

June 28, 1932.

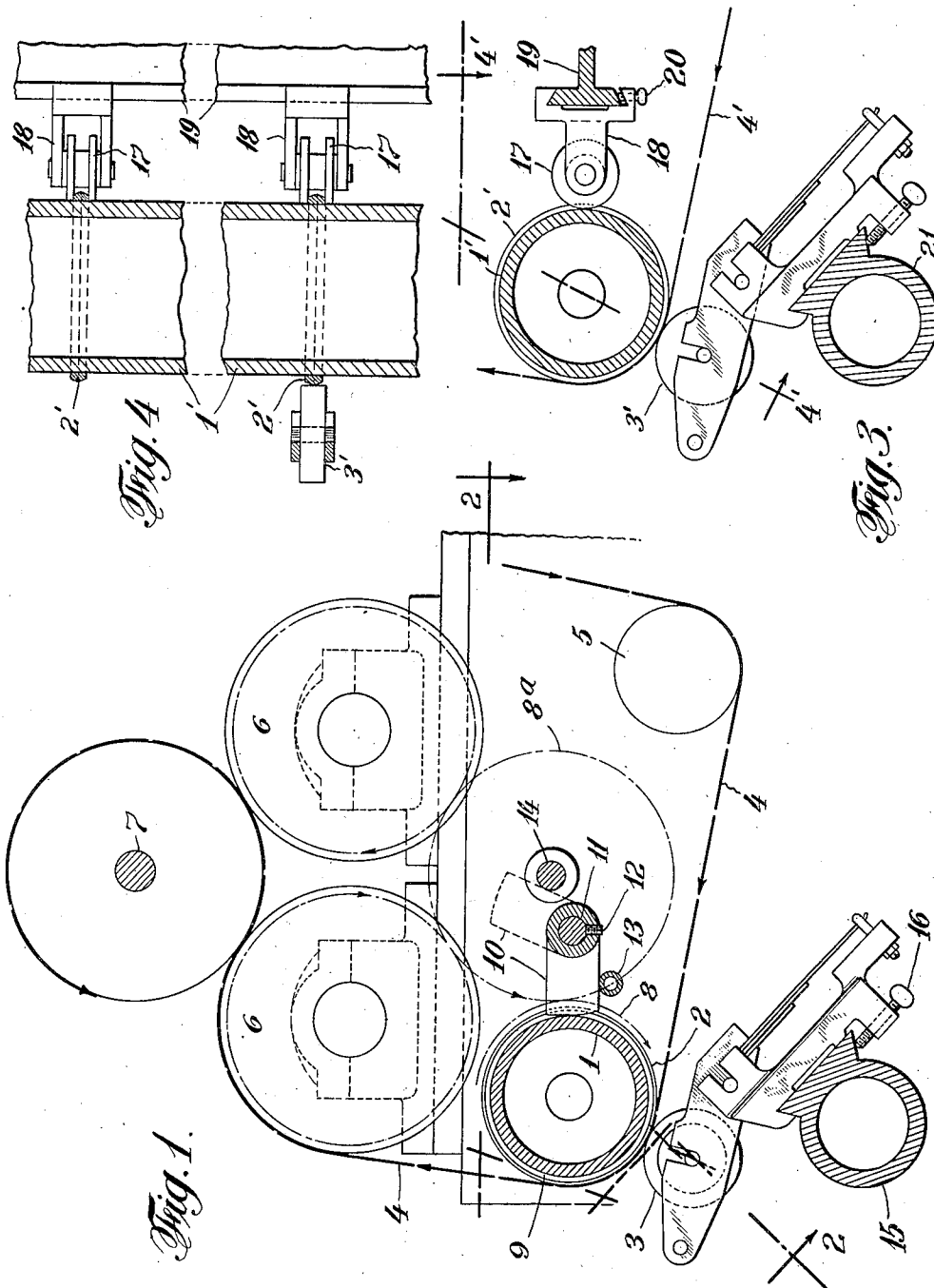
J. A. CAMERON

1,865,302

MEANS FOR SLITTING WEBS OF FLEXIBLE MATERIAL

Filed Jan. 12, 1929

5 Sheets-Sheet 1



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June 28, 1932.

