Oct. 29, 1929. J. A. TAFT 1,733,434

COTTON BALING PROCESS

Filed June 24, 1921 4 Sheets-Sheet 1

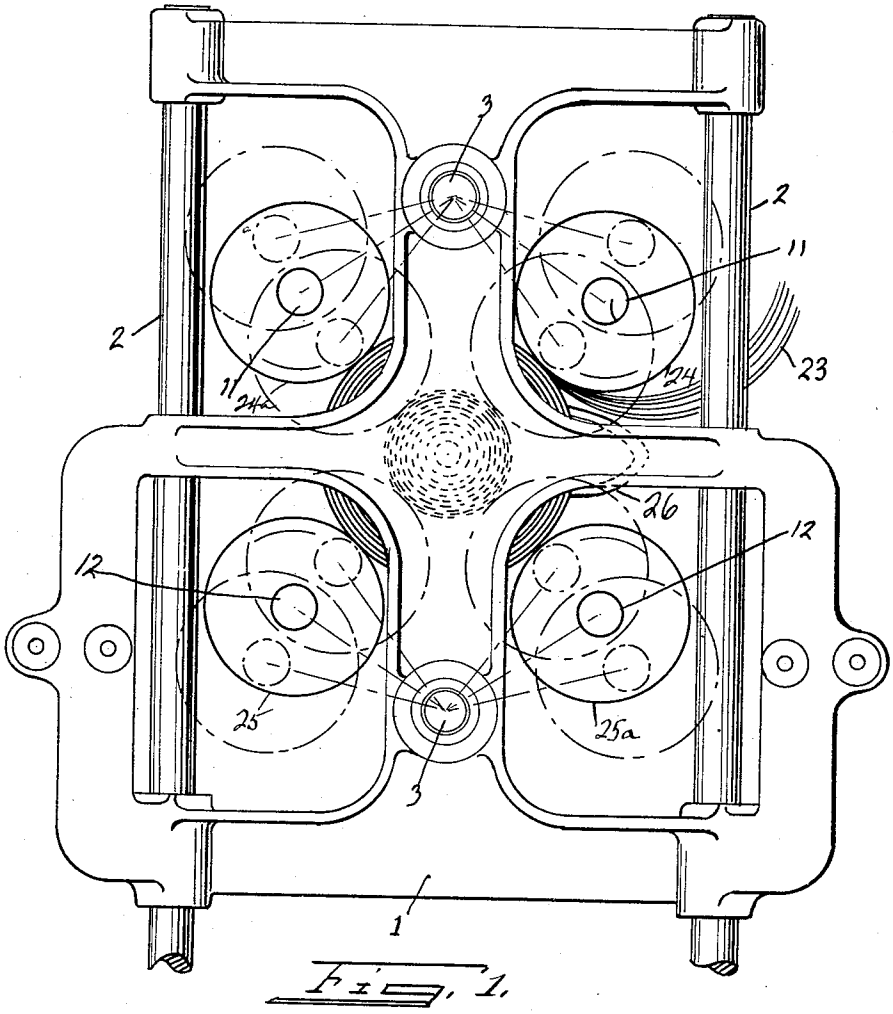


Fig. 1.

INVENTOR:
John Albert Taft
BY
Reece & Kellen
ATTORNEYS.

