No. 672,394. Patented Apr. 16, 1901.

H. L. DUNCAN.

BALING PRESS.

(Application filed Feb. 16, 1901.)

(No Model.)

Fig. 2.

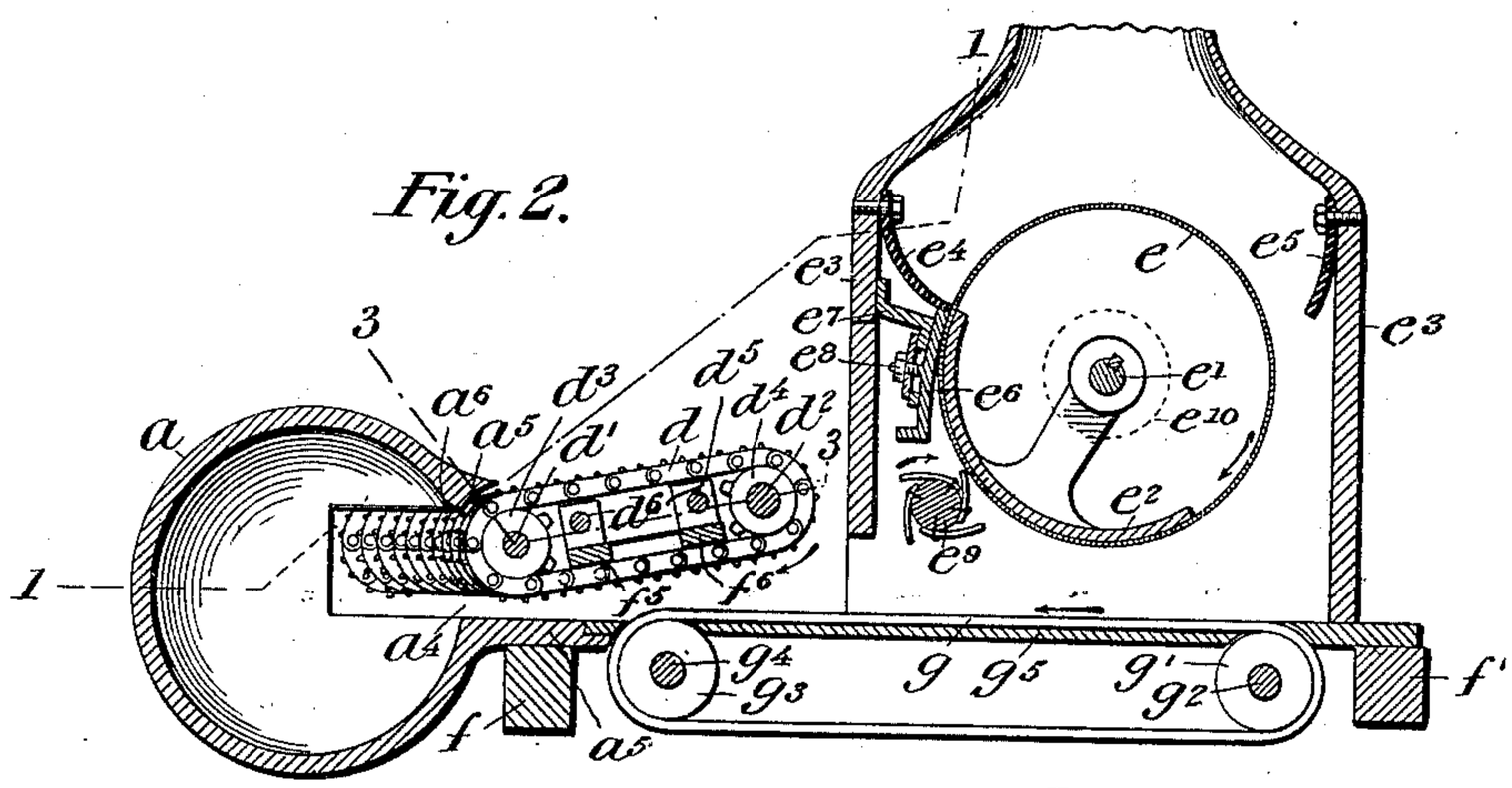


Fig. 1.

