(No Model.) 3 Sheets—Sheet 1.

G. ESTERLY.

AUTOMATIC GRAIN BINDING MACHINE.

No. 303,926. Patented Aug. 19, 1884.

Fig. 1

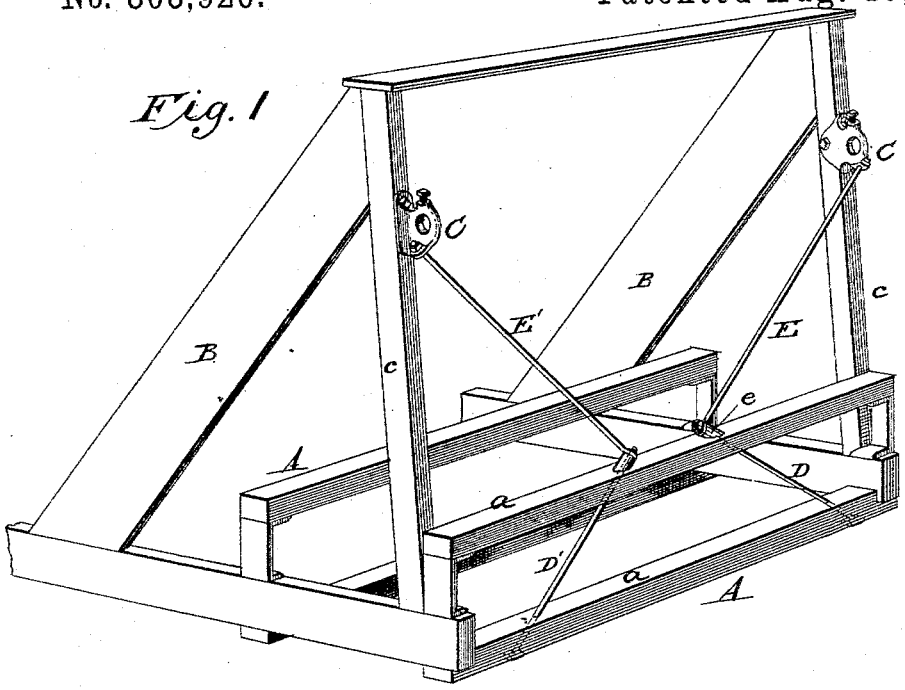
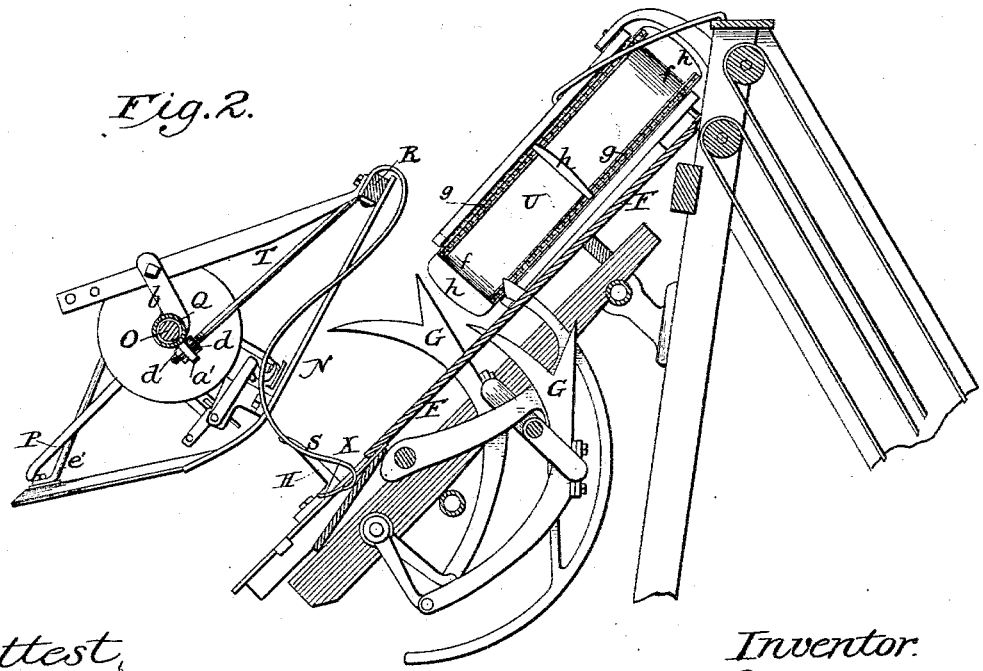


Fig. 2.