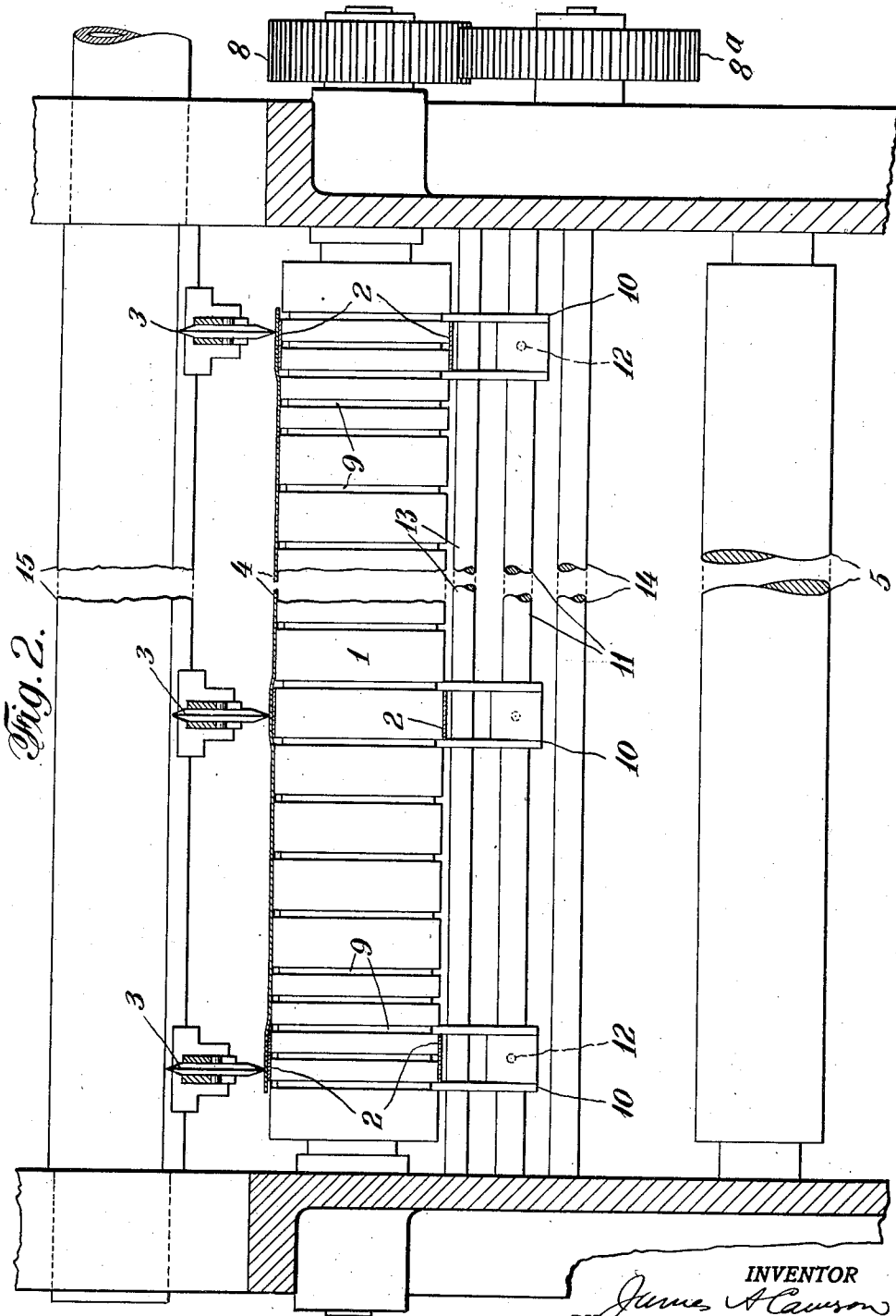
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MEANS FOR SLITTING WEBS OF FLEXIBLE MATERIAL