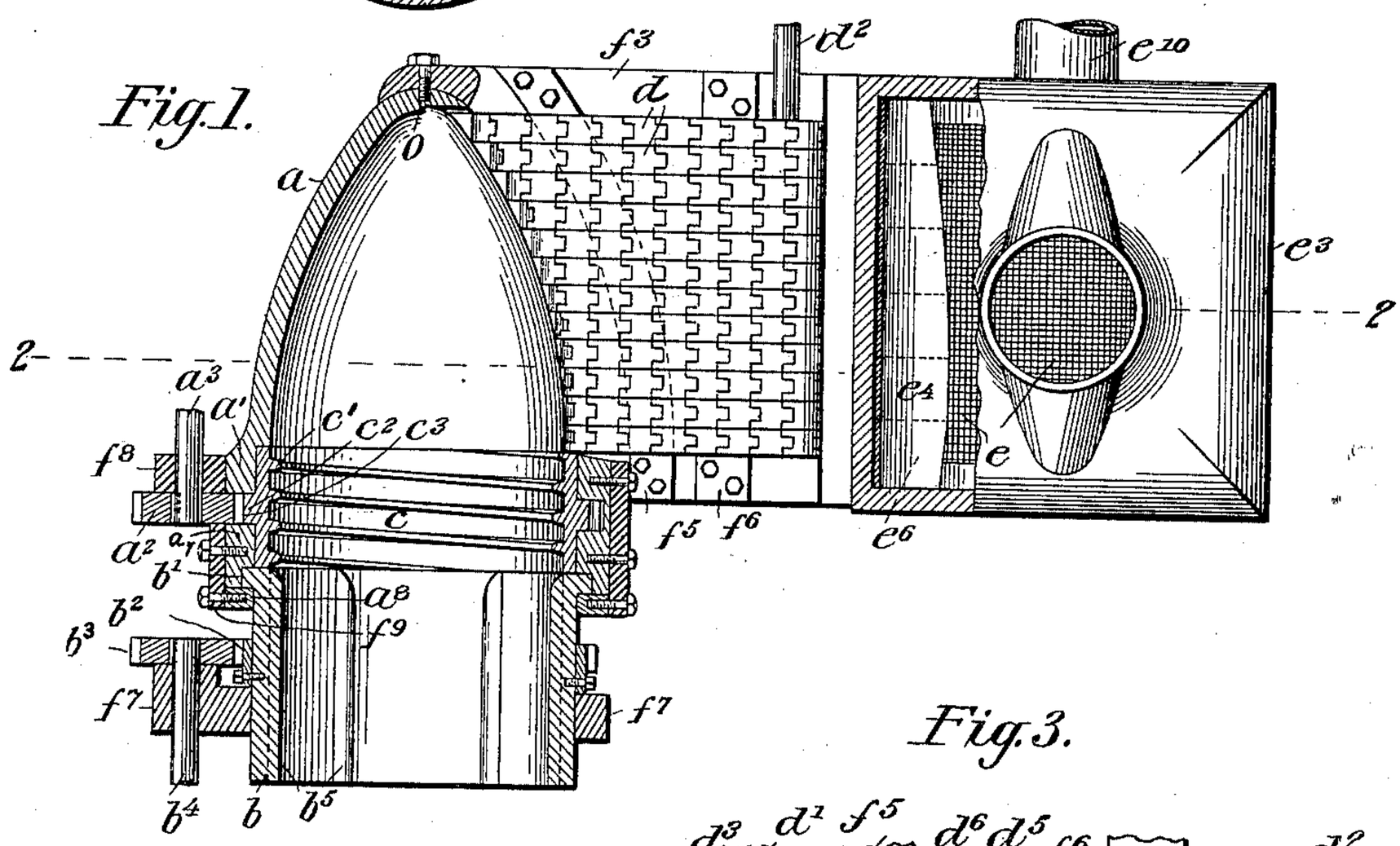


Fig. 3.

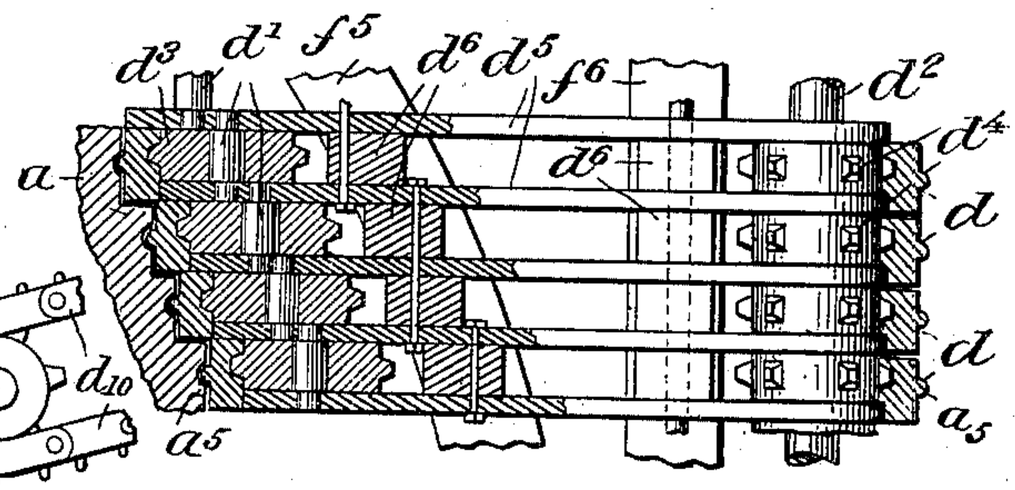
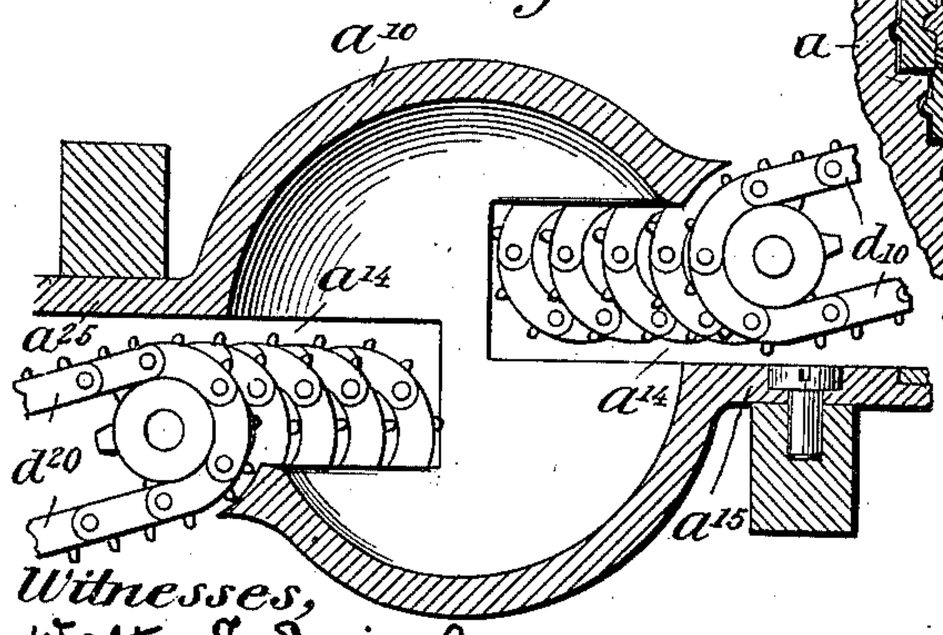


