Sheet 1-4 Sheets.

S. E. Ament.

Revolving Rake.

No. 62107 Patented Feb. 19, 1867.

Fig. 1.

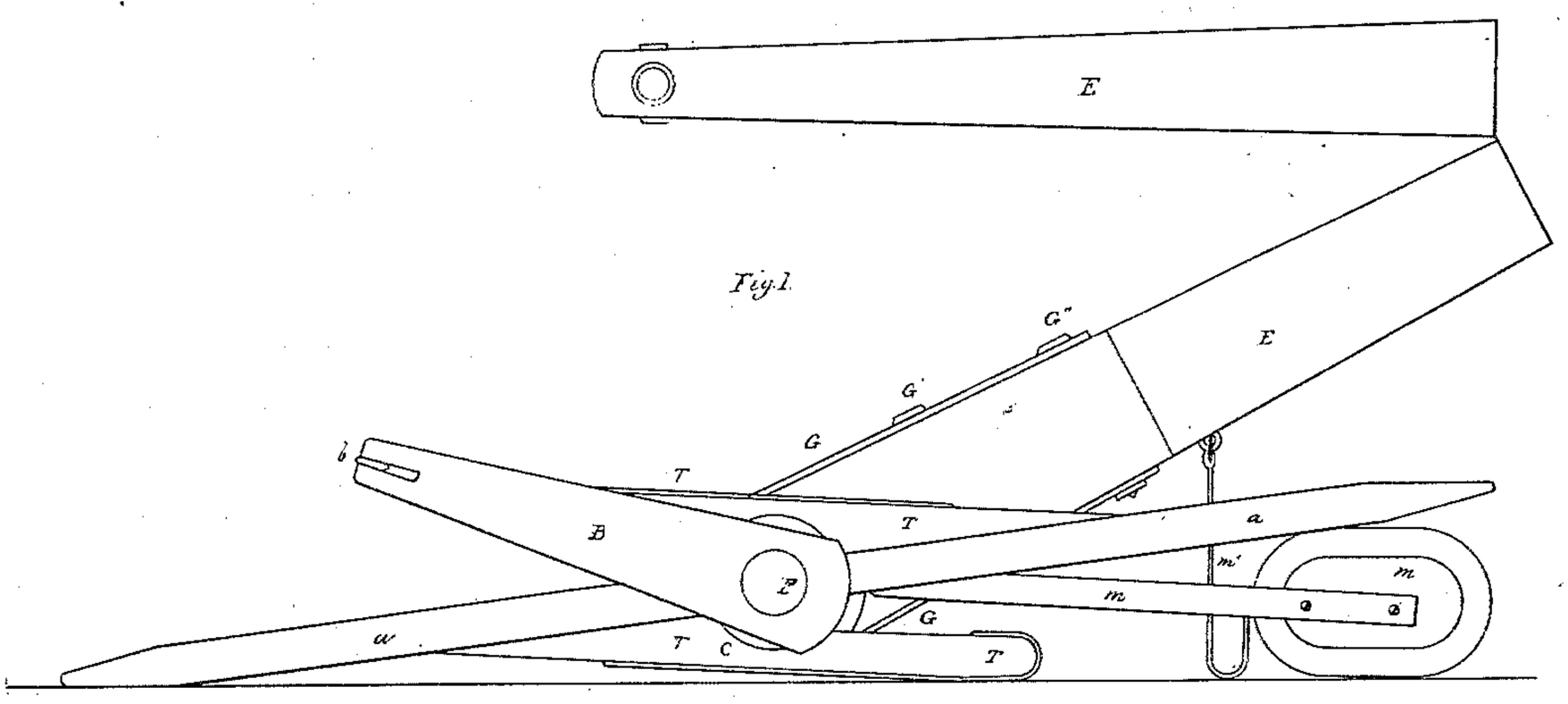


Fig. 2.

