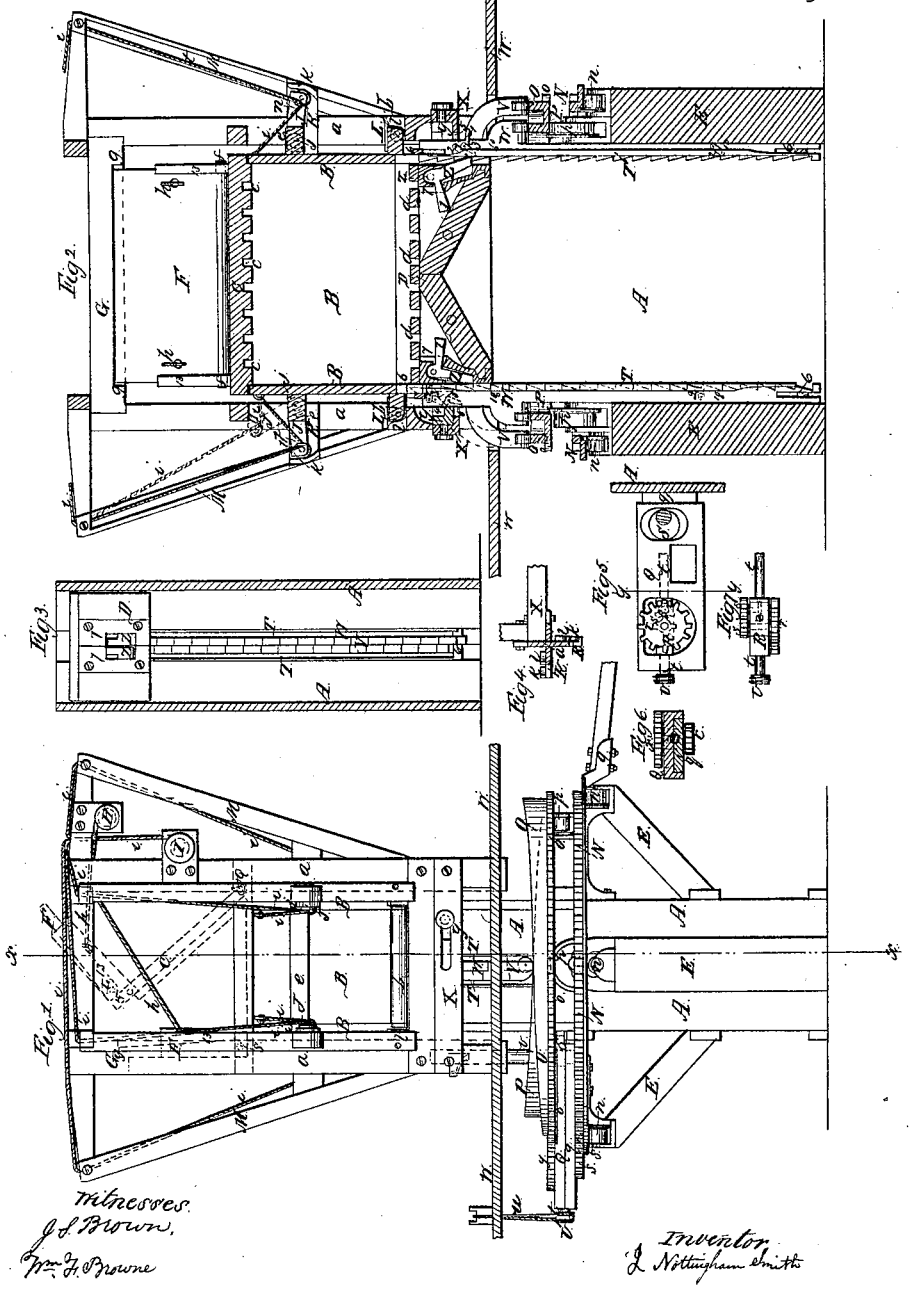
J. N. Smith,

Hay Press.

No. 52,084. Patented Jan. 16, 1866.



Witnesses.
J. J. Brown,
Wm. F. Browne

Inventor
J. Nottingham Smith

UNITED STATES PATENT OFFICE.

J. NOTTINGHAM SMITH, OF JERSEY CITY, NEW JERSEY.

IMPROVED HAY AND COTTON PRESS.

Specification forming part of Letters Patent No. **52,084**, dated January 16, 1866.