Fig. 4.



Witnesses,
Walter J. Swingle.
Alfred H Brookes.

Inventor,
Harry L Duncan

UNITED STATES PATENT OFFICE.

HARRY L. DUNCAN, OF NEW YORK, N. Y.

BALING-PRESS.

SPECIFICATION forming part of Letters Patent No. 672,394, dated April 16, 1901.

Application filed February 16, 1901. Serial No. 47,570. (No model.)

To all whom it may concern:

Be it known that I, HARRY L. DUNCAN, a citizen of the United States, residing in the city of New York, county of Kings, and State of New York, have invented a new and useful Improvement in Baling-Presses, of which the following is a specification.

This invention relates to machinery for producing cylindrical bales of fibrous material by means of a relatively-rotating slotted cap-plate and baling-chamber; and it has for its object novel means for producing such a bale of material so that it will be substantially coherent or self-binding and of substantially uniform density from center to circumference.

The exact scope of my invention will be more particularly pointed out in the annexed claims.

In my copending applications, Serial Nos. 47,569 and 47,571, filed February 16, 1901, and Serial No. 48,130, filed February 20, 1901, I claim such parts of my invention as are disclosed, but not claimed, in this case.

In the figures of the drawings, in which like reference characters refer to the same parts throughout the several views, Figure 1 is a sectional plan view of my improved press and feeder therefor, taken on line 1 1 of Fig. 2. Fig. 2 is a transverse sectional view of the same, taken on line 2 2 of Fig. 1. Fig. 3 is a detail view, on a larger scale, taken on line 3 3 of Fig. 2, showing the construction of the feeding-chains for supplying the material to the cap-plate of this press and means for mounting the same. Fig. 4 is a detail view, on a larger scale, showing a modified construction of press, the view being taken transversely to the axis of the press near the point of the cap-plate.

In this case the cap-plate a is formed with an inner surface substantially a paraboloid, as is shown by the cross-section along the axis of the press. This cap-plate is held stationary by being secured to heavy framing ff^3. Just behind the cap-plate and having a bearing in the flanged extension a' thereof is the screw ejector c, formed with an integral gear c^3. The meshing gear a^2 upon shaft a^3, mounted in suitable bearings f^8 in the frame, may be rotated at any desired speed, so as to vary the speed at which the ejector is driven. Upon the inside of the ejector is formed the screw-thread c' of uniform pitch, but having the threads gradually increasing in height at the inner end. Directly behind c is the baling-chamber b, having a bearing-collar b' at the inner end. The annular flanges a^7 a^8 hold these two elements in position and are bolted to an extension of the frame f^9. The gear b^2 is secured to b, and just below it the frame f^7 incloses the chamber b, so that it can revolve properly about its axis. The shaft b^4, carrying gear b^3, meshing with b^2, can be revolved at any desired rate by suitable means, and it serves to vary the speed of revolution of the chamber b as desired. Longitudinal ribs or fins b^5 are formed on b and project into it, as shown. The press proper therefore consists of the substantially parabolic cap-plate a, which is stationary, the cylindrical screw ejector c, and the cylindrical baling-chamber b, both of which revolve about their axes, which coincide with the axis of the cap-plate.

Feeding mechanism.—A condenser-cylinder e, of foraminous or wire-net material, is rotated about its axis at any desired speed. Fixedly attached to the stationary shaft e' is the shield e^2, which is supported adjacent the lower part of the condenser-cylinder. These parts are supported in and surrounded by a casing e^3, which supports the strip e^5 of flexible material, such as rubber, adapted to press forward against the bat of material which collects on the cylinder. The flexible strip e^4 is attached to the casing on the other side, and its lower edge is attached to the upper ends of a series of slides e^6, mounted on the support e^7 and adapted to be clamped in any position thereon by bolts and washers e^8, which work in connection with large openings in the support e^7. The concentric pieces e^6 can therefore be adjusted after removing the lower section of e^3 adjacent thereto through a considerable angle about e and, as shown in the plan view, can vary the effective angle of the condenser e, which is active to collect material fed to it in a blast of air supplied through an opening in the top of the casing e^3. The function of these slides, of which any desired number may be used, is to so adjust the condensing-surface of the cylinder that the bat of material collected thereon is perfectly uniform from end to end. A suit-

able doffer e^9 operates in connection with the condenser-roll under the shield, as is usual in this art.