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Sidney P. Hollingsworth
Harry Shipley

Inventor:
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By his attorney
Philip T. Dodge.

(No Model.) 3 Sheets--Sheet 2.

G. ESTERLY.

AUTOMATIC GRAIN BINDING MACHINE.

No. 303,926. Patented Aug. 19, 1884.

Fig. 3.

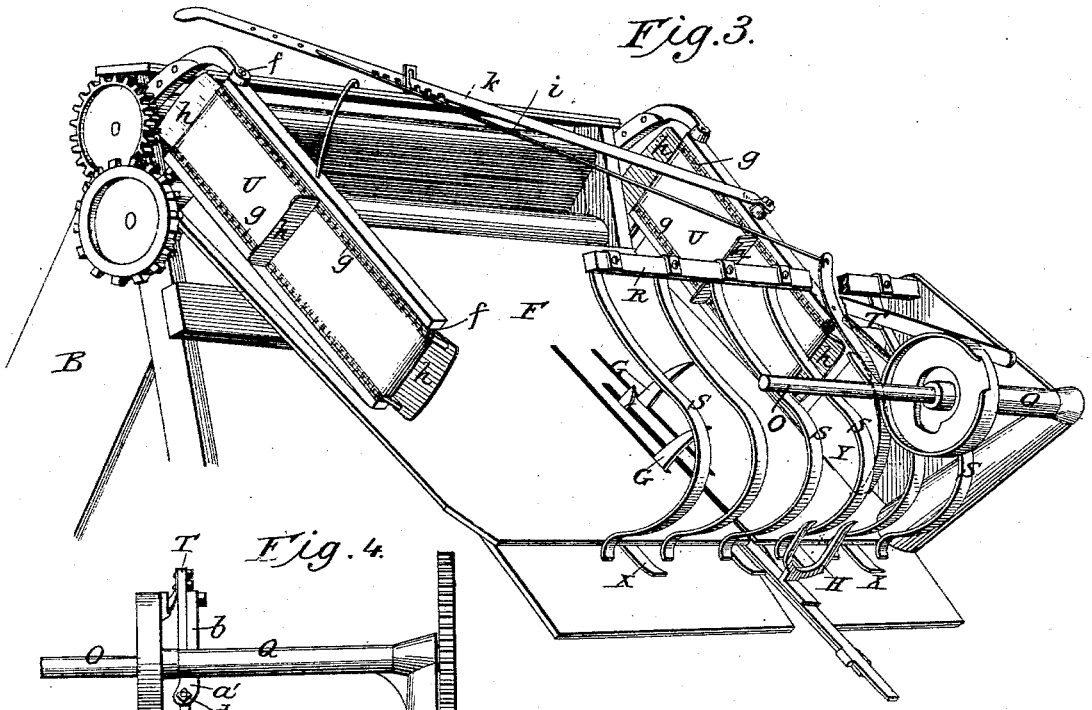


Fig. 4.

