(No Model.)

R. D. WEBB.

COTTON PRESS.

No. 566,431. Patented Aug. 25, 1896.

Fig. 1.

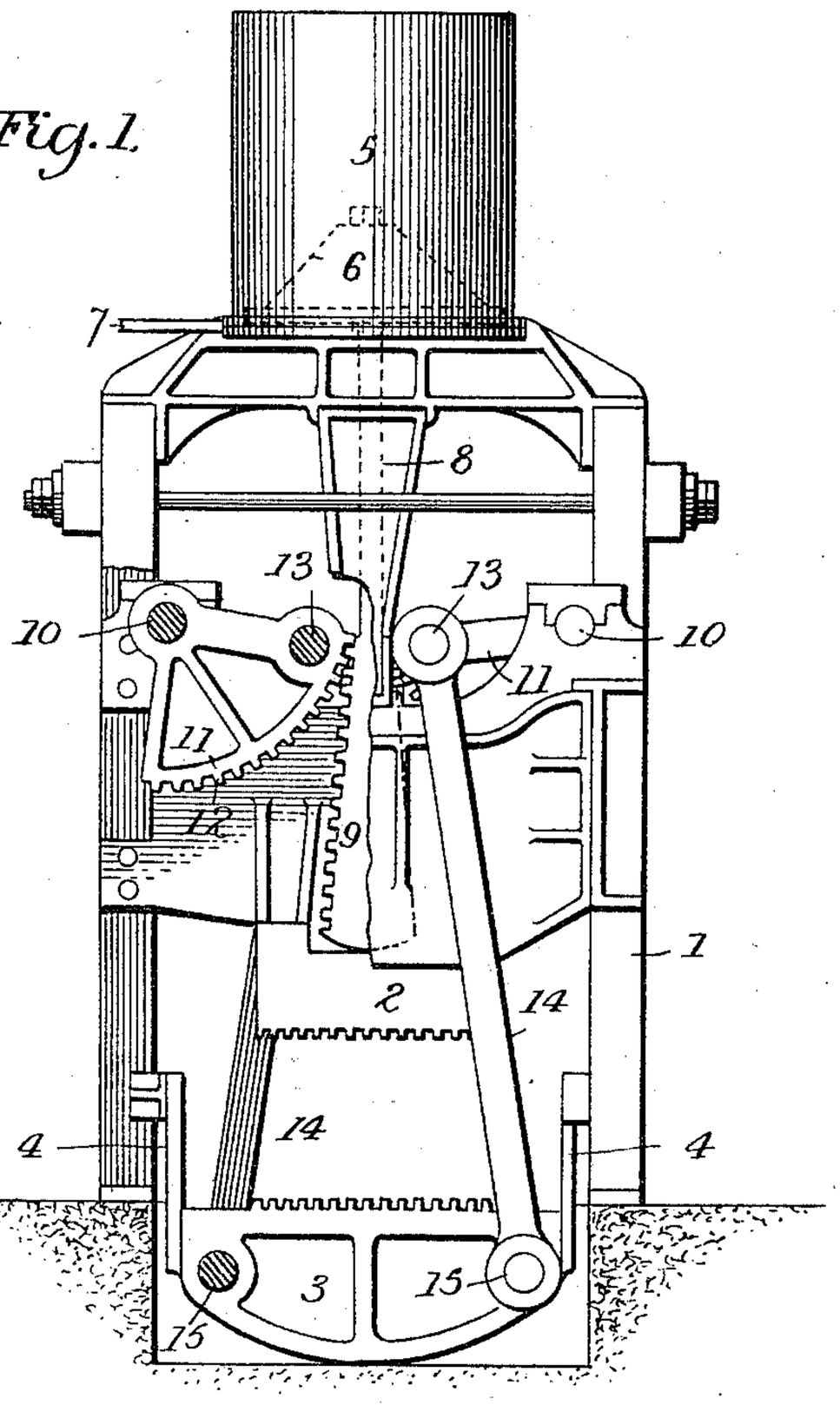


Fig. 2.

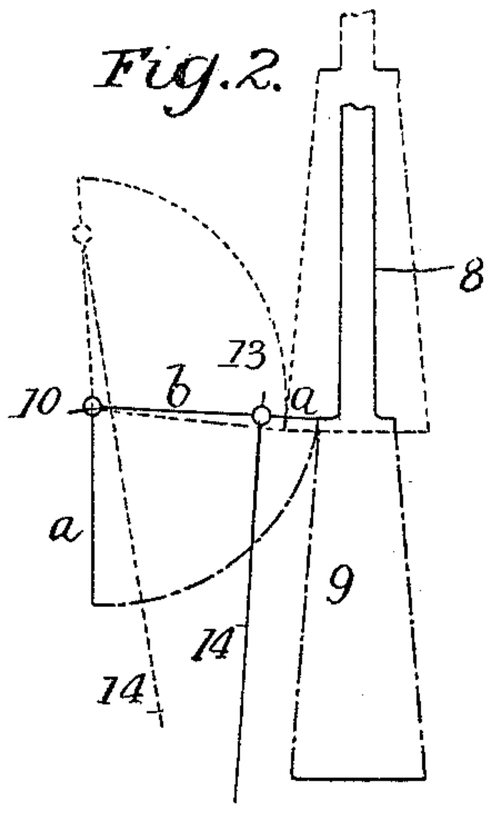


Fig. 3.