The air is exhausted from the inside of the condenser by an exhaust-pipe e^{10}, connected therewith in a usual manner and also connected with some suction device. The bat formed is carried by an apron g, mounted on roll g', driven positively by the shaft g^2, so as to give the apron the same surface speed as the condenser-cylinder, and also passing over roll g^3, loose on shaft g^4. The apron rests on the plate g^5, which is supported on the framing f' and on the heavy lip a^5 of the cap-plate. Adjacent to the feed-slot are the feed-chains d, which have formed on their outer working faces slight projections or teeth, so as to grasp the bat of material and positively feed it forward into the feed-slot at the same speed throughout the whole length of the slot. These feed-chains are tangent at their inner ends to the inner surface of the cap-plate a, and at that point all of them are the same distance above the feeding-lip a^5. The feed-chains are so supported that their inner ends are all tangent to the continuation of the inner curved surface of the cap-plate, so that if the regular inner retaining-surface of the cap-plate were continued past the compressing-abutment a^6 the chains d would each be tangent to such surface. The rear ends are supported at a higher level by the driving-sprockets d^4, fast on the shaft d^2, adapted to be driven at any desired rate by suitable means. The lower or feeding run of these chains grip the material more and more tightly in connection with the smooth feeding-lip and positively force it into the feed-slot a^4 at the same radial speed throughout the whole length of the slot. The portion a^5 is preferably made to closely hug the feed-chains near the edge of the compressing-abutment a^6. Suitable annular depressions accommodate the feeding projections on the chains, that are made to aline longitudinally of the chains. In this way the material carried into the cap-plate is released from the feeding projections at the point a^6, and said material is positively scraped off the chains by the close-lying abutment a^5. Thus a series of substantially annular recesses are formed in the edge of the cap-plate at a^5 adjacent the feeding-passage in the cap-plate. Each one of these annular recesses accommodates one of the feeding-chains, as is shown in Fig. 3.

A heavy framework built up of strong steel plates d^5, bolted together with spacing-blocks d^6 to the frame members f^5 f^6, supports the driving-sprockets d^4 and the loose guiding-wheels d^3, mounted on their axles d' adjacent the cap-plate. It will be noted by referring to the detail view that the chains extend over the plates d^5, so as to form a practically continuous feeding-surface. The separate chains are accommodated by the formation of the cap-plate, which is substantially tangent to them at a^5, while a slight relief is made at a^6, so that the chains can readily free themselves at this point from any material, which will then be carried along and incorporated in the bale.

The inner surface of the cap-plate is so constructed that an axial section through the point just above a^6 where the new material is compressed against the rotating bale will be a parabola whose axis is the axis of the press. The cap-plate is preferably designed for some particular feed of the bale through the press by the ejector—say one inch per revolution of the bale in the cap-plate. The inner surface would in that case be the surface generated by the revolution of the forming parabola about its axis and its simultaneous uniform feed along its axis at the rate of one inch per revolution. In case a number of feed-slots were employed the inner surface of the cap-plate between any two slots would be a surface formed as above, and these elements would be symmetrically placed about the axis of the press.

In practice the inner surface of the cap-plate may be constructed as a paraboloid of revolution. This involves small variation from the curved surface described above, which I term a "parabolic helicoid," when the ejector-feed is comparatively small, and practically none at all when a number of feed-slots are employed.

Operation of the press.—A uniform bat of fibrous material, such as cotton, is formed by the condenser and is positively fed into the cap-plate at the same radial speed throughout the length of the feed-slot by the feed-chains d. This bat is compressed against the end of the forming bale at the edge of the feed-slot and thereupon revolves with the bale. The fins b^5 on the baling-chamber are forced into the bale and grip the same, so as to insure its rotation with the chamber. The threads of the ejector are also forced into the bale and grip it sufficiently so that the positively-rotating ejector can feed the bale forward constantly at any desired rate. The threads c' and the fins b^5 project into the bale enough and only enough to get the proper engagement with it under all conditions of operation, and their size will be such in practice that they will do this properly with the material on which the press operates.