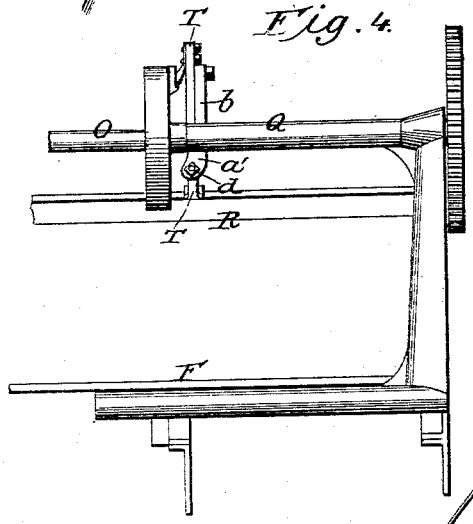
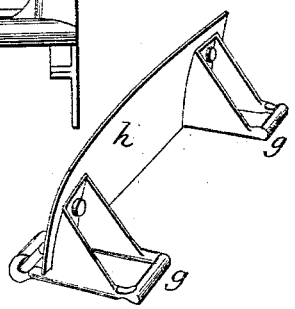


Fig. 5.



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(No Model.) 3 Sheets—Sheet 3.

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AUTOMATIC GRAIN BINDING MACHINE.

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Fig. 6.

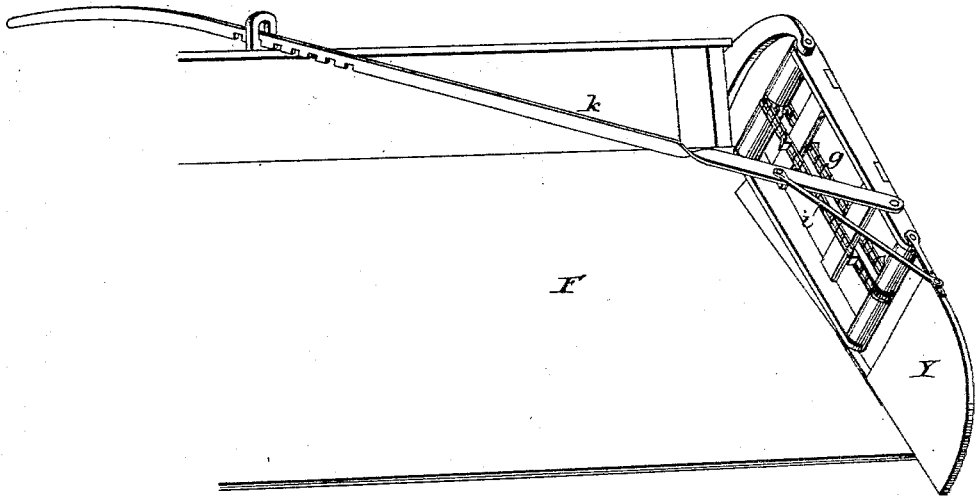


Fig. 7.

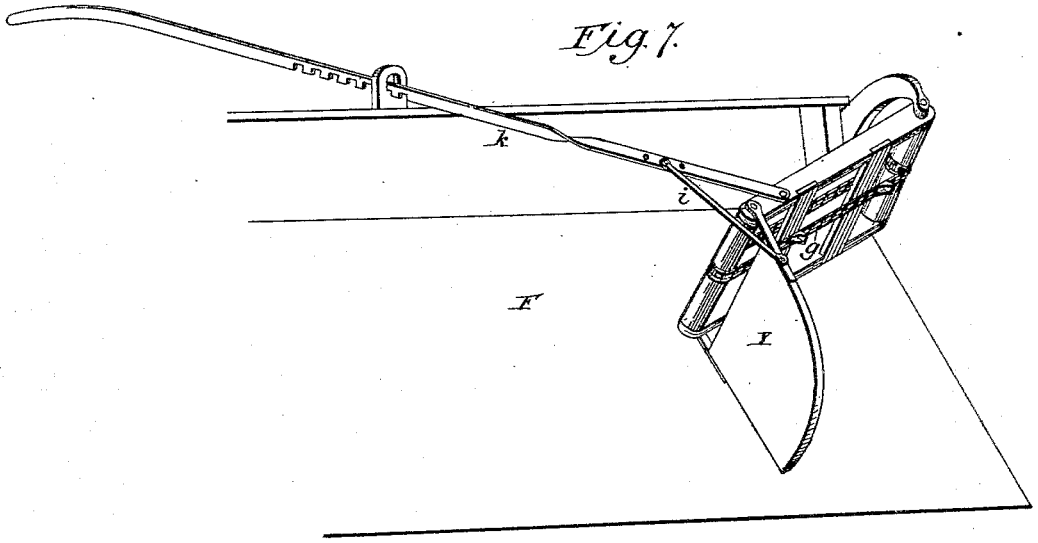
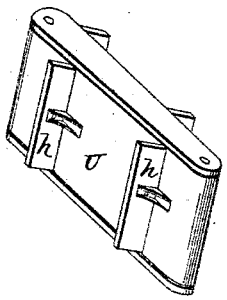


