness inclined to the bale axis, and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and the convolutions of said sheet being closely compressed against each other, and an extraneous binding member extending spirally around the bale, substantially as described.

26. As an article of manufacture, a bale of fibrous material composed of a thin, spiral sheet of such material, said sheet being substantially continuous and of uniform thickness inclined to the bale axis, and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and the convolutions of said sheet being closely compressed against each other and approximately free from air, and an extraneous binding member extending spirally around the bale, substantially as described.

27. As an article of manufacture, a bale of fibrous material composed of a thin, spiral sheet of such material, said sheet being substantially continuous and of uniform thickness and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and the sheet being oblique to the bale axis, so that the convolutions of the sheet are of conoidal form and nested, and an extraneous binding member extending spirally around the bale, substantially as described.

28. As an article of manufacture, a bale of fibrous material composed of a thin, spiral sheet of such material, said sheet being substantially continuous and of uniform thickness and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and the sheet being oblique to the bale axis, so that the convolutions are of conoidal form and nested, and said convolutions being closely compressed against each other and approximately free from air, and an extraneous binding member extending spirally around the bale, substantially as described.

29. As an article of manufacture, a bale of fibrous material composed of a thin, spiral sheet of such material, the fibers being paralleled or drawn and said sheet being substantially continuous and of uniform thickness and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and the sheet being oblique to the bale axis so that the convolutions of the sheet are of conoidal form and nested, and an extraneous binding member extending spirally around the bale, substantially as described.

30. As an article of manufacture, a bale of fibrous material composed of a thin, spiral sheet of such material, the fibers being paralleled or drawn, and said sheet being substantially continuous and of uniform thickness and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and the convolutions being conoidal and compressed against each other and under tension, and an extraneous binding member extending spirally around the bale, substantially as described.

31. As an article of manufacture, a bale of fibrous material composed of a thin, spiral sheet of such material, said sheet being substantially continuous and of uniform thickness and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and the sheet being at such angle to the bale axis and under such tension as to render the convolutions of the sheet nested and the bale self-binding, and an extraneous binding member extending spirally around the bale, substantially as described.

32. As an article of manufacture, a bale of fibrous material composed of a plurality of parallel, thin, spiral sheets of such material, each of said sheets being substantially continuous and of uniform thickness and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and each such sheet being oblique to the bale axis, so that the convolutions of the sheet are of conoidal form and nested, and an extraneous binding member extending spirally around the bale, substantially as described.

33. As an article of manufacture, a bale of fibrous material composed of a plurality of parallel, thin, spiral sheets of such material, each of said sheets being substantially continuous and of uniform thickness and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and such sheets being oblique to

the bale axis so that their convolutions are conoidal and nested, and said sheets being closely compressed against each other and approximately free from air, and an extraneous binding member extending spirally around the bale, substantially as described.

34. As an article of manufacture, a bale of fibrous material composed of a plurality of parallel, thin, spiral sheets of such material, the fibers being paralleled or drawn, each of said sheets being substantially continuous and of uniform thickness and the axial edge thereof extending approximately to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and the convolutions of said sheets being conoidal and compressed against each other and under tension, and an extraneous binding member extending spirally around the bale, substantially as described.

35. As an article of manufacture, a bale of fibrous material composed of a plurality of parallel, thin, spiral sheets, each of said sheets being substantially continuous and of uniform thickness and the axial edge thereof extending to the axis of the bale and the peripheral edge thereof extending to the perimeter of the bale, and said sheets being at such angle to the bale axis and under such tension as to render the convolutions of the sheet nested and the bale self-binding, and an extraneous binding member extending spirally around the bale, substantially as described.

36. A bale of fibrous material composed of highly-compressed layers inclined to the bale axis superposed one upon the other in the form of a continuous spiral, and an extraneous binding member extending spirally around the bale, substantially as described.

37. A bale of fibrous material composed of nested, self-binding layers, and an extraneous binding member extending spirally around the bale, substantially as described.

38. A bale of fibrous material composed of nested, self-binding layers, the layers at each end being tapering in form, and an extraneous binding member extending spirally around the bale, substantially as described.

In testimony whereof I affix my signature, in presence of two witnesses, this sixteenth day of August, in the year one thousand nine hundred and one.

WILLIAM L. SPOON.

Witnesses:
W. I. OLIVER,
A. F. YOUNG.