The bale formed by this press is self-binding or coherent without any external binding means, just as is the blanket or convolutionally-wound lap-bale, since its external layers are so nearly parallel to the axis at that point that radial expansion is resisted by the circumferential strength of the fibers, and longitudinal expansion after the bale is once formed is prevented by the friction of the layers due to the great radial pressure between them. The bale as fast as it is built up within the cap-plate is a coherent solid mass, in which the material does not materially change its position after it is once laid on. If we consider the point a^6 on the cap-

plate, the material laid on at this point and nearer the vertex of the cap-plate forms a cylinder in the finished bale whose radius is the radial distance of the point a^6 from the axis of the press. Calling O the intersection of the press-axis with the cap-plate, this point is also manifestly the vertex of the parabola through a^6. The width of bat fed into the slot up to the point a^6 equals the axial distance of this part from the vertex O, and its weight bears a fixed ratio to this distance, since the bat is uniform and is uniformly fed into the slot. The cylindrical section of the bale formed thereby in a given time bears a fixed ratio to the square of the radial distance of a^6. The density of this bale-section, which is the quotient of the two, bears a fixed ratio to the axial distance divided by the square of the radial distance of the point a^6. This holds true of any point on the edge of the feed-slot. Since, however, the edge is a rectangular parabola and the axial distance of any point from the vertex divided by the square of its radial distance is a fixed ratio throughout the extent of the curve, the density of a cylindrical bale-section is a fixed quantity, no matter what its radius, or, in other words, the bale has a constant density throughout its whole extent.

It is manifest that many variations from the exact construction set forth could be made by the skilled workman and still attain the beneficial results of the construction that I set forth. The contour of the cap-plate need not be exactly parabolic, and the density and feed of the bat might vary from what I have described. It is also manifest that for any cap-plate of curved outline some formation of bat could be readily arranged which when fed radially thereto would produce a bale of uniform density.

The bale issuing from the baling-chamber can be severed into lengths by any desired mechanism and can be covered and tied, if desired.

In Fig. 4 I have shown a modified form of cap-plate, in which two feeding-openings are formed along opposite sides of the cap-plate and on substantially the same axial plane. I have also shown two sets of sprocket-chains adapted, as they will be formed in practice, to positively grip the material supplied to them and feed it into the feed-slot at the same radial speed throughout the length of that slot. Each segment of the cap-plate between adjacent slots is formed by the revolution of the compressing-abutment, similar to a^6 in Fig. 2, about the axis of the press and its simultaneous movement along the axis at the rate at which it is desired to feed the bale through the press.

It is manifest that in such a press as this two sets of bat forming and feeding mechanism similar to the single set shown in Fig. 2 would be employed on either side of the cap-plate. The same construction of baling-chamber and ejector could manifestly be employed in this case and the bale formed would be similar in character, as has already been pointed out.

While I have shown the ejector as coaxial with the forming bale, I do not wish to be limited to this construction, since the ejector would work equally well in any position relative to the bale so long as the threads upon the ejector impinged upon the bale to properly grip the same.

It will be manifest that various modifications of the mechanism shown in the drawings may be made. It would not be necessary, for instance, to have the entire cap-plate formed with an inner surface of paraboloidal form. The tip of the cap-plate might be constructed of another shape and might be fed with material in any desired manner so as to produce a center for the bale by means other than I have shown in the illustrations. A bat of desired cross-section could be fed into the slot adjacent to the paraboloidal portion of the cap-plate, so as to form a part of the bale in this manner around a center or core made in any other desired way. The part of the bale formed by the paraboloidal portion of the cap-plate would of course be of substantially uniform density. Parts of my mechanism herein disclosed could be used without employing the whole, and I do not wish to be limited to the exact means disclosed in the drawings.

Instead of employing the bat-forming means and feeding means which I have disclosed in this case my press could be fed with material in any other desired way by supplying material to the feed-slot in the cap-plate, and if during the operation of the press material was constantly supplied throughout the whole extent of the slot a bale would manifestly be produced having superposed ribbons of material the surfaces of which would be substantially a paraboloidal heli-coid.

While I have disclosed in this case the paraboloidal cap-plate as projecting outward from the baling-chamber, I do not wish to be limited to this arrangement of the two parts.

Where I refer to the "inner" surface of the cap-plate in the claims, I mean the working surface or the surface which compresses the material against the forming bale.

Having now described my invention, what I claim is—

1. In a baling-press, a cap-plate having a substantially paraboloidal inner surface and having a feeding-passage formed therein; means to form and feed a bat of material of uniform density into said feeding-passage; means to rotate the forming bale and hold it pressed against said cap-plate so as to form a cylindrical bale of substantially uniform density from center to circumference.

2. In a baling-press, a cap-plate the inner surface of which is substantially a paraboloid having a suitable feeding-passage formed along an axial plane in said cap-plate; means

to form and feed a uniform bat of material radially into said feeding-passage; means to rotate the coherent forming bale and to allow it to move away from said cap-plate so as to form a coherent bale of substantially uniform density from center to circumference.

3. In a baling-press, a slotted cap-plate having an inner surface of paraboloidal contour, means to form a bat of material, means to feed said bat radially into the slotted cap-plate, means to rotate the forming bale within the cap-plate and to hold it pressed axially against the same.

4. In a baling-press, a cap-plate provided with a suitable feeding-passage, the inner surface of said cap-plate having a curved contour, means to form a bat of material, means to feed said bat of material in a positive manner radially into the feeding-passage in the cap-plate, means to rotate the forming bale and means to hold it pressed against the cap-plate.

5. In a baling-press, a cap-plate provided with a feeding-passage, the inner surface of said cap-plate being a surface of revolution, means for positively feeding a bat of material radially into said feeding-passage, means to rotate the forming bale within the cap-plate and to hold it pressed against the same.