Fig. 8.



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Sidney P. Hollingsworth

Harry Shipley

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George Esterly

By his attorney

Philip T. Dodge.

UNITED STATES PATENT OFFICE.

GEORGE ESTERLY, OF WHITEWATER, WISCONSIN.

AUTOMATIC GRAIN-BINDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 303,926, dated August 19, 1884.

Application filed May 1, 1883. (No model.)

To all whom it may concern:

Be it known that I, GEORGE ESTERLY, of Whitewater, in the county of Walworth and State of Wisconsin, have invented certain Improvements in Automatic Grain-Binding Machines, of which the following is a specification.

This invention relates to various improvements designed more particularly for application to what are commonly known in the market as the Esterly-Appleby machines, although, as hereinafter described, the improvements are adapted for application to other machines of the same general character.

One improvement relates to an improved manner of bracing the upright frame-work in which the elevator-aprons are sustained, commonly known as the "A-frame," to prevent the same, as well as the main frame, from being twisted out of their proper rectangular form by the weight of the binding mechanism and the other strains to which they are subjected; and to this end it consists in the peculiar arrangement of diagonal braces hereinafter explained.

Another part of the invention consists in a peculiar manner of sustaining the upper overhanging end of the standard or bracket in which the horizontal main shaft of the binder is mounted; and to this end it consists in the combination, with said standard, of two diverging braces extending thence to the top of the breast-plate above the grain-space, these braces having their upper ends attached to the bracket in the peculiar manner hereinafter explained.

It consists, further, in combining with the swinging frame in which the forward adjuster or butter-apron is carried, an adjustable blade or board forming a continuation of said frame for the purpose of determining the position of the grain longitudinally after it has passed below the end of the apron, and mechanism for effecting an independent adjustment of said blade.

Another feature of the invention is designed to secure the binding of those loose or scattered straws which are ordinarily permitted to escape from the machine unbound, and to avoid the necessity for employing the hinged leaves or boards used at the lower edge of the binding-table.

To this end it consists in depending springs arranged to engage the outer side of the bundle during the binding operation substantially in line with the lower compressing-arm.

It also consists in this connection of springs applied to the face of the binding-table substantially in line with the compressor to engage beneath and outside of the gavel during the binding operation.

Referring to the accompanying drawings, Figure 1 is a perspective view of the frame of the harvester with the binding-supports thereon. Fig. 2 represents a transverse vertical section through the center of the binding mechanism. Fig. 3 is a perspective view of the binding-table and the adjacent parts, the breastplate and tying mechanism of the binder being omitted to expose the parts located thereunder. Fig. 4 is an elevation, looking against the lower or outer edge of the binding-table. Fig. 5 is a perspective view of the grain-carrying blade used in connection with the adjuster or belts. Figs. 6 and 7 are perspective views illustrating another and preferred construction of the adjuster or butter aprons, the extension-blades, and the grain-carrying blades used therewith. Fig. 8 is a perspective view of the butt-adjusting apron, its frame, and the blades attached thereto.

Referring to the drawings, A represents the rectangular main frame of a harvester, in which the driving-wheel will be mounted, as usual. This frame is constructed with two horizontal timbers on the outer side, as shown at *a a*.