Filed Jan. 12, 1929

5 Sheets-Sheet 2



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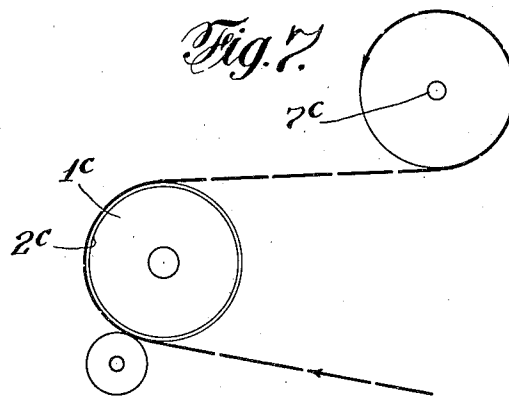
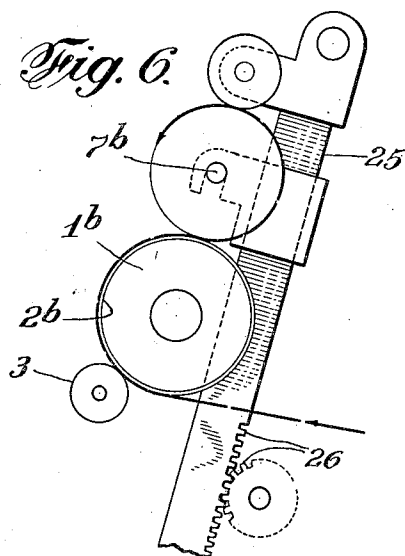
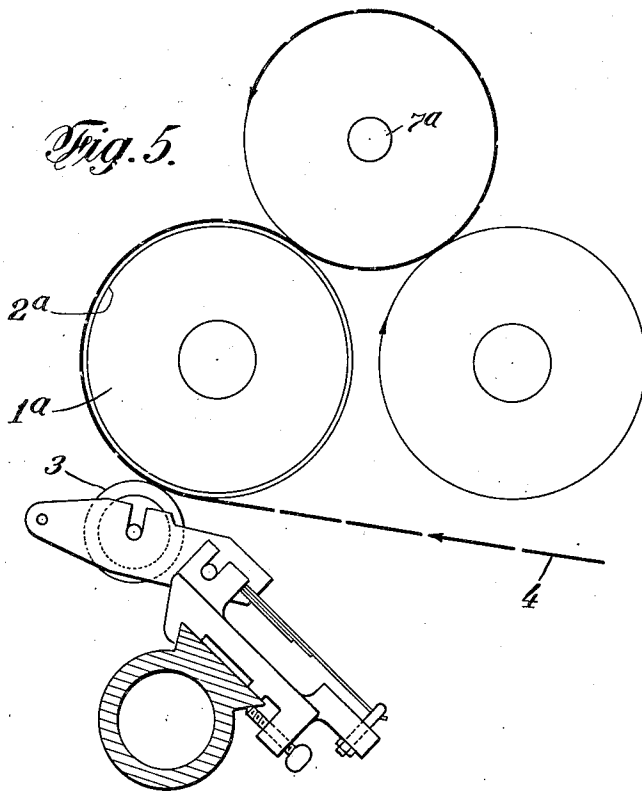
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MEANS FOR SLITTING WEBS OF FLEXIBLE MATERIAL

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5 Sheets-Sheet 3



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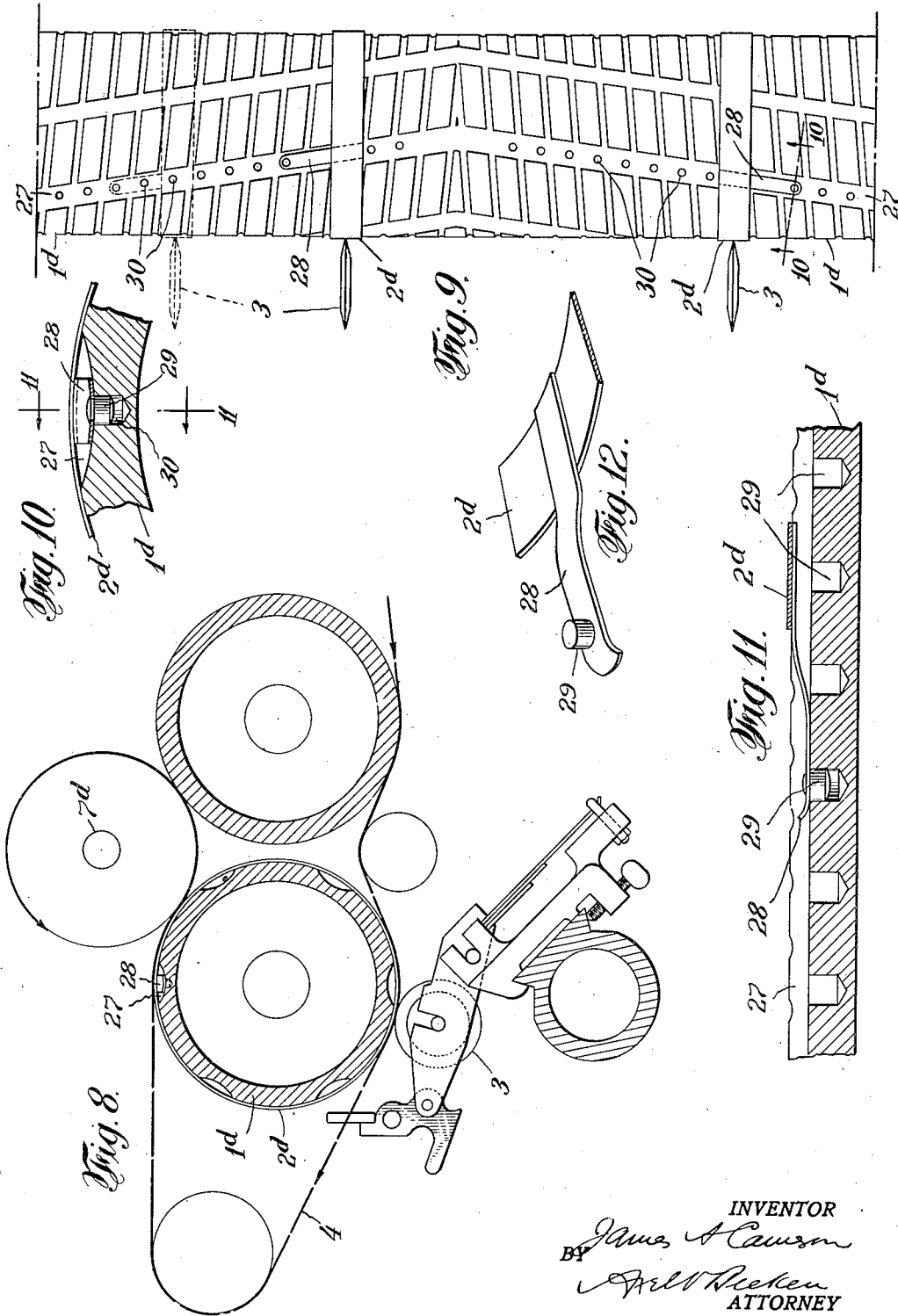
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MEANS FOR SLITTING WEBS OF FLEXIBLE MATERIAL