6. In a baling-press, a cap-plate having a feeding-passage, the inner surface of said cap-plate being substantially a surface of revolution the axial section of which is curved, means to form and feed a bat of material radially into said feeding-passage.

7. In a baling-press, a cap-plate having a feeding-passage therein, the inner surface of said cap-plate being substantially paraboloidal, the edge of said cap-plate adjacent said feeding-passage being formed with an annular recess to accommodate a feeding element.

8. In a baling-press, a cap-plate having a feeding-passage therein formed along a substantially axial plane, the inner surface of said cap-plate being substantially paraboloidal, the edge of said cap-plate adjacent the feeding-passage being formed with a series of annular recesses to accommodate radially-arranged feeding-chains, the inner paraboloidal surface of said cap-plate being relieved adjacent such annular recesses to form a curved compressing-abutment.

9. In a baling-press, a cap-plate formed with a feeding-passage the inner surface of said cap-plate being substantially a surface of revolution; means to form a bat of material and means to positively feed said bat at a constant radial speed to said feeding-passage throughout the length of the same.

10. In a baling-press, a slotted cap-plate the inner surface of which is substantially a surface of revolution; means to form a bat of material a cross-section of which is always the same throughout its length, and means to positively feed said bat into the feed-slot at a constant-radial speed throughout the length of the slot so as to form a bale of substantially uniform density from center to circumference.

11. In a baling-press, a slotted cap-plate the inner surface of which is substantially a surface of revolution; means to form a bat of material of the same cross-section throughout its whole length; means to positively feed said bat radially into the cap-plate, and means to rotate the forming bale within said cap-plate so as to produce a cylindrical bale of substantially uniform density from center to circumference.

12. In a feeder for a cylindrical baling-press, a series of radially-arranged gripping-chains to positively engage and feed forward the material radially, such chains being driven at the same surface speed.

13. In a feeder for a cylindrical baling-press having a curved cap-plate provided with a feed-slot, a platform over which material is adapted to be fed; a series of feeding elements adjacent said platform; means to positively drive these elements at the same surface speed whereby material is adapted to be positively gripped between said feeding elements and said platform and fed into the feed-slot of the curved cap-plate at a constant radial speed.

14. In a feeder for a baling-press having a cap-plate the inner surface of which is substantially a surface of revolution and which is provided with a feeding-passage; a series of moving feeding elements adjacent said feeding-passage and substantially tangent to the inner surface of the cap-plate; means to drive these feeding elements at the same surface speed whereby they are adapted to engage and positively feed material into said feeding-passage at a constant radial rate throughout the extent of the feeding-passage.

15. In a baling-press, a cap-plate provided with a feeding-passage the inner surface of said cap-plate having a substantially paraboloidal contour; a series of feeding elements mounted adjacent said feeding-passage and substantially tangent to the inner surface of the cap-plate; means thereon adapted to positively engage material to be fed to the press, and means to positively rotate said feeding elements at the same surface speed so that they are adapted to positively feed material into said feed-passage at substantially the same radial speed throughout the length of said feeding-passage.

16. In a baling-press, a cap-plate having a suitable feeding-passage the inner surface of said cap-plate having a substantially paraboloidal contour; a series of radially-arranged sprocket-chains mounted adjacent said feeding-passage so as to be substantially tangent to the inner surface of the cap-plate at that point; a feeding-platform adjacent said feeding-chains, and means to positively drive said feeding-chains at the same surface speed.

17. In a baling-press, a cap-plate provided with a suitable feeding-passage having an inner surface of substantially paraboloidal

form; a feeding-platform formed adjacent one edge of said feeding-passage; a series of gripping sprocket-chains coöperating therewith and arranged radially substantially tangent to the inner surface of the cap-plate at the feed-slot, and means to positively drive said chains at the same surface speed.

18. In a baling-press, a cap-plate having a suitable feeding-passage therein the inner surface of said cap-plate having a substantially paraboloidal contour; a feeding-platform adjacent one edge of the feeding-passage so that its surface is a substantially axial plane; a series of radially-arranged gripping sprocket-chains coacting therewith; means to mount said chains substantially tangent to the inner surface of the cap-plate, and means to positively move said chains at the same surface speed.

19. In a baling-press, a slotted cap-plate; a relatively-rotating baling-chamber; a cylindrical ejector coaxial with the baling-chamber having screw-threads formed upon the inner surface thereof, said threads projecting inward varying distances whereby to gradually bite into the forming bale, and means to rotate the same at any desired speed.

20. In a baling-press, an abutment having a feeding-passage therein; means to rotate a forming bale; an ejector-ring through which the forming bale passes having screw-threads formed upon the inner surface of the same, and means to rotate the same at any desired speed.

21. In a baling-press, means to rotate a forming bale; means to press material against the end of said forming bale, and a helical ridge coaxial with said forming bale adapted to engage said forming bale.

22. In a baling-press, an abutment having a feeding-passage therein; a relatively-rotating baling-chamber; an ejector-ring through which the forming bale passes rotatably mounted, a screw-thread upon its inner surface adapted to engage the bale and a gear-wheel integral therewith whereby the ejector may be rotated.