B represents the inclined elevator-frame, mounted upon the main frame in the ordinary manner, as represented in the drawings. The outer posts or standards, *c*, of this elevator-frame rise from the upper portion of the main frame, and are provided, as usual, near their upper ends with bracket-castings C, bolted firmly thereon and designed to give support to the horizontal rod or shaft, which serves as the upper support of the binding-machine.

The foregoing parts are of substantially the ordinary construction, and, with the exception

of certain peculiarities in the brackets hereinafter described, constitute no part of the present invention.

In practice it is found that, owing to the causes before mentioned, there is a constant tendency of the main and elevator frames to assume a rhomboidal form, whereby the parts are caused to bind and wear in an objectionable manner. To avoid this difficulty I employ at the stubble side of the machine two braces, D and E. The brace D, commencing at the lower forward end of the main frame on the outer or stubble side, extends obliquely upward and backward through the two timbers of said frame and through the plate or casting *e* thereon. The upper brace, E, is seated at its lower end, and extends thence upward and forward to and through the binder-supporting bracket C, as represented. At the rear end of the frame I arrange two corresponding braces, D′ and E′, the former extending upward and forward through the main frame and connecting with the lower end of a brace, E′, which extends thence upward and backward through the rear bracket, C, as plainly represented. Nuts applied to the ends of the braces serve to keep the same under proper tension. In practice it is found that the diagonal braces thus applied give to the parts the requisite rigidity and retain them permanently in proper form and position, at the same time permitting the frame-work if desired to be made lighter than usual.

While it is preferred to pass the upper ends of the braces E and E′ through the binder-supporting brackets, which are provided with ears for the purpose, they may be connected directly to the upper portion of the elevator-frame, if desired.

The essential feature of the invention consists in arranging the braces in the diagonal positions represented, and it will be manifest to the skilled mechanic that the form of their ends and their mode of connection may be modified, provided their position remains substantially as indicated in the drawings.

Referring next to the peculiar manner of bracing the overhanging standard or bracket in which the main shaft of the binder is mounted, attention is directed particularly to Figs. 2 and 4.

The entire binding-machine, which is of the well-known Esterly-Appleby type, is sustained upon the outer stubble side of the harvester, being sustained by the A-frame in the form and manner represented in Letters Patent No. 262,026, hitherto granted to me, the general construction of the parts being essentially the same as that in the patent referred to and in the Patent to Appleby No. 212,420.

An inclined table, F, receives the grain from the elevator-aprons and gives support thereto during the binding operation. Alternately-acting packer-arms G serve to force the grain downward and effect its compression against an upright compressor, H, rising above the lower end of the table. Above the table there is a stationary breastplate, N, which serves to confine the grain from above and assist in giving support to the tying devices in the ordinary manner. Above the breast-plate, and connected therewith by suitable bearings, there is a horizontal shaft, O, forming the main driving-shaft of the binder, and serving, through the cams and other devices thereon, to impart motion to the knotting mechanism, and also serving to carry the rotary discharge-arm P, by which the bound bundles are discharged from the machine, as in the patents above referred to. This shaft O is sustained, in the usual manner, by means of a stationary bracket or standard, Q, which, rising from the base of the binder proper at one end of the binding-table, overhangs the latter in the manner shown, the shaft being sustained in this overhanging portion.