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COTTON BALING PROCESS

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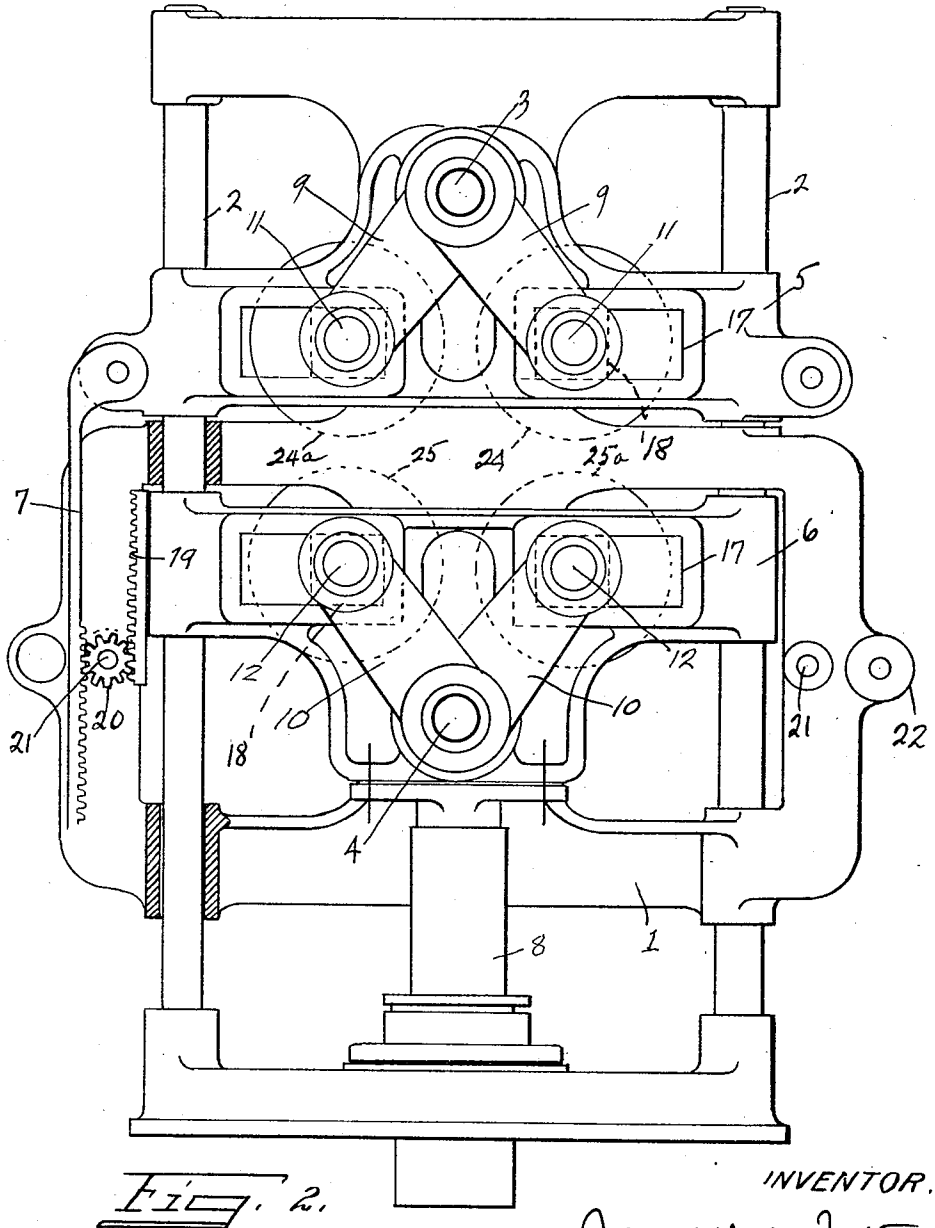


Fig. 2.

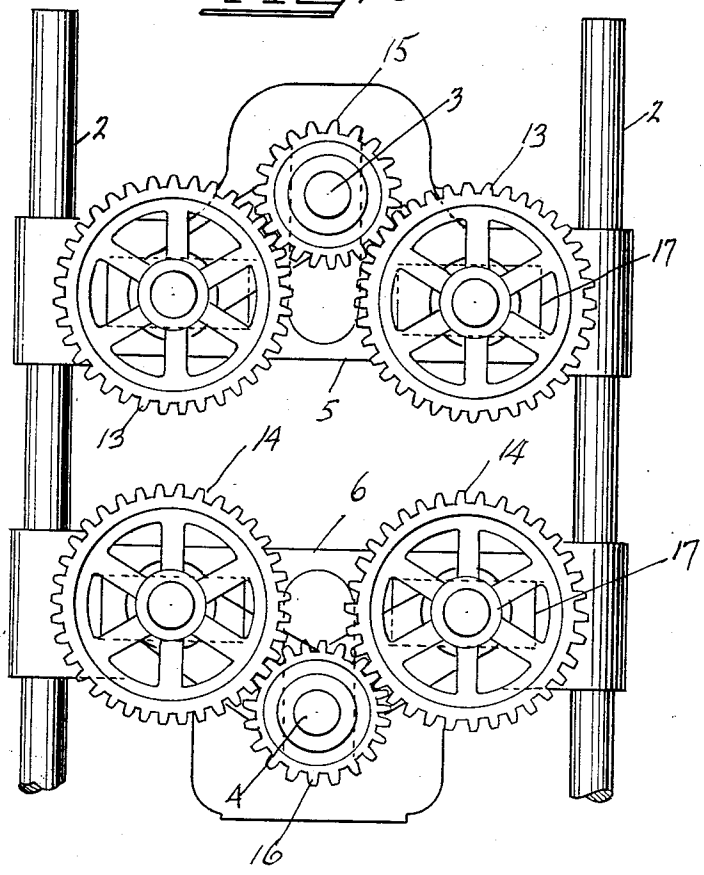
INVENTOR:
John Albert Taft
BY Allen & Allen
ATTORNEYS.