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5 Sheets-Sheet 4



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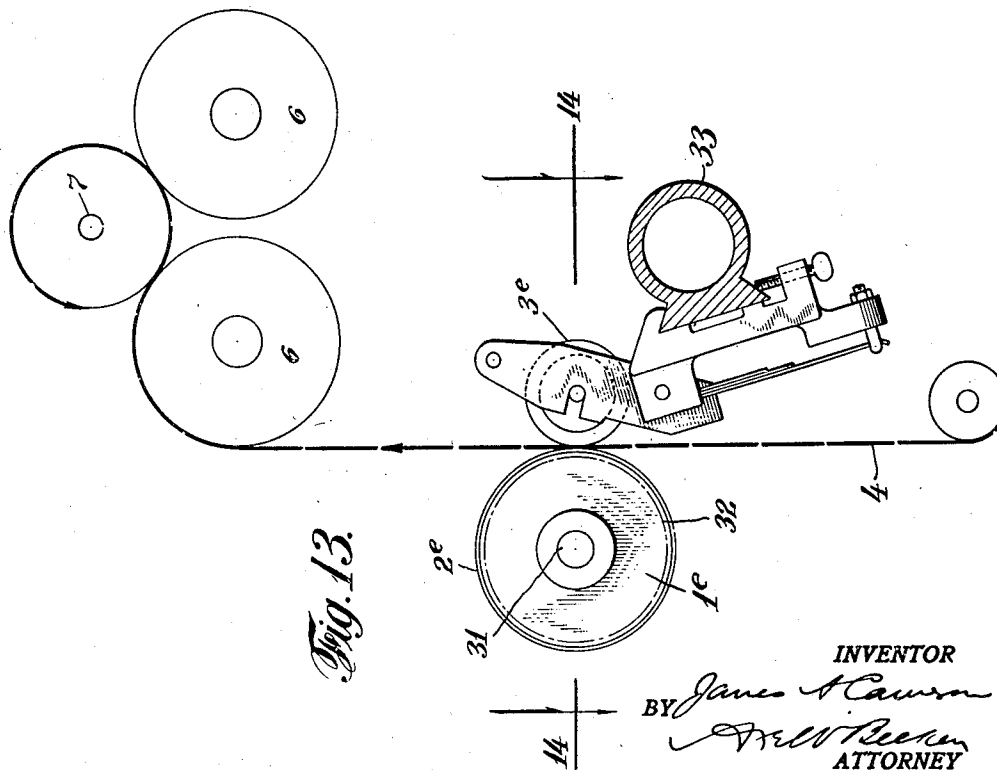
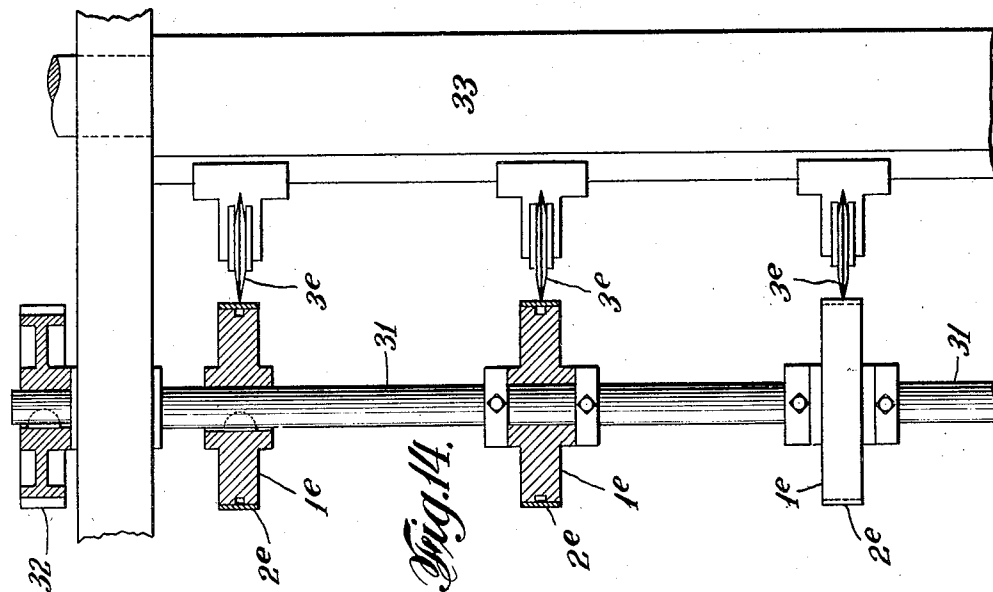
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MEANS FOR SLITTING WEBS OF FLEXIBLE MATERIAL