To all whom it may concern:

Be it known that I, J. NOTTINGHAM SMITH, of Jersey City, in the county of Hudson and State of New Jersey, have invented an Improved Press for Pressing Hay, Cotton, &c., and for other analogous uses; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, making part of this specification—

Figure 1 being a side elevation of a press for pressing hay or cotton constructed with my improvements; Fig. 2, a vertical section thereof in a plane indicated by the line *x x*, Fig. 1; Fig. 3, a vertical section through the pressing-box, in which the follower moves, showing also an end view of the follower in place; Fig. 4, a cross-section, showing a modified construction of a press-post made of flanged iron; Fig. 5, a plan of the gear-shifting arrangement by which the speed and power of the press are interchanged; Fig. 6, a cross-section of the same, as at *y y*, Fig. 5; Fig. 7, a side view of the shifting-pinions, with the roller on which they are shifted in position.

Like letters designate corresponding parts in all of the figures.

My invention is founded on the leading feature of an annular revolving wedge or, generally, wedges, to which the power is applied directly or by gearing, and which are made the moving and controlling instrument of the whole machine.

The nature of my invention consists in the employment of these wedges for producing great force upon the principles hereinafter set forth, and in various subordinate devices and improvements useful in the application of the fundamental feature.

All the features of my invention, so far as they relate to simple presses for compressing materials, are illustrated in the accompanying drawings of a hay and cotton press, which I will proceed to describe.

Let *w* indicate a platform or floor of a building, above which is the press proper, and below is the apparatus for applying the power. An annular driving-wheel, N, of large or any required diameter, rests upon four or more friction-rollers, *n n n n*, which are themselves supported firmly on blocks or posts and braces E E E E, and these friction-rollers may have flanges on their inner ends, as shown, to keep the driving-wheels in a concentric position, so that it needs no shaft, and is thus enabled to extend around the press and have any size desired. Instead of these centering-flanges vertical friction-rollers may be employed in proper position. Any moving power may be applied, as that of horses drawing on a sweep-lever secured to a socket-projection, *s*, of the wheel. The wedges, which constitute the main feature of my invention, may be attached directly to this annular driving-wheel when the force to be produced is comparatively moderate; but when an immense force is required, and especially when variable force and speed of action are required or desired, I arrange a geared connection between this wheel and the annular wedges, substantially as follows:

The wedges O P are located concentrically above the driving-wheel, and are constructed with or secured to a rim, *o*, with cogs on its periphery, and having the same diameter as the driving-wheel N, which also has the same number of cogs on its periphery. The connecting-gear consists of a larger pinion, *r*, and two smaller pinions, *s s*, the outer one of which latter is secured to the opposite end of the same shaft as the larger pinion, while the inner pinion, *s*, is geared to the outer, and extends inward even with the said larger pinion, so that it will gear into the cogs of the driving-wheel N at the same time that the pinion *r* gears into the cogged rim *o* of the wedges, as shown in Fig. 1. Since the pinions *s s* are smaller than the pinion *r*, the wedge-rim will turn faster than the driving-wheel M by the arrangement shown, and consequently there will be a multiplication of speed thereby, proportionate to the greater size of the pinion *r* compared with that of one of the pinions *s s*. This is the arrangement of parts employed when the least force is required to be applied, as in giving the first pressure in compressing a bale of cotton or hay; but, on the other hand, when a great force is required, as in finishing the pressure of a bale of cotton or hay, I arrange the intergear-pinions *r* and *s s* so as to be reversed in position—that is, the larger pinion *r* to be geared into the cogs of the driving-wheel N, and the inner small pinion, *s*, geared into the cogged rim *o* of the wedges. This change causes the wedges to travel round slower than the driving-wheel N, thus increasing the power at the expense of the speed of the machine.