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COTTON BALING PROCESS

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Fig. 3



INVENTOR:
John Albert Taft
BY
Allen & Allen
ATTORNEYS.

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COTTON BALING PROCESS

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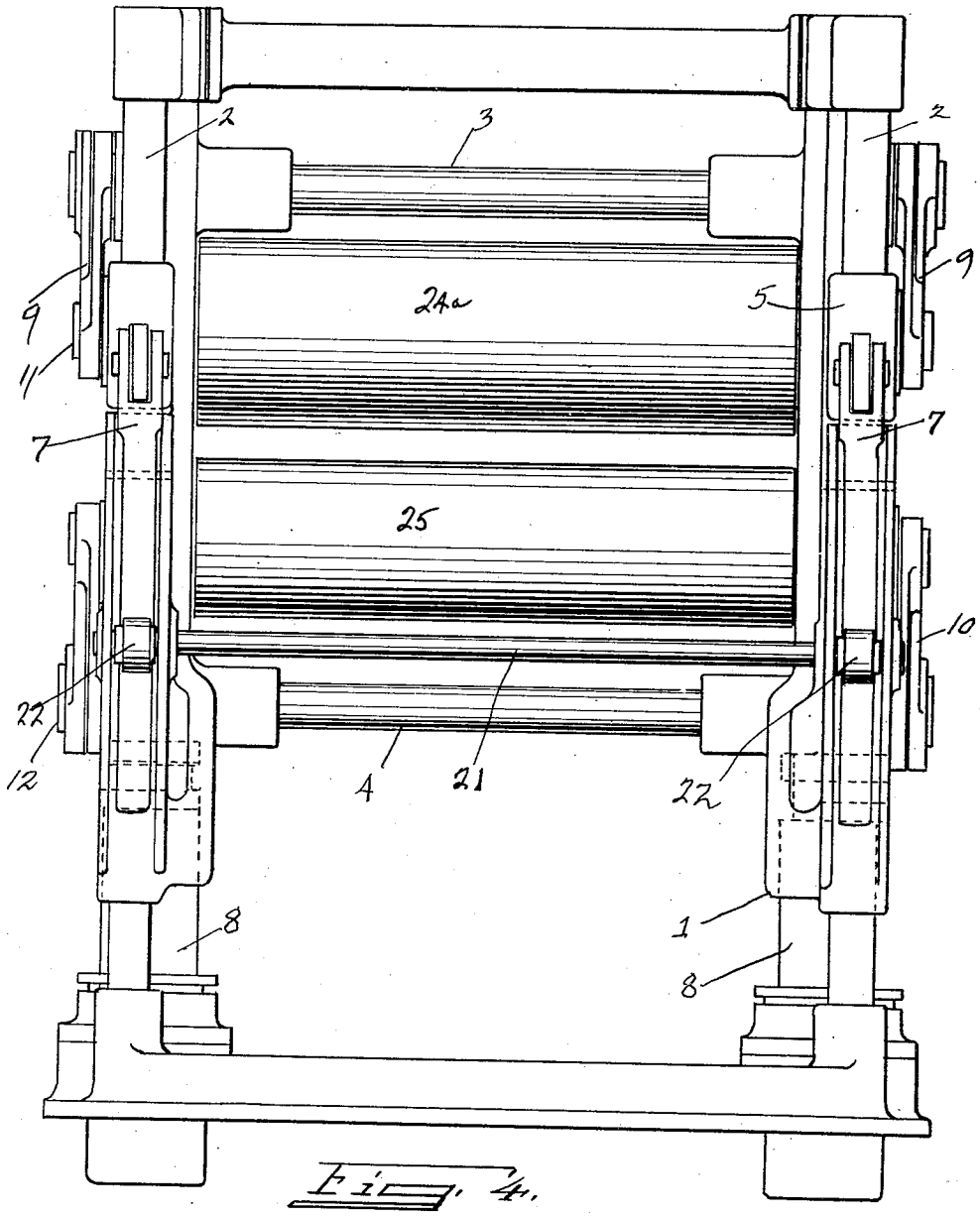