The feature of my invention now under consideration has reference to the manner of bracing the overhanging end of the standard and connecting the same with the breastplate thereunder. As shown in the drawings, the breast-plate has its upper end bolted to or partially sustained by a horizontal bar, R, located at a suitable distance above the grain-table, and bolted at one end firmly to supports connected with the standard Q. This bar R also serves to support elastic pressure-fingers S, which will be hereinafter described, and is liable to be forced out of position when sustained in the ordinary manner. It is one of the objects of this invention to give this bar, and through the bar the breast-plate, a suitable support. This I accomplish by casting to the overhanging end of the bar or bracket Q a downwardly-extending lug, *a′*, and an upwardly-extending lug or arm, *b*, and connecting to these two lugs, respectively, the two ends of a forked or bifurcated brace, T, the upper end of which is bolted rigidly to the bar R. On reference to Figs. 2 and 4, it will be seen that the upper arm of the brace is bolted firmly to the upper arm, *b*, of the standard, but that the lower arm of the brace is passed through the lower arm or stud, *a′*, of the standard, provided with a screw-thread and with two nuts, *d d*, located on opposite sides of the arm *a′*. These nuts admit of pressure being applied through the braces to either or both sides of the stud or arm *a′*, thus determining the relation of the upper end of the brace to and of the bar R, attached thereto with respect to the standard Q. In practice it is found that by making use of this divided brace or its equivalent two diverging braces, one of which has provision for the adjustment endwise with respect to the standard, I am enabled to bring the parts readily and quickly to a proper position and maintain them in such position under all circumstances.

It is to be understood that the breastplate receives support at its lower end in the ordinary manner by means of a brace-rod, *e′*, and of the standard which serves to support the tying and clamping devices, and which con-

nects the breast-plate with the main shaft, these features not being of my invention.

While it is preferred, as shown, to connect the upper end of the brace with the breast-plate through the medium of the intermediate bar, R, it is manifest that the brace may be bolted directly to the breast-plate, if preferred.

Referring next to the oblique belts or aprons located at the two ends of the table, and which act upon the ends of the grain to effect its longitudinal adjustment, and which are commonly known in the art as "butter" or "adjuster" aprons, it will be seen on reference to Figs. 2 and 3, that each apron, U, is carried, as usual, at its two ends by rolls *f*, standing perpendicular to the face of the table. The two rolls are mounted in a frame, which swings about the axis of the upper roll as a center, thus permitting the inclination or obliquity of the belts with respect to the course of the grain, to be varied at will in the ordinary manner. The manner of constructing and adjusting these frames and of imparting motion to the belts constitutes no part of the present invention. My improvement consists in arranging along the center or along the edges of either or both adjuster-belts an endless chain or chains, *g*, in such manner as to travel with the belt, and in securing to said chain or chains transversely across the belt-projecting blades *h*, designed to engage over or upon the ends of the grain to carry the same positively downward over the surface of the binding-table or grain-board toward the binding mechanism. It will be observed on reference to Fig. 3 that these blades, which are preferably made of sheet metal or other thin material, which will enter freely between the grain-stalks without forcing the same endwise, project a considerable distance, usually from two to three inches, beyond the surface of the aprons, and that their faces stand perpendicular, or substantially so, to the surface of the table. Being thus constructed they will pass into the mass of grain between the stalks or straws and engage for a considerable width or distance upon the ends of the grain, taking a firm hold thereon and causing the same to be carried downward toward or into the binding mechanism in a positive manner. By this action they give material assistance to the packer arms G in forcing the grain downward into the binding mechanism and compacting the gavel therein. They are peculiarly advantageous in that they avoid the difficulties commonly experienced by the grain shifting or turning in such manner as to lie obliquely across the grain-table. When these blades are used, it is found in practice that the difficulty ordinarily experienced on account of the grain advancing over the table more rapidly at one end than at the other is entirely avoided.

It is preferred, as shown in Fig. 5 of the drawings, to construct the links of the chain with suitable projections thereon, to admit of the blades being riveted or secured directly thereon; but it is manifest that the form of the blades and the manner of their attachment to the chain may be modified, provided their mode of action is not essentially changed. The blades may be attached directly to the surface of the apron and the carrying-chains omitted; but the use of the chains or equivalent carrying devices with the aprons is preferred because of the greater strength and durability of the parts. When the chains are employed, the upper or driving roll, *f*, is preferably provided with sprocket-wheels to impart a positive motion to the chains. The edges of the blades are preferably curved longitudinally, whereby they are adapted the better to prevent the grain from being carried upward over the upper ends of the blades.