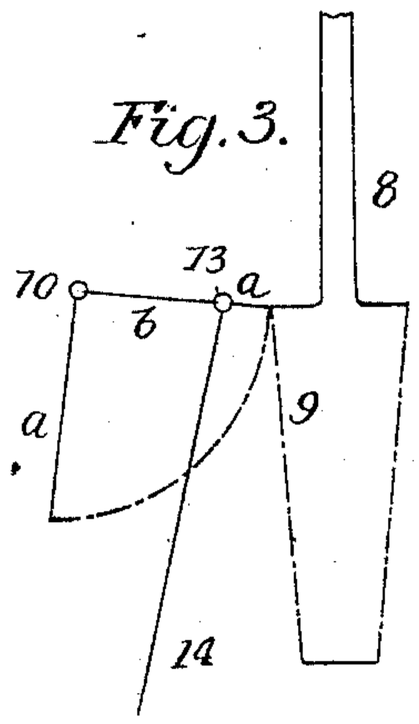
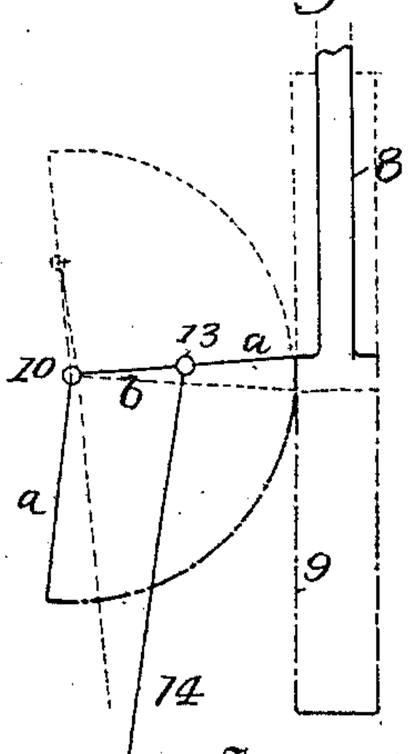


Fig. 4.



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UNITED STATES PATENT OFFICE.

ROBERT D. WEBB, OF MINDEN, LOUISIANA.

COTTON-PRESS.

SPECIFICATION forming part of Letters Patent No. 566,431, dated August 25, 1896.

Application filed October 3, 1895. Serial No. 564,528. (No model.)

To all whom it may concern:

Be it known that I, ROBERT D. WEBB, a citizen of the United States, residing at Minden, in the parish of Webster and State of Louisiana, have invented certain new and useful Improvements in Cotton-Presses, of which the following is a specification.

My invention relates to cotton and similar presses, and has for its object to improve the construction, arrangement, and operation of said presses; and it consists in the various features substantially as hereinafter more particularly pointed out.

The invention is more particularly adapted for use in connection with that well-known class of presses in which there is a stationary bed and a movable platen, which is caused to advance toward the stationary bed through the medium of what may be termed "compound levers" actuated by some suitable power. One of the well-known constructions embraces the use of sectors, which are connected with the movable platen by means of connecting-rods pivoted to the sectors and to the platen, the sectors being actuated by racks operated by or connected with the piston-rod of a steam or other engine. In this case the sectors were true sectors of a circle, that is, the sectors had equal radii throughout, and the racks were straight and moved in a plane parallel with the plane of the piston-rod. The connecting-rods were so arranged that as the sectors were operated, while their connecting-points with the sectors remained at a constant distance from the pivotal points of the sectors, their relations changed in such a way that a greatly-increased leverage was produced toward the latter part of the movement of the sectors, and a corresponding descreased movement of the platen, and thereby it was possible to produce an exceedingly great pressure toward the end of the stroke. It was alleged that even this construction did not give sufficient increase of pressure toward the latter portion of the movement of the platen, and in order to increase this pressure a press was made in which the sectors, instead of being sectors of a circle, had gradually-increasing radii, so that the toothed segments formed cycloidal curves, thereby increasing the leverage of the sectors toward the latter part of their movements, and in order to operate these sectors the racks on the piston-rod were arranged at an angle to the plane thereof, the racks converging toward the plane of the piston-rod toward its bottom or the latter portion of its stroke. This construction undoubtedly produced the results desired, that is, increased pressure toward the latter portion of the movements of the sectors. I have found that this alleged improvement, instead of being a practical advantage, is in reality a disadvantage, especially in compressing cotton-bales and the like, for the reason that the pressure increases too rapidly in proportion to the increase in resistance offered by the material of the bale, and the result is that the press is very often incapable of withstanding the excessive strain, and there is a waste of energy, as the increase in pressure is in excess of what is actually applied to the bale.