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5 Sheets-Sheet 5



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MEANS FOR SLITTING WEBS OF FLEXIBLE MATERIAL

Application filed January 12, 1929. Serial No. 332,037.

This invention relates to means for slitting webs of flexible material into longitudinal sections in the type of slitting machines usually referred to as "score-cut" slitting machines.

In the "score-cut" type of machines, the slitting means consist of a smooth-face backing member and a score-cut member in engagement therewith. The backing member is preferably provided, unless itself of sufficient inherent hardness, with a surface having a degree of hardness usually referred to as "glass hard," which may be obtained in any of the ways known in the art. The score-cutter has a relatively blunt cutting edge that bears, under tension, against the smooth-face backing member.

The main objects of this invention are to improve the slitting qualities of score-cut devices, to facilitate the separation of slitted web sections, to reduce the weight of the parts, and to lessen the cost of manufacture of machines of this type. Other objects will appear as the specification proceeds. The invention consists of the hereinafter disclosed structural features, several preferred forms of which are shown in the accompanying drawings and described in detail in the specification.

In the said drawings,

Fig. 1 is a somewhat diagrammatic view, partly in section and partly in side elevation, showing a slitting machine embodying one form of the invention;

Fig. 2 is a sectional view on the plane of irregular line 2—2 of Fig. 1;

Fig. 3 is a view somewhat similar to Fig. 1 showing a modified form of the construction disclosed in Fig. 1;

Fig. 4 is a sectional view on the plane of irregular line 4—4 of Fig. 3;

Figs. 5, 6 and 7 are diagrammatic views, showing modified forms of the invention;

Fig. 8 is a view similar to Fig. 1, but show-

ing a still further modified form of the invention;

Fig. 9 is a diagrammatic view in elevation of the surface of the backing roll shown in Fig. 8;

Fig. 10 is a detail sectional view on the plane of line 10—10 of Fig. 9;

Fig. 11 is a sectional view on the plane of line 11—11 of Fig. 10;

Fig. 12 is a perspective view of the anchoring means for the ring shown in Figs. 9, 10 and 11; and

Figs. 13 and 14 show still another form of the invention, Fig. 13 being a diagrammatic view in side elevation similar to Fig. 1, and Fig. 14 showing a sectional plan view substantially on the plane of line 14—14 of Fig. 13.