23. In a baling-press, a slotted cap-plate; a relatively-rotating baling-chamber formed with bale-gripping portions and movable relative to the cap-plate; an ejector-ring having a screw-thread, and means to rotate the same.

24. In a baling-press, a slotted cap-plate; a relatively-rotating baling-chamber having longitudinal bale-gripping ribs; a rotating ejector-ring having screw-threads formed upon its inner surface to engage the forming bale.

25. In a baling-press, a cap-plate having a feeding-passage the inner surface of the cap-plate being of a substantially paraboloidal contour; a relatively-rotating baling-chamber; means to rotate the same constantly at any desired speed; an ejector-ring relatively movable with respect to the chamber and means to rotate the same constantly at any desired speed, and means to feed a uniform bat of material into the cap-plate at a constant radial speed whereby to produce a self-binding bale of substantially uniform density throughout its extent.

26. In a baling-press, means to support and rotate a forming bale having a paraboloidal head at a constant speed; means to compress a uniform bat of material against the paraboloidal head of the same, said material being supplied in a radial direction at a constant speed and an ejector-ring having screw-threads thereon which are adapted to engage the bale, and means to rotate the same constantly relatively to the bale to produce a self-binding, cylindrical bale of substantially uniform density throughout its extent.

27. In a baling-press, an abutment having a feeding-passage; an ejector-ring rotatably mounted adjacent thereto; helical threads formed on the inner surface of the same, and a baling-chamber revolubly mounted adjacent said ejector-ring.

28. In a baling-press, a substantially paraboloidal cap-plate having a feed-slot; a revolubly-mounted baling-chamber formed with bale-gripping ribs; a gear attached to said chamber for rotating the same; an ejector-ring mounted revolubly intermediate said chamber and cap-plate having screw-threads thereon, and an integral gear thereon whereby the same may be rotated.

29. In a baling-press, a rotary baling-chamber, a cap-plate having a feeding-passage therein, the inner surface of said cap-plate being substantially paraboloidal, said cap-plate protruding outward from said baling-chamber.

30. In a baling-press, a cap-plate provided with a feeding-passage, the inner surface of such cap-plate being substantially a surface of revolution, the axial surface of which is curved, the edge of said cap-plate adjacent said feeding-passage being formed with suitable substantially annular recesses adapted to accommodate suitable feeding-chains moving radially and substantially tangent to the inner surface of the cap-plate.

31. In an ejector for a cylindrical baling-press, an ejector-ring through which the bale passes having bale-gripping ridges upon its inner surface and means to rotate said ring relative to the bale.

32. In an ejector for a cylindrical baling-press, an ejector-ring revolubly mounted having bale-gripping threads formed upon its inner surface and means to cause relative rotation between said ring and the forming bale.

33. In an ejector for a cylindrical baling-press, an ejector-ring having helical ridges upon its inner surface adapted to engage the surface of the forming bale and means to rotate said ring relative to said bale.

34. In an ejector for a cylindrical baling-press, an ejector-ring through which the bale passes having bale-feeding projections of varying height upon its inner surface and means to rotate said ring relative to said bale.

35. In an ejector for a baling-press adapted to produce a coherent cylindrical bale within a curved cap-plate, an ejector-ring, helical ridges of gradually-increasing height upon the same adapted to grip the bale and means to rotate said ring relative to the bale whereby to positively withdraw said coherent bale from said cap-plate at any desired rate.

36. In a baling-press, bale-rotating means, a curved cap-plate having a feeding-passage therein and adapted to form a coherent bale within the same, an ejector-ring, bale-gripping ridges thereon, means to revolve said ring relative to the bale whereby to positively withdraw said coherent bale from said cap-plate as desired.

37. In a baling-press, bale-rotating means, a compressing-abutment having a suitable feeding-passage therein, the working face of said abutment being substantially a surface of revolution having a curved axial section to form in connection with said bale-rotating means a coherent cylindrical bale, an ejector-ring, bale-gripping ridges thereon and means to revolve said ring relative to said bale whereby to positively withdraw said coherent bale from contact with said compressing-abutment at any desired rate of speed.

38. In a baling-press, an abutment having a feeding-passage, means to rotate the forming bale, a screw-thread arranged to engage the forming bale and means to move the screw-thread relative to the bale.

39. In a baling-press, means to rotate the forming bale and to compress material against the end of the same and a helical ejector arranged to engage the forming bale.

40. In a baling-press, a compressing-abutment having a feeding-passage therein, means to rotate a forming bale in contact with said abutment, an ejector-ring revolubly mounted at a fixed distance from said compressing-abutment, bale-gripping projections formed upon the same, and means to rotate said ejector-ring relative to the forming bale.

41. In a baling-press, a compressing-abutment having a feeding-passage therein, means to rotate a forming bale adjacent said compressing-abutment, an ejector-ring revolubly mounted at a fixed distance from the compressing-abutment, having a screw-thread formed upon the inner surface of said ejector-ring arranged to grip the forming bale passing through said ring and means to rotate said ring relative to said bale.