Fig. 4.

INVENTOR:
John Albert Taft
BY Allen & Allen.
ATTORNEYS.

Patented Oct. 29, 1929 1,733,434

UNITED STATES PATENT OFFICE

JOHN ALBERT TAFT, OF CINCINNATI, OHIO, ASSIGNOR TO P. M. CLARK, OF CINCINNATI, OHIO

COTTON-BALING PROCESS

Application filed June 24, 1921. Serial No. 480,180.

My invention relates to the baling of cotton in cylindrical form, and more specifically to improvements in processes of forming the cylindrical bales from webs of raw cotton as they come from a condenser.

While the forming of a proper web or bat of the cotton after it leaves the gin and is condensed is important in connection with the formation of a cylindrical bale, my invention herein is not addressed to this bat formation, but to the coiling and compressing of the web into a cylindrical shape.

There have been methods and devices in the past for performing the operation with which my invention is concerned, the principal one being the use of a movable core over which the bat from the condenser is wrapped, after which the bat and core are revolved by means of cylindrical rolls against which the core is impelled by suitably regulated pressure.

To get a fully compressed cylindrical bale, it is necessary to tightly wind the bat into the cylinder as well as to compress it during the winding operation. It is also necessary to keep the bale as truly cylindrical as possible during the winding operation.

Where to my knowledge baling machines having more than one roll have been used, the practice has been to have two of the rolls mounted on stationary journaled axes, and one or more rolls mounted on movably journaled axes. The result of this arrangement is that as the bale increases its diameter, the movable roll or rolls may become more and more widely separated from the fixed rolls.

In such machines, the journaled axes cannot maintain a constantly equal spacing about the bale, which causes the bale to be rolled in elliptic form. Thus the rolls which move, move in straight lines, and at no time during the operation is the pressure against the cylinder of cotton between the rolls subjected to a balanced pressure exerted radially of the same.

The result of the elliptical formation is that the fibres of the cotton work on each other forming a glaze, and often the heat generated from the working to and fro of the fibres will scorch the material, so as to ruin it for use. Furthermore, it is a very frequent occurrence for the entire bale to slip out from between the rolls as soon as the spacing between the movable and fixed rolls becomes dis-proportionately greater than the spacing between the two fixed rolls themselves.

It is the object of my invention to provide a winding or rolling process which insures the application of a constant radial pressure on the growing cylinder of cotton, and in which the pressure along the various radial lines is always equal. It is also my object to provide a process in which the winding action will be such as to draw the web or bat tightly around the inserted or self-formed core, thereby saving greatly in the necessary pressure to compress the cotton down.

I have not noted particularly the advantages of the cylindrical bale of cotton, since it is well known that in the cylindrical bale, without re-compression, a compact, easily handled package of cotton may be obtained, which saves at every point from baling through handling and shipping to the hands of the consumer. This is evident from the fact that the old customary bales of cotton have a density of around twenty-two pounds to the cubic foot, while the cylindrical bales properly formed have about twice that density.

I accomplish my objects by that certain process and mode of operation to be hereinafter more specifically pointed out and claimed.

In the drawings, which illustrate a mechanism suitable for following my process,

Figure 1 is a partially diagrammatic elevation illustrating the baling operation.

Figure 2 is a side elevation showing the connections of the rolls, and the pressure and equalizing features.

Figure 3 is a side elevation of a form of gearing for driving all rolls in all positions.

Figure 4 is a front elevation of the machine.