In the form of the invention disclosed in Figs. 1 to 4 inclusive, 1 or 1' indicates a roll having a circumferential web-supporting surface, which roll extends full width of the machine, and rotatably mounted on the web-supporting surface of this roll are one or more rings 2 or 2'. 3 or 3' indicates a complementary slitting member to coact with a ring on the roll and it will be obvious that there may be a number of such coacting slitting members to correspond with the number of rings. The ring may be a smooth-face member of sheet material having a hard surface, in which case the complementary member will be a score-cutter, or, conversely, the ring may be a score-cutter, in fact, merely a wire, in which case the complementary slitting member will be the smooth-face member. As shown in the drawings, in Figs. 1 and 2, the ring is a smooth-face member, while in Figs. 3 and 4 the member that is not carried by the roll is the smooth-face member. In either event, it will be observed that the ring projects but slightly above the web-supporting surface of member 1, say $\frac{1}{8}$ of an inch, although I wish it distinctly understood that I do not desire to limit my-

self to such dimensions. As shown more particularly in Fig. 2 the ring projects so slightly above the surface of the roll that it constitutes with the exposed portion of the latter a substantially continuous web-engaging surface. In this instance, roll 1 or 1' constitutes not only a backing member for the score-cutter, but is also a breast roll, that is the web indicated at 4 or 4' is wrapped partially around said roll, this being accomplished by suitable guides as 5, which direct the web in the proper manner to roll 1 or 1'. Suitable web-pulling means are employed, here taking the form of winding drums 6, that engage the surface of the material on winding shaft 7 and thereby drive the latter. Score-cut slitting means operate to best advantage when the moving web, the backing roll and the score-cut slitter all move at the same surface speed, but on account of variations in the character of the paper in the same web, it is a practical impossibility to effect an absolute equalization of speeds by means of gearing. It should be remarked here that in the prior art it has been customary to drive the backing roll positively by suitable gears properly related to the gears that drive the drums 6, and to drive the score-cutter by frictional engagement with the backing member, said score-cutter being pressed by means of a suitable spring tension device against said backing member. In machines like the one shown in Fig. 1, where the backing member acts as a breast roll, the difficulty of controlling the speed of said roll increases very materially when the machine is built to act upon very wide webs, for it will be understood that the strain to which such a breast roll as 1, unsupported except at its ends, is subjected is enormous, with the result that there is a tendency to flex the roll. It will be understood, therefore, that a more accurate synchronism of speed can be obtained by allowing the web to control the speed of the several members, but it will also be understood that to impose the task, of rotating a heavy roll at an exact speed, upon the moving web presents serious difficulties. It will now be understood that, assuming roll 1 to be not driven by gearing but to be simply impelled by the moving web, said web will impinge upon the web-supporting surface of said drum, thereby causing rotation thereof, and further that, if the paper web is unable to drive the drum itself at a proper speed, the said web will turn the rings upon the drum at a surface speed substantially equal to its own, and will likewise tend to turn the score-cutter at the same surface speed. If the character of the web presents or creates different operating conditions at different points transversely, then by this construction one ring may travel at one speed and another ring may travel at a different speed, the speed of the roll itself being immaterial. If it is desired to do so, however, it is possible, as shown in the drawings, to drive roll 1 by means of a slip friction drive or by means of gears. In the present instance, roll 1 is shown as being provided with a spur gear 8, that receives motion from intermediate gear 8a, which in turn meshes with the gears on winding drums 6. In these circumstances, the surface speed imparted to the roll by gear 8 may be slightly lower or higher than the surface speed of the web, and rings 2 will, therefore, be advanced or retarded by means of the web, as the case may be. The preferable method, however, is to drive roll 1 as near the surface speed of the web as possible, in which case the increased diameter produced by ring 2 will impart to said ring 2 a surface speed slightly in excess of that of the web. Score-cutter 3, however, acts as a drag upon the ring and tends to retard it, but, in view of the fact that roll 1 tends to drive ring 2 at a slightly greater speed than that required, the result is a compromise whereby the action of the web and the drag of the score-cutter tend to retard the ring somewhat with the result that the paper-engaging surface of the drum, the ring, the score-cutter, and the web all travel at substantially the same surface speed. It will be noted from an examination of Fig. 2 that the slitting operation is being carried on in a plane somewhat higher than the plane in which the major portion of the web is supported. One advantage of this is that the path, transversely, occupied by the paper is longer than would be the case were the entire web supported in the same plane so that, when the slitting action takes place, the paper, being under tension, will tend to separate transversely, thereby preventing overlapping or interweaving of adjacent slitted sections. Care should be taken, however, that the point of engagement of slitter 3 with ring 2 be not too far away from the point of tangency of the web with roll 1, that is to say, from the point where said web 4 first strikes roll 1, because if the paper is allowed to travel for a considerable distance over the high spots formed by rings 2, there would be a tendency on the part of the web to become set so that there would be no transverse retraction of the side edges of the slitted sections.