The shifting of the position of the pinions

r and *s s* is effected by mounting their shafts in a roller, R, which has a turning movement of one hundred and eighty degrees on its axis *t*, which is allowed in one direction only, as indicated in Fig. 5. The bearings of the roller are in a carrier, Q, which has a slight reciprocating movement inward and outward on a supporting-way, *q*, projecting from the frame of the press. This movement is made by turning an eccentric, S, on a shaft, *v*, under the control of the operator, the amount of movement being sufficient to ungear the pinions *r s* from the cogged rims of the driving-wheel and wedges and gear them together again after shifting the pinions. The roller R is turned for shifting the pinions by means of a cord, *u*, coiled around a pulley, U, on the roller-axis *t*, and extending upward through the floor or platform *w*, within the reach of an attendant, all substantially as represented in Figs. 1 and 5. The axis *t* of the roller R rests one-half in a groove in the supporting-way *q*, as indicated in Fig. 6, and slides therein. The shafts of the pinions are held in their roller-bearings by a cap-plate, as shown in Fig, 7. The wedge-rim *o* (when thus separated from the driving-wheel) is also firmly supported by friction-rollers *p p p p*, which may have centering-flanges on their ends, as shown, or vertical rollers may take the place of the flanges. The bearing-blocks of the rollers, situated under where the wedge-power is applied to the lifting-posts, are supported on the firm posts or blocks E E of the frame. Each annular wedge, when revolved, exerts a very powerful lifting action, since its length is the whole circumference of the circle and its height may be quite small. There may be a single wedge reaching round the whole circumference, in which case there is an abrupt drop from the top of the wedge to the bottom again at each revolution; but for the purpose of a cotton or hay press it is better to have the wedge ascend only one-half of the circumference, and then descend the other half, as shown in the drawings. In this case there is lifting action only one-half of the time, and a gradual return to the lower end of the wedge during the other half of the revolution. With this arrangement the wedge may be revolved in either direction with the same result; and in order to give a continuous action to the press the two annular wedges O and P are employed, as represented, the two alternating in action, so that one is lifting while the other is descending, and one is at the full height while the other is at the lowest point. The powerful lifting force of these wedges is communicated to the follower D of the press through the means of lifting rods or posts V W, situated in the middle of two opposite sides of the pressing-box A, and having a vertical reciprocating motion in sunk ways or grooves of said sides, as represented in Figs. 2 and 3.

In order to produce continuous lifting of the follower by means of the two wedges O P there are two lifting-posts, V V, for the outer wedge, O, and two other lifting-posts, W W, for the inner wedge, P, one of each on each side of the pressing-box, so that a post, V, on one side and a post, W, on the other side shall lift simultaneously on the opposite ends of the follower D, and vice versa, the two sets alternating in action—that is, one lifting while the other is descending for a new hold on the follower. The posts V W also alternate to each other on opposite sides of the pressing-box, so that the two which are lifting at the same time shall sustain the follower centrally. Since the lifting-posts are necessarily situated inside of the annular wedges, they have projecting arms to reach over their respective wedges, and these arms are provided with friction-rollers to rest on the wedges, as shown in the drawings. The lifting-posts have guide-bars 6 6, as shown, at the upper and lower ends, to keep them always in the proper line. The lifting-posts are each provided with ratch-teeth on their inner edges, as shown, the distance apart being equal to the height or lift of each wedge. These ratch-teeth, as the lifting-posts ascend, engage with pawls Z Z, in the ends of the follower D, there being a pawl for each lifting-post. These pawls are made self-engaging with the ratch-teeth by means of overbalance-arms 1 1, Fig. 2, projecting inward, so as to throw the feet of the pawls outward against the teeth. Thus, when a lifting-post begins to ascend its ratch-teeth, being abrupt upward, engage with its pawl Z, and raise the follower, and when it descends its ratch-teeth push the pawl aside without engaging therewith, while in the meantime its fellow lifting-post is ascending and lifting the follower. In this manner the follower is continually rising. The axis of each pawl bears in a concave metallic socket, *z*, when the lifting-post is acting against it, as shown at the right-hand pawl in Fig. 2, thereby securing strength; but when the lifting-post descends and the pawl hangs free it is suspended by a pivot-pin in a central hole of the socket, as indicated at the left-hand pawl in the same figure, so that the pawl will turn easily.

After the compression is completed and the bale is bound the follower is lowered in the pressing-box; also by a continuous action of the wedges on the lifting-posts. This lowering of the follower is thus made gradual, in order that the pressing-box may be filled with the material to be pressed while the descent is going on, so that it may be trodden in and distributed evenly by the attendant, and the rate of descent may be so graduated that the filling goes on just as fast as the follower descends, the horses being under the direction of the operators. If the descent is required to be rapid the connecting-gear between the driving-wheel and wedge-rim is shifted so as to make speed.