I will first describe the drawings as the simplest way of illustrating the process, it

being understood that these drawings are intended as illustrative of one mechanism whereby my process may be accomplished, said mechanism to form a separate basis for application for patent.

In the frame 1 of the machine are set four vertical posts 2, said frame providing journals for two driving shafts 3 and 4 for the upper and lower structures. Sliding on the posts 2 and slotted where they straddle the shafts 3 and 4 are the upper and lower cross heads 5 and 6. The upper cross heads have rack arms 7 hinged thereto for a purpose to be described, and the lower cross heads have positioned below them and exerting hydraulic pressure against them, the pistons 8.

There are a pair of arms 9 on each end of the upper shaft 3 and a pair of arms 10 on each end of the lower shaft 4, said arms carrying a pair of shafts 11 in the upper cross head and a pair of shafts 12 in the lower cross head.

The shafts extend across the machine and are equipped at their ends with gears 13 and 14, and the shafts 3 and 4 have gears 15 and 16, which mesh with the gears 13 and 14 in all positions of the mounting arms.

The cross heads have horizontally extending pockets 17 therein, in which slide boxes 18, said boxes serving to journal the shafts 11 and 12. These shafts carry the forming rolls 24 and 24ª above and 25 and 25ª below the center of the machine.

The lower cross heads have racks 19 cut or mounted on their outer ends, and these racks mesh with gears 20, 20, carried at each end of a pair of shafts 21, one shaft at each end of the machine.

The frame is channeled out to receive from each end of the two upper cross heads, the rack arms 7, and rollers 22 set at one side of the channels serve to keep these arms in mesh also with the gears 20.

The mechanism now described operates as follows:—

The bat of cotton as at 23 is brought into the space between the four rolls 24 and 24ª and 25 and 25ª, all of which are driven in the same direction by the gearing above described. This action causes the cotton bat to form a cylinder between the four rolls.

Due to the fact that the rollers are of slightly different diameters, the peripheral speed is different for each. In the preferred form the roll 24 is smallest and the diameter increases in the rolls 24ª, 25 and 25ª respectively, so that the roll 24, located just above the incoming bat of cotton, will move the slowest and each succeeding roll will be driven at a higher peripheral speed than the one that precedes it in its contact with the bat.

This operates to give a pull to the incoming bat which tightly wraps it over the previously formed core and leaves a free loop as at 26 between the fourth and first rolls, which loop will be taken up about every third revolution of the first roll, and as a fold will pass into the cylinder.

As the cylinder increases in size, the rolls will be forced away from the center, and in doing so, will have two enforced paths of motion. One path is to slide in the horizontal pockets in the two cross heads, and the other will be to force the cross heads to move, said two movements being simultaneous, since the lateral movement will not be possible without the vertical movement. The vertical movement or cross head movement is controlled by the two hydraulic pistons, which bear against the lower cross heads.

The cross heads cannot move, however, except together, since when either cross head moves the gears 20 will revolve, and said gears will then feed the other cross head in such a way as to give it the exact movement of the lower cross head. Furthermore, the two sides of the machine are balanced, since the gears 20 are fastened on the shaft 21, which extends cross the machine.

The rolls are so mounted on the radial arms from the drive shafts that the lines connecting the axes of the rolls will always be a rectangle whose center is the axis of the cylinder of cotton to be rolled.

The use of four rolls for rolling a cylinder of cotton thus according to my process is safeguarded by providing for the equalization of movement and pressure on all four rolls and maintaining them always radial and equidistant from the axis of the cylinder that is being formed between them. It is particularly important that the points of contact on the cotton be substantially equidistant about the circumference of the bale while forming it, irrespective of its diameter within the capacity of the machine. This is, of course, subject to slight differences in diameter of the rolls.

The rolls also operate on a constantly increasing speed ratio, which acts to wrap the bat tightly into a cylinder by the frictional pull (in one direction) of the bat as the air is pressed from it upon the entrance into the rolling mechanism. This saves the use of great pressure on the cotton, and tends to insure an even rolling of the bat into a true cylinder. The extra fold, which accumulates, works into the true cylinder immediately, since the incoming bat passes over it at the moment it enters the cylinder and is molded over it to leave a true cylindrical surface.