The details of construction of the machine may vary widely. The rings fit snugly on the roll or core, and are placed in properly spaced relation on said roll, and are adjustable thereon lengthwise of the roll to admit of the machine slitting webs into sections of different widths. Suitable means are provided for preventing lateral displacement of the rings after they have been adjusted, such means taking in the present instance (Figs. 1 and 2) the following form; the roll may

be provided with grooves 9 extending circumferentially, and into these grooves may extend a double arm projection 10 carried by shaft 11, which when in the position indicated in Fig. 2 will confine a ring between its two arms. Projection 10 is adjustable laterally on shaft 11 and when adjusted may be retained in its new position by set-screw 12. Projection 10 is, further, movable about shaft 11 so as to permit the ring to be adjusted on the core. 13 and 14 indicate two stops, 13 supporting the free end of projection 10 when in working position, and 14 supporting such free end when the projection is thrown out of operation, as indicated in dotted lines in Fig. 1. It is preferred to have the ring span a plurality of grooves, as shown. The complementary slitting members are likewise adjustable laterally on support 15 and held in position by screw 16. Each of said members is individually spring-pressed, as is shown, and they are brought into engagement with the rings as a group by imparting a rocking motion to support 15 in a manner well understood. In Figs. 3 and 4, the arrangement is reversed in that the rings here constitute the score-cut members and the complementary members are smooth-face hardened disks. In this form of the invention, the rings may be shaped to have a blunt outer circumference, or they may be simply a round wire of small cross-section. In Figs. 3 and 4, the means for preventing lateral displacement of the rings consist of a grooved roller 17 carried by a bracket 18 adjustable on support 19 and held in position by set-screw 20. In Figs. 3 and 4, the complementary slitting members are adjustable on shaft 21 to correspond to the location of the rings, and said shaft may be rocked to move the complementary slitting members to the end away from the rings, as will be understood.

The invention is by no means limited to a construction in which roll 1, carrying rings 2, is a breast roll. As shown in Fig. 5, roll 1^a, carrying rings 2^a, constitutes in this instance one of the winding drums that support winding shaft 7^a of the machine. Other forms of winders to which the invention may be applied are shown in Figs. 6 and 7. In Fig. 6, roll 1^b, carrying rings 2^b, is a breast roll, and winding shaft 7^b is supported in frame 25, which rises as the material accumulates thereon, its rising motion being controlled by rack-and-pinion 26. In Fig. 7, roll 1^c, carrying rings 2^c, is a breast roll as well as a backing member for the score-cutter. Winding shaft 7^c is not a shaft which is rotated by frictional engagement with winding drums, as in Figs. 1, 5 and 6, but has motion imparted to it at its center. In this type of machine, generally known as the "center winding" type to distinguish it from the "surface winding" type, the surface speed

of the paper increases with the accumulation of material, and in this case, therefore, it will be seen that it is of great advantage to have the rings 2^c capable of a slipping action on the roll.

The invention is, however, not limited to a construction in which the rings are capable of circumferential movement on the roll in response to the action of the web. In Figs. 8 to 12, inclusive, is shown a modified form of the invention, in which roll 1^d is provided with non-rotating rings 2^d that are adjustable lengthwise of said roll, and which when adjusted to the desired position are then anchored in a suitable manner. To this end roll 1^d may be provided with one or more grooves 27 in its surface, and the rings can be provided with a spring portion 28, having a button 29 at its outer end, which can be anchored in an aperture like 30, of which there may be any desired number in the bottom of the groove. The advantage of this construction is that, if it is desired to provide the roll with the so-called "Johnstone grooves", shown in Patents Nos. 1,355,106 and 1,355,107, such grooves may be used for the reception of the anchoring means of the ring, which admits of the entire surface, if desired, of the roll being provided with grooves, and at the same time permits slitting action to be carried on at any point lengthwise of the roll by adjusting the rings to any desired position. The form of the invention shown in Figs. 8 to 12 inclusive is not claimed specifically in this case but forms the subject matter of application Ser. No. 442,754, filed April 9, 1930.

The invention may be embodied in many other forms. In Figs. 13 and 14, is shown a construction in which a number of rolls 1^e are carried by a shaft 31, which shaft is driven by a gear, as 32. Rolls 1^e may all be pinned to said shaft, or they may be free to rotate independently thereof under compulsion of the web. Carried by each of said rolls 1^e is a hardened sleeve or ring 2^e, which is rotatable on roll 1^e. Suitable score-cutting elements, as 3^e, are arranged to coact with these rings, and said score-cutters may be mounted so as to be individually rotatable on the same shaft 33, or on a number of separate studs. The operation of this form of the invention is that the paper controls the speed of movement of the rings and of the score-cutters, or, as pointed out above, rings 2^e need not be rotatable on the rolls 1^e, but may be simply thin sheet-metal rings suitably hardened and secured to the roll 1^e. In that case, however, roll 1^e would be rotatable independently of shaft 31 and the paper would, therefore, control the speed of the parts, as before.