For the purpose of making the lifting-posts operate to lower the follower instead of raising it, as by their natural operation, a tripping-

plate, T, is jointed to the side of each lifting-post by means of two parallel bars, 2 2, near the ends, one end of each bar being pivoted to the lifting-post and the other end to the tripping-plate, as clearly shown in Fig. 2. The arrangement of the parts is such that when the tripping-plate is swung upward and inward till the parallel bars are turned to a horizontal position the ratch-teeth of the lifting-post will be covered by the tripping-plate, and the pawl Z will thus be prevented from engaging with the teeth, so that the ascent of the lifting-post will not raise the follower, all as indicated at the left-hand side in Fig. 2; but when the tripping-plate is swung outward and downward till the parallel pivot-bars 2 2 reach an oblique position of about forty-five degrees it will uncover the ratch-teeth of the lifting-post, and allow the pawl Z to engage therewith, as represented at the right hand in the said figure. Stops 10 10 may be employed to prevent the tripping-plates from swinging down too far.

The remainder of the device consists of an arrangement for throwing forward each tripping-plate so as to prevent the pawl from engaging with the teeth of the lifting-post just as it commences to ascend, and for throwing back the tripping-plate, so as to allow the pawl to engage with the teeth as the lifting-post begins to descend. The effect of such an arrangement is that the follower is supported only by the descending posts, and hence is carried downward by their action. The arrangement consists of a short bent lever, 3, pivoted to each lifting-post close under the upper parallel bar, which connects the lifting-post with its tripping-plate, and of a stationary slide-block, Y, whereby the bent lever is controlled as it is moved up and down on the lifting-post. Ordinarily, when this bent lever goes up and down, there is a notch, 5, Fig. 2, in the girt X, to allow the lever unobstructed motion, and the weight of the tripping-plate keeps it down, and the ratch-teeth consequently uncovered thereby; but when the follower is to descend the block Y is slid over the notch 5, as shown at the left hand in Fig. 2, and when the bent lever 3 ascends by it, the outer end, 4, thereof is pushed inward, thereby causing the inner end to turn upward under the parallel bar 2, and to lift it to a horizontal position, as shown by dotted lines at the left hand in Fig. 2. Hence the tripping-plate is thereby made to cover the ratch-teeth, so that the pawl Z does not engage with them in the ascent of the lifting-post. Then, when the lifting-post begins to descend, the outer extremity of the bent lever is so arranged as to catch upon the upper side of the block Y, whereby the inner end thereof is turned downward, as indicated by red lines in the same part of the figure, and the tripping-plate is thus allowed to descend by its own gravity and expose the ratch-teeth to the pawl Z, so that the follower descends with the lifting-posts.

In addition to the improvements in the working parts of presses, as above set forth, I have also made some improvements in the arrangement of the side doors, B B B B, and top door, C, of the press, whereby they are readily and automatically removed from the way to afford free room for binding and removing the bale, and for admitting the material to be pressed, and are as readily returned to position again. The fixed pressing-box A extends up a convenient distance above the floor or platform *w* for manipulating the material and bales, and the side doors, B B B B, of the press fit and rest directly over the sides of the said pressing-box. When these side doors are thus in place they are firmly held there against the outward pressure of the bale by means of strong iron brackets K K and L L, projecting from the frame of the press, and respectively provided with ledges *k k* and *l l*. Against the ledges *k k* of the upper brackets, K K, lifting-arms J J bear, which are hinged at *j j* to a projecting cleat, *e*, on the outside of each door B, and against the ledges *l l* of the lower brackets, L L, a cleat, *b*, projecting from the bottom of each door, bears, all substantially as represented in the drawings. At the outer ends of the lifting-arms J J and outer edges of the cleats *b b* are friction-rollers, to bear against the respective brackets, but the faces of the bracket-ledges, where the friction-rollers bear, are vertical, or nearly so, in order that the pressure against the doors may have no tendency to lift the arms and cleats out of place. From the brackets *k k* and *l l* oblique supporting-ways M M extend upward, being properly supported by the frame-work of the press. In these ways, one at each end of each door B, the said doors are intended to rest and be hoisted high enough to be out of the way in manipulating the bales and material. The hoisting of these doors is all done at once by means of a windlass, I, Fig. 1, from which cords *i i* extend, first up over pulleys in the top of the press-frame, and thence down through eyes on the outer ends of the hinged lifting-arms J J, and are finally secured, respectively, to the doors near their upper edges, all substantially as represented in Figs. 1 and 2.