My invention differs from the former constructions in that I so construct the various parts that the increase of pressure will be in proper relation to the increase of resistance of the bale under pressure, and in carrying out my invention and adapting it to the class of presses before recited I arrange the sectors and racks in such a manner that while the pressure increases, owing to the change of relation of the connecting-rods with the fulcrums of the sectors, the operating lever-arms of the sectors decrease in length, thereby decreasing in a certain proportion the total increase of pressure, and thus avoiding the excessive overproduction of pressure and preserving proper relation between increasing pressure and increasing resistance.

In order to illustrate the principles of my invention so that they will be clearly understood, reference is made to the accompanying drawings, in which—

Figure 1 is a partial section and partial elevation of a well-known type of press. Fig. 2 is a diagram illustrating the construction of the essential features of my press. Figs. 3 and 4 are similar diagrams illustrating old presses.

Referring to Fig. 1, there is a frame 1, supporting a fixed bed 2 and provided with a movable platen 3, arranged to slide in the frame, having suitable guides 4, and the ma-

terial to be compressed is placed upon the movable platen between it and the fixed bed. Mounted on the frame is some sort of power-motor, shown as a cylinder 5, having a piston 6 and inlet-pipe 7 for the motor fluid, and connected to the piston is a piston-rod 8. Secured to the piston-rod are the racks 9, adapted to move with the piston-rod. Mounted in bearings 10, forming fulcrums therefor, are the sectors 11, the engaging surfaces 12 of which are provided with teeth or otherwise adapted to engage the racks 9 and be operated thereby. Connected to the sectors, preferably at points near the engaging surfaces, as at 13, are the connecting-rods 14, which are also connected to the movable platen 3 at the points 15. These connecting-rods are connected to the sectors between the fulcrum-points 10 and the rack-bars 9, and when the platen is depressed the sectors are preferably in substantially the position shown in Fig. 1, so that the pivotal points 13 are in substantially the plane of the fulcrums 10, or a little below. It will be evident that when the motor fluid is admitted to the cylinder the piston is raised, and the racks on the piston-rod operate the sectors to raise them and swing them around their fulcrums, and the pivotal points 13 move upward and outward, and the whole forms what may be termed a "compound lever," adapted to increase and multiply the power in its effect or pressure upon the bale between the platen and bed, in a well-known manner. In order that this may be clearly understood, it may be assumed that the sector between the fulcrum 10 and the rack 9 forms one arm, which may be called the "operating-arm," of a lever, and which I will designate as a, while the sector between the fulcrum 10 and the pivotal point 13 of the connecting-rod 14 forms the other or what may be termed the "working" arm of the lever, and which I will designate as b.

In Fig. 4 I have indicated roughly a diagram in which the rack 9 is parallel to the plane of the piston-rod 8 and the sector 11 is a true sector, in which the lever-arm heretofore designated as a is constant, the radii of the sector being uniform, while also the distance between the points 10 and 13 always remains constant. As the point 13 travels upward and forward it will be evident that the connecting-rod 14 is carried outward toward the fulcrum 10, and it results that the working arm b may be said to be constantly changing or becoming shorter, as its effect on the connecting-rod is the same as if said arm gradually decreased in length in the exact ratio that the connecting-rod approaches the fulcrum 10. Further than this, the amount of vertical movement of the point 13 decreases as it is moved upward and outward in its relations to the movement of the rack 9. With this construction, applying the well-known law relating to levers, assuming the piston-rod to be under a constant power or strain x, and assuming y to represent the pressure on the bale, the relations of power to pressure at the beginning of the stroke of the piston will be $a\,x=b\,y$. In this case a is constant and b is constantly changing, growing less, as before described, and the pressure would increase in a constant ratio. Assuming this changing increment to be represented by m, the pressure at any moment would be represented by the equation $a\,x=(b-m)y$.

In Fig. 3 I have illustrated another form of press, in which the arm a, between the fulcrum 10 and the rack 9, constantly increases in length, the sector being cycloidal, with its shortest radii at its upper portion at the commencement of the stroke of the piston-rod. The rack 9 in this case is inclined to the plane of the piston-rod 8 to properly engage the sector. The lever-arm b in this case is practically shortened progressively as the sector moves upward and outward in the same ratio as in Fig. 4, and the equation would be the same as in Fig. 4, except that the lever-arm a would be progressively lengthened and the power thereby increased, and if n represents the increment of the increased lengthening of the lever-arm a the pressure exerted at any given point will be represented by the equation $(a+n)x=(b-m)y$. It will be seen that in this instance not only is there a direct increase of pressure, due to the constant shortening of the lever-arm b, but this pressure is further increased by the constant lengthening of the lever-arm a, and the result is that the pressure toward the end of the stroke increases at a greater ratio than in the arrangement shown in Fig. 4. While at first throught it would seem that this were desirable, I have found that the pressure increases too rapidly in proportion to the resistance offered by the bale.