42. In a baling-press, a cap-plate having a feeding-passage, means to rotate a forming bale in contact with said cap-plate, an ejector-screw mounted at a fixed distance from said cap-plate and means to revolve said screw with respect to the forming bale.

43. In a baling-press, means to rotate a forming bale, means to compress material against the end of said forming bale, an ejector-ring mounted at a fixed distance from the end of said forming bale to which material is added, bale-gripping projections upon said ejector-ring and means to rotate said ejector-ring relative to said forming bale.

44. In a baling-press, means to rotate a forming bale, means to compress material against the end of said forming bale, a screw mounted at a fixed distance from the end of said forming bale to which material is added and means to rotate said screw relatively to said bale.

45. In a baling-press, a cap-plate having a feeding-passage, a relatively-rotating baling-chamber, an ejector-screw mounted at a fixed distance from said cap-plate arranged to grip the forming bale passing therethrough and means to rotate said screw relative to said bale whereby to accurately move said bale axially away from said cap-plate.

46. In a baling-press, a cap-plate having a feeding-passage therein, means to rotate a forming bale in contact with said cap-plate at any desired rate, a bale-gripping screw mounted at a fixed distance from said cap-plate, and means to rotate said screw at any desired rate relative to said bale whereby to allow the exact axial movement of said bale away from said cap-plate that may be desired.

47. In a baling-press, a cap-plate provided with a feeding-passage, the edge of said cap-plate adjacent said feeding-passage being formed with a series of substantially annular recesses to accommodate radial feeding-chains.

48. In a baling-press, a cap-plate having a feeding-passage therein, the inner surface of said cap-plate being substantially paraboloidal.

49. In a baling-press, a cap-plate having a feeding-passage therein, the inner surface of said cap-plate being a substantially paraboloidal helicoid.

50. In a baling-press, a cap-plate having a suitable feeding-passage therein, the inner surface of said cap-plate being substantially paraboloidal and the edge of said cap-plate adjacent said feeding-passage being relieved to form a slanting compressing-abutment.

51. In a baling-press, a cap-plate having a feeding-passage therein, the inner surface of said cap-plate being substantially a paraboloid of revolution and means to rotate a forming bale within said cap-plate.

52. In a baling-press, means to rotate a forming bale having a substantially paraboloidal end, and means to apply compressed material to said paraboloidal end of the forming bale in such manner as to preserve the paraboloidal shape thereof.

53. In a baling-press, means to rotate a forming bale having a substantially paraboloidal end, means to continuously apply compressed material to said paraboloidal end of the forming bale in such manner as to preserve the paraboloidal shape thereof.

54. In a baling-press, means to apply compressed material to the paraboloidal end of a forming bale, and means to rotate said forming bale relatively to said applying means in

such manner as to preserve the paraboloidal shape thereof.

55. In a baling-press, a compressing-abutment having a substantially paraboloidal inner surface, and having a suitable feeding-passage therein.

56. In a baling-press, means to rotate a forming cylindrical bale, a compressing-abutment having a feeding-passage therein, the inner surface of said compressing-abutment being substantially paraboloidal, said compressing-abutment projecting outward away from said bale-rotating means to form a cylindrical bale having a protruding paraboloidal end.

57. In a baling-press, bale rotating means, a compressing-abutment having a suitable feeding-passage therein, the inner surface of said compressing-abutment being substantially paraboloidal, the edge of said compressing-abutment adjacent said feeding-passage being slanting to gradually compress material, said compressing-abutment projecting away from said bale-rotating means.

58. In a baling-press, a baling-chamber, a cap-plate having a feeding-passage therein, the inner surface of said cap-plate being substantially paraboloidal, said cap-plate projecting outward away from said baling-chamber, means to rotate said baling-chamber relatively to said cap-plate and an ejector-ring having bale-gripping threads upon the same, mounted revolubly with respect to said baling-chamber.

59. In a baling-press, bale-rotating means, a compressing-abutment having a feeding-passage therein, the inner surface of said compressing-abutment being substantially paraboloidal, said compressing-abutment projecting outward away from said bale-rotating means and means to positively feed material in a radial direction into said feeding-passage.

60. In a baling-press, a slotted cap-plate, a relatively-rotating baling-chamber, a cylindrical ejector having screw-threads formed upon the same to impinge upon the forming bale, and means to rotate the same at any desired speed relative to the forming bale.

61. In a baling-press, means to rotate a forming bale, means to add material to one end of said forming bale, and a helical ridge engaging said forming bale.

62. In a baling-press, bale-forming means to produce a cylindrical bale, and a helical ridge impinging upon said bale having rotary movement relative to said bale.

63. In a baling-press, a cylindrical baling-chamber, a cap-plate having a feeding-passage therein, the inner surface of said cap-plate being substantially paraboloidal, said cap-plate projecting outward away from said baling-chamber, means to rotate said baling-chamber relative to said cap-plate, means to form a bat of material of uniform cross-section and means to positively feed said bat of material radially into said feeding-passage at a constant speed throughout the width of said bat.

In testimony whereof I hereto affix my signature, in the presence of two witnesses, this 15th day of February, 1901.

HARRY L. DUNCAN.

Witnesses:
ALFRED B. DENT,
H. G. MEEM.