When the windlass I is turned, (by means of a rope and pulley, as represented, or otherwise,) and the cords *i i* are wound simultaneously upon it, the effect is, first, to raise the outer ends of the hinged lifting-arms J J from their brackets, as shown by red lines at the left hand in Fig. 2. This movement then first draws the upper edges of the doors directly outward, while the lower edges or cleats, *b b*, thereof turn as pivots in their brackets. Then the way being clear, the doors are drawn directly upward on the ways M M. This entire movement is quite free, since the first motion of the doors is directly outward, away from the bales, the pressure of which assists rather than retards the motion. In descending the doors simply drop down until their cleats *b b*

rest on their bracket-ledges *l l*. In that position, the outer edges of the cleats being the supporting-points, the upper edges of the doors swing inward to their place, by their own gravity, after which the hinged lifting-arms J J swing down into their brackets by their own weight, so that the whole downward movement is automatic, as well as their upward movement. The top door, C, of the press is also raised out of the way and returned to and secured again in place automatically by merely turning a windlass, H, which winds up cords *h h*, connecting with a hinged plate or bar, F, at one edge of the door. The opposite edge of the door, when in place, reaches under the edge of a girt of the press-frame, as indicated at 12 in Fig. 1, and this vertical bar-plate F is hinged at *f f* to two standards, 13 13, secured rigidly to the door. When the door is in place the bar-plate F rests in a vertical position, and its upper edge stands in or under a notch, *g*, of a girt, G, of the frame. Thus two opposite edges of the door are securely held under girts of the frame, which resist the most powerful pressure of the follower. But on turning the windlass H the cords *h h* first draw the upper edge of the bar-plate F sidewise from under the girt G, the standards 13 13 allowing side movement sufficient for that purpose and no more. Consequently the further winding up of the cords swings up that edge of the door, the other edge remaining in place and serving as a fulcrum on which the door turns, as indicated by red lines in Fig. 1. The winding up of the cords is continued till the door attains a vertical position at one side of the press, where it is out of the way. In descending the door first swings down into position, and finally the upper end of the bar-plate swings back under its girt G by gravity. The whole movement, both of ascending and descending, is automatic.

In Fig. 4 is shown a cross-section of a flange-iron post, *a*, very suitable for constructing the frame-work of the press. The brackets K K and L L are here constructed as a part of the post itself. The figure shows how the flanges of the posts fit the girts of the press, to which they are bolted, as indicated.

In addition to the purpose of ordinary presses for compressing bulky materials into bales, I contemplate the application of the annular wedge or wedges, on the principles herein set forth, to other analogous uses, such as for pressing bricks and for swaging and shaping metals and other substances, as well as for operating dies, trip-hammers, &c. In some cases there may be two or a greater number of wedges in one circle, all operating in one direction on the annular rim, and each wedge terminating abruptly at the beginning of the next wedge in order.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. An annular wedge or wedges receiving the motive power direct and operating as the driving-force for applying pressure or for analogous purposes, substantially as herein specified.

2. Two or more annular driving-wedges alternating in action, so as to produce a continuous effect, substantially as and for the purposes herein set forth.

3. The shifting or reversing gear between the driving-wheel and annular wedge-rim, whereby a change is effected from increased speed to increased power, and vice versa, while the motion of the power remains constant, substantially as herein specified.

4. The alternating lifting-posts or reciprocating racks for communicating the pressure or force of the annular wedges continuously to the follower of a press or other part to be driven, substantially as herein specified.

5. The tripping-plates T T, arranged and operating substantially as herein described, in combination with the lifting posts or reciprocating racks, for the purpose of reversing the motion of the follower or its equivalent, as set forth.

6. The combination and arrangement of the bent levers 3 3 and adjustable blocks Y Y, operating in connection with the tripping-plates, substantially as and for the purpose herein described.

7. The construction and arrangement of the counterweighted pawls Z Z, substantially as and for the purposes herein specified.

8. The hinged or pivoted lifting-arms J J, arranged and operating substantially as and for the purposes herein specified.

9. The construction, arrangement, and combination of the side doors, B B, of the press, with their brackets, cleats, lifting-arms, ways, and cords, and a windlass or its equivalent, whereby the doors are drawn away and returned to and secured in place automatically, all operating substantially as and for the purposes herein set forth.

10. The pivoted vibratory bar-plate F on the swinging edge of the top door of the press, arranged and operating substantially as herein set forth.

11. The combined arrangement of the bar-plate F, the opposite pivot-edge of the top door, the girts projecting over them, and the cords and windlass, or their equivalent, by which the door is raised and lowered, all substantially as herein described.

J. NOTTINGHAM SMITH.

Witnesses:
J. S. BROWN,
WM. F. BROWNE.