I claim:

1. The combination of a roll having a circumferential web-supporting surface, and an

annular slitting member mounted on and adjustable over said web-supporting surface in a direction lengthwise of the roll, said slitting member projecting but slightly above the surface of the roll so as to constitute with the exposed portion of the latter a substantially continuous web-engaging surface.

2. A backing member for score-cut slitting means comprising: a roll having a circumferential web-supporting surface, and a sheet-material ring mounted on and adjustable over said web-supporting surface in a direction lengthwise of the roll, the exposed surface of the roll and said ring constituting a substantially continuous web-engaging surface.

3. Score-cut slitting means including: a roll having a circumferential web-supporting surface, an annular slitting member mounted on and adjustable over said web-supporting surface in a direction lengthwise of said roll, said slitting member projecting but slightly above the surface of the roll so as to constitute with the exposed portion of the latter a substantially continuous web-engaging surface, and a complementary slitting member mounted independently of the roll and adjustable to correspond with the adjustment of the first-named slitting member.

4. Score-cut slitting means including: a roll having a circumferential web-supporting surface, an annular slitting member mounted on and adjustable over said web-supporting surface in a direction lengthwise of said roll, said slitting member projecting but slightly above the surface of the roll so as to constitute with the exposed portion of the latter a substantially continuous web-engaging surface, a complementary slitting member mounted independently of the roll and adjustable to correspond with the adjustment of the first-named slitting member, and guide means to direct a web of flexible material to contact both the web-supporting surface of said roll and the slitting members.

5. The combination of a roll having a circumferential web-supporting surface, and an annular slitting member rotatably mounted on said web-supporting surface, said slitting member projecting but slightly above the surface of the roll so as to constitute with the exposed portion of the latter a substantially continuous web-engaging surface.

6. The combination of a roll having a circumferential web-supporting surface, and a slitting member consisting of a ring of sheet material rotatably mounted on said web-supporting surface, the exposed surface of the roll and said ring constituting a substantially continuous web-engaging surface.

7. A slitting element including: a rotatable backing member, and an annular slitting member rotatably mounted on and surrounding said backing member.

8. A slitting element including: a rotatable backing member, and a ring of sheet

material rotatably mounted on and surrounding said backing member.

9. A score-cut slitting device including: a rotatable backing member, an annular slitting member rotatably mounted on and surrounding said backing member to thereby turn with or independently of said backing member in response to the pulling action of a moving web, and a complementary slitting member rotatably mounted independently of the backing member to engage the annular slitting member under tension.

10. A score-cut slitting device including: a rotatable backing member, an annular slitting member rotatably mounted on and surrounding said backing member to thereby turn with or independently of said backing member in response to the pulling action of a moving web, a complementary slitting member rotatably mounted independently of the backing member to engage the annular slitting member under tension, and guiding means to direct a web into engagement with one of said slitting members at a point in advance of the point of contact of the two slitting members.

11. A score-cut slitting device including: a rotatable roll having a circumferential web-supporting surface, an annular slitting member rotatably mounted on said web-supporting surface to thereby turn with or independently of said roll in response to the pulling action of a moving web, said slitting member projecting but slightly above the surface of the roll so as to constitute with the exposed portion of the latter a substantially continuous web-engaging surface, and a complementary slitting member rotatably mounted independently of the roll to engage the annular slitting member under tension.

12. A score-cut slitting device including: a rotatable roll having a circumferential web-supporting surface, an annular slitting member rotatably mounted on said web-supporting surface to thereby turn with or independently of said roll in response to the pulling action of a moving web, said slitting member projecting but slightly above the surface of the roll so as to constitute with the exposed portion of the latter a substantially continuous web-engaging surface, a complementary slitting member rotatably mounted independently of the roll to engage the annular slitting member under tension, and guiding means to direct a web into engagement with one of said slitting members at a point in advance of the point of contact of the two slitting members.

13. The combination of a breast roll having a circumferential web-supporting surface, an annular slitting member mounted on said web-supporting surface, said slitting member projecting but slightly above the surface of the breast roll so as to constitute with the exposed portion of the latter a sub-

stantially continuous web-engaging surface,
a complementary slitting member to coact
with the annular slitting member, and guide
means to so direct the web as to partially
5 wrap it around said breast roll and annular
slitting member for a distance adjacent the
point where the two complementary slitting
members engage.

Signed at New York, in the borough of
10 Brooklyn, county of Kings and State of
New York, this 22 day of December, 1928.

JAMES A. CAMERON.

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