While I have represented in Figs. 2 and 3 two chains applied in connection with each adjuster-belt to carry the blades *h*, a single centrally-located chain may be employed, if preferred, as shown in Figs. 6 and 7. In such case it is preferred to have the chains located within or beneath the belts, and provide them with lugs or extensions protruding through openings in the belt to receive the blades *h*, which are applied externally.

I am aware that adjuster-aprons have been provided on their surfaces with ribs or serrations for the purpose of adapting them to act with greater certainty in forcing the grain endwise; but I am not aware that any one has hitherto employed blades of suitable character to engage positively and firmly upon the grain to move the same laterally into the binding mechanism.

Another improvement in connection with the butter or adjuster apron at the front consists in combining therewith a blade, board, or wing extending downward over the binding-table beyond the adjuster-frame, to act upon the butts of the grain which have passed the adjuster to retain the same in the proper longitudinal position during the binding action, said blade being combined with mechanism hereinafter described, whereby it is adjustable in the direction of the length of the grain independently of the adjuster-apron. The forward apron is necessarily made of such length as to terminate its action upon the grain before the latter completes its downward movement over the table. In operating in the field it has been found that the grain, after leaving the ends of the adjuster-aprons, is frequently caused to shift endwise by the inclination or motion of the machine, or both, thus producing an irregular elongated bundle. This difficulty is completely avoided by combining with the lower end of the adjuster-apron the extension referred to.

Referring to Figs. 3, 6, and 7, it will be perceived that the extension-blade Y is hinged or jointed to the lower end of the frame in which the adjuster-apron is carried, so that its lower end may swing horizontally with respect to the frame and the apron. A rod, *k*,

is pivoted at one end to the frame which carries the apron, and extended thence backward within reach of the driver, the lower edge of the rod being notched and arranged to engage a guide on the main frame, as shown in the several figures. The rod *i* is extended from the hinged blade to the bar *k*, by which the apron-frame is adjusted. When therefore the bar or handle *k* is moved to adjust the apron, it will cause the rod *i* to control the position of the extension-blade. The rod *i* may be attached directly to the blade Y, as shown in Figs. 6 and 7, or attached to an arm extending from the blade, as represented in Fig. 3. In either case its rear end may be detachably connected to the bar *k*, so as to admit of its being adjusted with relation to the bar to effect the adjustment of the blade Y independently of the adjuster-apron. A simple connection between the rod and bar is that represented in Fig. 3, the bar being provided with a series of holes, into either of which the end of the rod may be engaged at will.

Passing next to the means which I have provided for preventing the escape of grain during the binding operation, or, in other words, for insuring the binding of all the grain, reference is made to Figs. 2 and 3.

As before stated, the grain delivered upon the inclined binding-table is forced downward by the packers beneath the breast-plate and against the upright compressor located at or near the lower edge of the table, the compressor being arranged, as in the patents before referred to, to serve as a means for throwing the binder into action with its driving-gear whenever the accumulating gavel has attained the proper size. In this class of machines as hitherto constructed it has been customary to provide the table at its lower end with upwardly-turning leaves or boards, as represented, for example, in Patent No. 266,254, granted to George Esterly, for the purpose of assisting to hold the gavel during the binding operation. It has also been customary to provide the machine with a series of depending spring-fingers acting upon the grain from above and at a point between the conveyer-aprons and the compressing-arm H, at a considerable distance inside of the latter. The hinged boards and the depending fingers I now dispense with, and in place thereof I employ a series of depending spring-fingers, S, such as represented in Figs. 2 and 3. These fingers are attached at their upper ends to the overhead-bar R, before alluded to, and are curved thence downward and forward in position to engage over and outside the accumulating gavel, the lower ends of the fingers terminating in line or substantially in line lengthwise of the table with the compressor H. The fingers thus constructed and arranged serve effectually to retain all straw which passes down over the surface of the binding-table in such position that the cord will be carried around it by the binder-arm, their action in this regard being widely different from that of the depending springs hitherto employed, which acted upon the loose grain above the gavel simply for the purpose of holding the same down upon the surface of the table. There may be a greater or less number of the fingers S; but in ordinary cases I find from four to six will answer every purpose.