The act of winding a bat into a cylinder, between rolls without permitting it to get out of cylindrical shape when used with the tight drawing effect of the frictional pull of the varied diameter rolls, taken together, is what I consider the most important development contributed to the art by me. It is possible to get fairly good cylindrical bales of cotton

by any one of the multitude of machines designed for this purpose, but the mere insurance of equally spaced rolls, or the mere arrangement for tight drawing through various speed rollers, taken by itself, will not give the best results. Where the frictional tight drawing is present and an elliptical effect is permitted to be present, all the advantage of the tightness is lost. Where the equal spaced rolls are present and no tight drawing, then cotton will not form into even thickness laps. Where both things are adhered to, the effect is to produce a bale of even density in which the fibers are drawn lengthwise somewhat like to a woven belt. This should be qualified by the additional feature of the compression exerted by the first roll on the bat prior to the tension or pull being exerted.

Also while there may have been structures in the past for insuring an even spacing of winding rolls in a cylindrical baling press, the pressure applied to the rolls is almost always indirect, the mechanism which interconnects the rolls being called upon to take care of all the roll pressure as well. This is not true in my case, wherein the pressure is applied direct to the cross heads, and the rack and pinion are not called upon to do more than insure an equality of motion.

While I have described my process mainly in terms of one selected mechanism for the performance thereof, it will be understood that the constantly equidistant spacing, uniform pressure, plural roll expanding principle is the basis of my invention herein, together with the increasing speed ratio of the peripheries of the rollers.

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

1. A process for rolling cylindrical bales of cotton which consists in imparting rotation to the core of such bale at a plurality of points substantially equally interspaced with relation to each other and the axis of the cylindrical roll formed between such points, maintaining a uniform constant pressure at each point against the roll as it increases in size, and maintaining a substantially equal radial spacing of said points of pressure as the size of the bale increases.

2. A process for rolling cylindrical bales of cotton which consists in imparting rotation to the core of such bale at four points substantially equally interspaced with relation to each other and the axis of the cylindrical roll formed between such points, maintaining a uniform constant pressure at each point against the roll as it increases in size, maintaining a substantially equal radial spacing of said points of pressure as the size of the bale increases, and successively increasing the speed of rotation at said points to effect a frictional draft upon the bat from which the roll is formed.

3. In a cotton baling apparatus for producing cylindrical bales, a plurality of rollers substantially equally interspaced with relation to each other and to the axis of the cylindrical roll formed between them, means for maintaining a uniform constant pressure against the roll as it increases in diameter, and means for maintaining a substantially equal radial spacing of said rollers during such increase of the bale in diameter.

4. In a cotton baling apparatus for producing cylindrical bales, opposite movable heads, means for producing a joint uniform movement of said heads relative to each other, driven pressure rolls mounted in said heads for movement toward and from each other, and means for effecting a uniform spacing of said rolls in the relative movement of the rolls in each head to those of the opposing head.

5. In a cotton baling apparatus for producing cylindrical bales, opposite movable heads, means for producing a joint uniform movement of said heads relative to each other, driven pressure rolls mounted in said heads for movement toward and from each other, link members connecting the axis of the rolls in each head with a fixed pivot, and pressure means applied to one of said heads.

6. In a cotton baling apparatus, a support, opposite heads mounted thereon for movement toward and from each other, means connecting said heads to effect a simultaneous movement thereof, a pair of pressure rollers mounted in longitudinal slots in each head, and means connecting the rollers of each head to effect an equal movement thereof relative to the rollers in the opposite head.

7. In a cotton baling apparatus, a supporting frame, opposite heads mounted thereon for movement toward and from each other, means connecting said heads to effect a simultaneous movement thereof, a pair of pressure rollers mounted in longitudinal slots in each head, fixed pivots upon the supporting frame, and links extending from said pivots to the rollers in each head.

8. In a cotton baling apparatus, vertical standards, opposite heads slidingly mounted thereon, rack bars carried by said heads and having an intermeshing gear, means for transmitting motion to one of said heads and to the other of said heads through said rack bars and gear, pressure rollers slidingly mounted for movement in said heads, and links extending from the axis of said rollers to a fixed pivot supported by the standard.

JOHN ALBERT TAFT.