It has been proven by actual tests showing the amount of pressure actually necessary to compress an ordinary cotton-bale at different stages that the increase of pressure in the class of presses illustrated in Fig. 4 is in excess of the increase of resistance as the bale is compressed. I do not deem it necessary here to state actual figures, which can be done; but it is sufficient to say that experiment has demonstrated the fact above stated. Of course, if this is true, the structure illustrated in Fig. 3 is still more objectionable in that the ratio of increase of pressure is greater than in the arrangement indicated in Fig. 4.

I have further found that by using a cycloidal sector, starting with the arm a at its greatest length and gradually decreasing the length of said arm in accordance with the cycloidal curve, while the lever-arm b decreases, the ratio of increase of pressure on the bale is in substantial accordance with the increase of resistance of the bale as it is compressed. I therefore apply these principles to a construction such as is illustrated in the drawing Fig. 1 and in the diagram Fig. 2, wherein the lever-arm a gradually decreases

in length at the same time that the lever-arm b is decreasing in length, and in this construction, assuming that n represents the increment of decrease in the length of the lever-arm a, the pressure at any given moment would be represented by the equation $(a-n)x=(b-m)y$. This principle of construction and mode of operation can be well carried out in the structure shown, in which the racks 9 are inclined with relation to the plane of the piston-rod, the incline in this case being upward or in the direction of its movement when operating to compress the bale, and the sectors are so arranged that at the commencement of the movement of the rack their longest lever-arms or radii engage the rack, and as the movement progresses the arms or radii gradually shorten in accordance with the cycloidal segment, so that at the end of the movement of the sector the shortest radius or arm thereof is practically doing the work, and at any intermediate moment the pressure exerted on the bale will be represented by the equation above set forth.

It will thus be seen that my invention differs from the machines heretofore used in construction and arrangement of parts and mode of operation or results produced, and while I am not enabled to increase or multiply the power originally applied to any great extent in the abstract I have arranged these parts so that the pressure on the bale increases in proportion as the resistance to the pressure on the bale increases. Thus there is a regular increment of increase of pressure in the compound levers caused by the practical shortening of one arm of the lever by the movement of the connecting-links with relation to its fulcrum, and another regular increment of decrease of pressure, caused by the practical shortening of the other arm of the lever, owing to the cycloidal shape of the sector and the rack cooperating therewith, so that the real pressure exerted on the bale is the difference between the amount of increased pressure on the one hand and decreased pressure on the other, thus giving a more uniform and greater average pressure on the bale with much less expenditure of energy and far greater safety.

It will further be seen that while I may use substantially the same elements, broadly considered, in carrying out my invention as are shown in the prior patents, these elements are differently arranged, so that they coöperate in producing a different result, which has been found to be a very desirable and important improvement in this class of presses.

It is evident to those skilled in the art that the details of the construction of the device may be varied without departing from the spirit of my invention, and I do not, therefore, limit myself to the use of the particular features of construction shown and described herein.

What I claim is—

1. In a cotton-press, the combination with the bed and platen, of compound levers for operating the platen, and means for operating the levers, the levers being constructed and arranged with operating-arms decreasing in length with the movement of the platen toward the bed, so that there is a regular increment of increase of pressure on the platen as it moves toward the bed, and a regular increment of decrease of pressure, so that the resulting pressure is in accordance with the resistance offered by the bale, substantially as described.

2. In a cotton-press, the combination with the bed and platen, of the compound levers, and means for operating them, the levers comprising operating-arms decreasing in length with the movement of the platen toward the bed, the connecting-links, and the rack-bars arranged substantially as described, so that there is a regular increment of increase of pressure and a regular increment of decrease of pressure, whereby the resulting pressure will be the difference between the two, substantially as described.

3. In a cotton-press, the combination with the bed and platen, of the cycloidal sectors, links connecting the sectors and platen, and inclined racks operating the sectors, the sectors being so arranged and adjusted that their shortest radii will engage the racks at the last part of their movement, substantially as described.

4. In a cotton-press, the combination with the bed and platen, of the cycloidal sectors, the connecting-rods connecting the platen with the longest radii of the sectors, and the piston-rod carrying the inclined racks, the inclines being outward at the lower portion of the rod, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ROBT. D. WEBB.

Witnesses:
T. W. NETTLES,
J. D. WATKINS.