As an additional means of keeping the grain in position, I attach to the binding-table another series of spring-fingers, X, extending downward substantially in line with the lower edge of the table and terminating in upwardly-curved ends, which stand substantially in line with the compressor-arm H and with the ends of the spring-fingers S. When these springs X are employed, it is preferred to have the binding-table terminate at a point nearly in line with the compressor H, or to have its face inclined backward or downward from said point, as illustrated in the drawings, and as more particularly described in Letters Patent granted to me on the 17th day of July, 1883, No. 281,623. While it is preferred to employ the fingers S and X in combination, either series may be employed alone with good effect. After the binding of the bundles has been completed, its delivery from the machine will be effected by means of the rotary ejector arm or arms P in the usual manner, being carried over the lower edge of the table between the springs S and X, or by means of any other equivalent ejecting device.

I am aware that an adjusting or butting apron has been combined with a plate or shield forming a continuation thereof, the parts being united, however, by intermediate devices, which prevented their independent adjustment. My improvement consists in combining with the apron and shield means by which the blades may be adjusted independently of the apron.

Having thus described my invention, what I claim is—

1. As an improvement in combined harvesting and binding machines, the combination of the main frame, the elevator-frame, the lower diagonal braces extending through the main frame, and the upper diagonal braces extending from the main frame to the elevator-frame, substantially as described.

2. In a combined harvester and binder, diagonal braces extending from the upper part of the elevator-frame inward to the top of the main frame, and thence downward and outward to the side of the main frame, substantially as specified.

3. In a harvester and binder, the main frame and elevator-frame, in combination with the binder-supporting brackets attached to the elevator-frame, and the diagonal braces extending from said brackets downward to the main frame, substantially as described and shown.

4. In combination with the main and elevator frames, the diagonal braces extending upward and inward through the main frame, combined with the diagonal braces extending

from the upper portion of the elevator-frame downward and inward, and applied directly to the upper ends of the lower braces, as shown.

5. In a grain-binding machine, the combination of the standard or bracket Q, having the arms or lugs upon the upper and under sides of its overhanging portion, the breastplate N, and the forked brace T, having its upper arm secured rigidly to the upper side of the standard, its lower arm attached adjustably to the under side of the standard, as and for the purpose described, and its opposite end connected with the breastplate.

6. The combination of the breastplate N, the bar R, the standard Q, and the bifurcated brace T, having its upper arm secured rigidly to the upper side of the overhanging portion of the standard, and its lower end connected with the under side of said overhanging portion by means of the two nuts *d*, as described and shown.

7. In combination with the endless adjuster-aprons, substantially as described, the longitudinal chain or chains, and the projecting blades or plates attached thereto, and extending beyond the edges of the aprons, as described.

8. In combination with the adjuster or butter aprons, substantially as described, the blades or wings hinged thereto, and forming a continuation thereof, and means, substantially as described, whereby said wings may be adjusted independently of the adjustment of the aprons.

9. In a grain-binder, a binding-table or grain-support, a trip-arm against which the gavel is compacted, and by which the binding mechanism is set in action, in combination with a series of depending spring-arms having their free ends bent downward, and arranged substantially in line with the trip-arm, whereby they are caused to assist in sustaining the accumulating gavel, substantially as described.

10. In an automatic grain-binding machine, the combination of a binding-table or grain-support, a trip-arm against which the gavel is compacted, and by which the driving mechanism is set in motion, and springs X, curved upward over the surface of the table substantially in line with the trip-arm, as described, whereby they are adapted to assist in sustaining and forming the gavel and the latter prevented from operating the trip until properly compacted.

11. In a binding-machine, the combination of the binding-table or grain-support, an arm or compressor against which the gavel is compacted, depending spring-arms S, and springs X, substantially as described and shown.

GEO. ESTERLY.

Witnesses:
J. H. PAGE,
I. Z. MERRIAM.