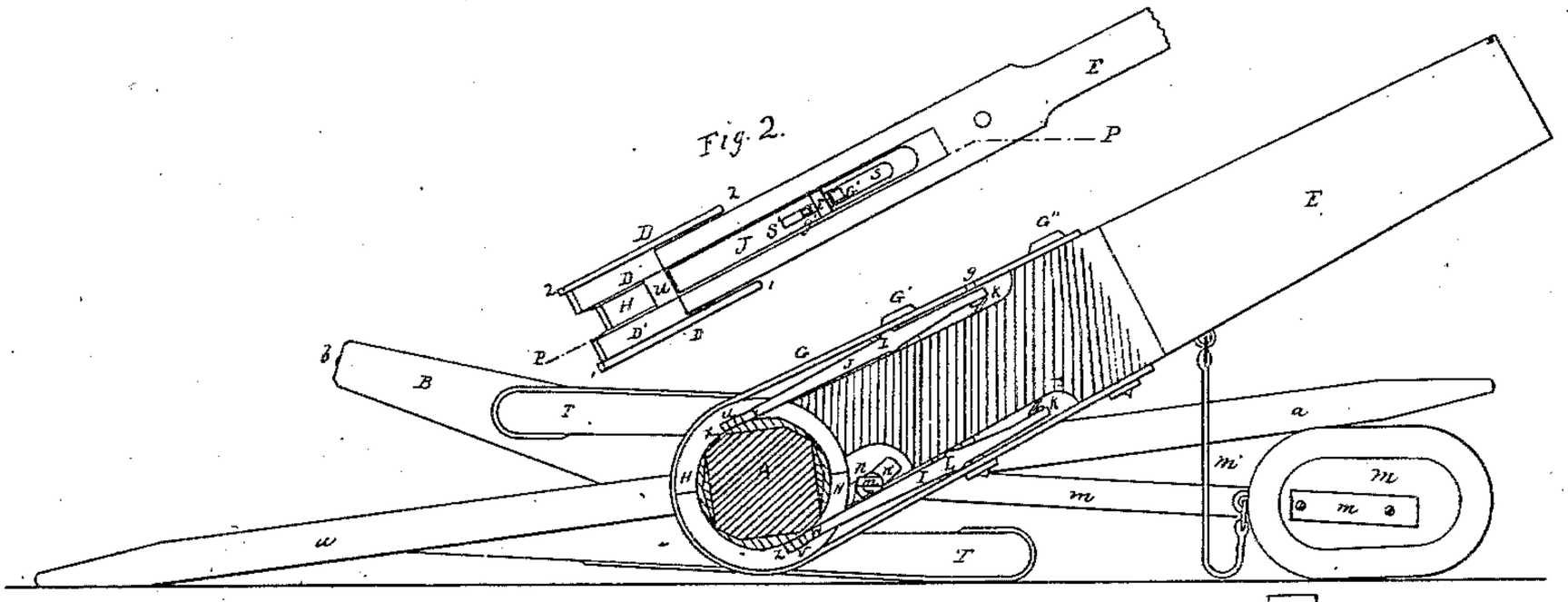


Fig. 4.

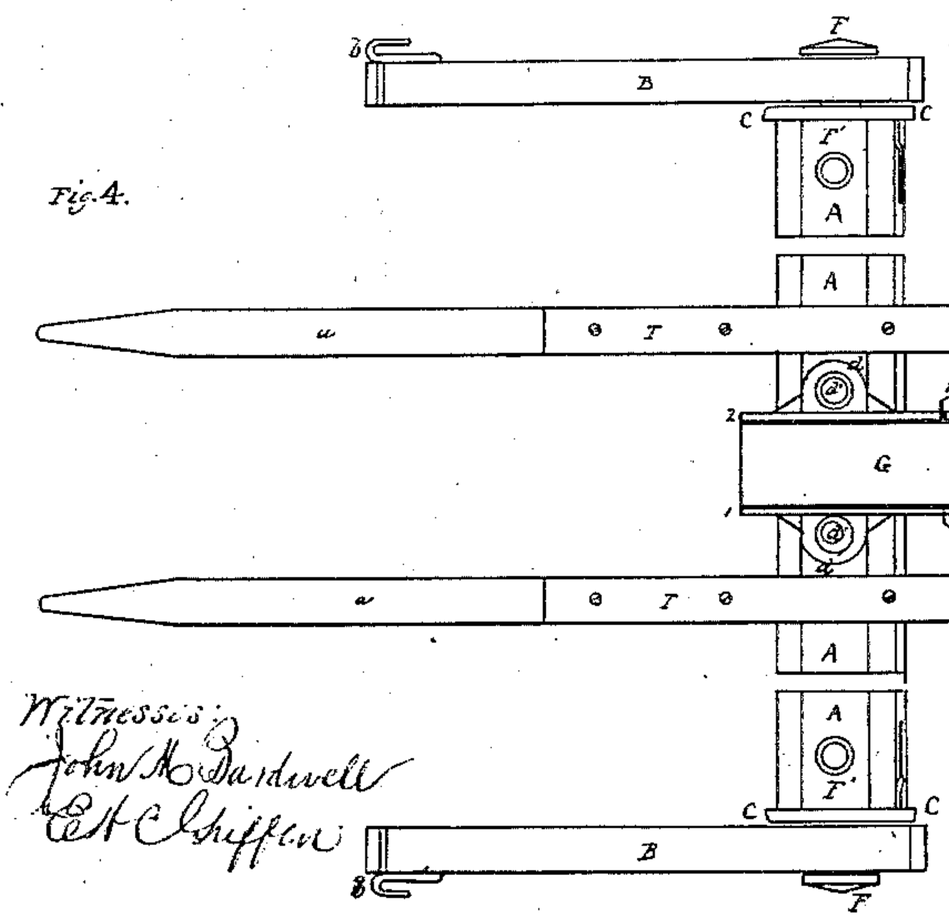
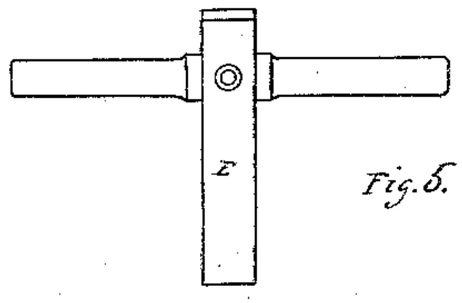


Fig. 5.



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Inventor:
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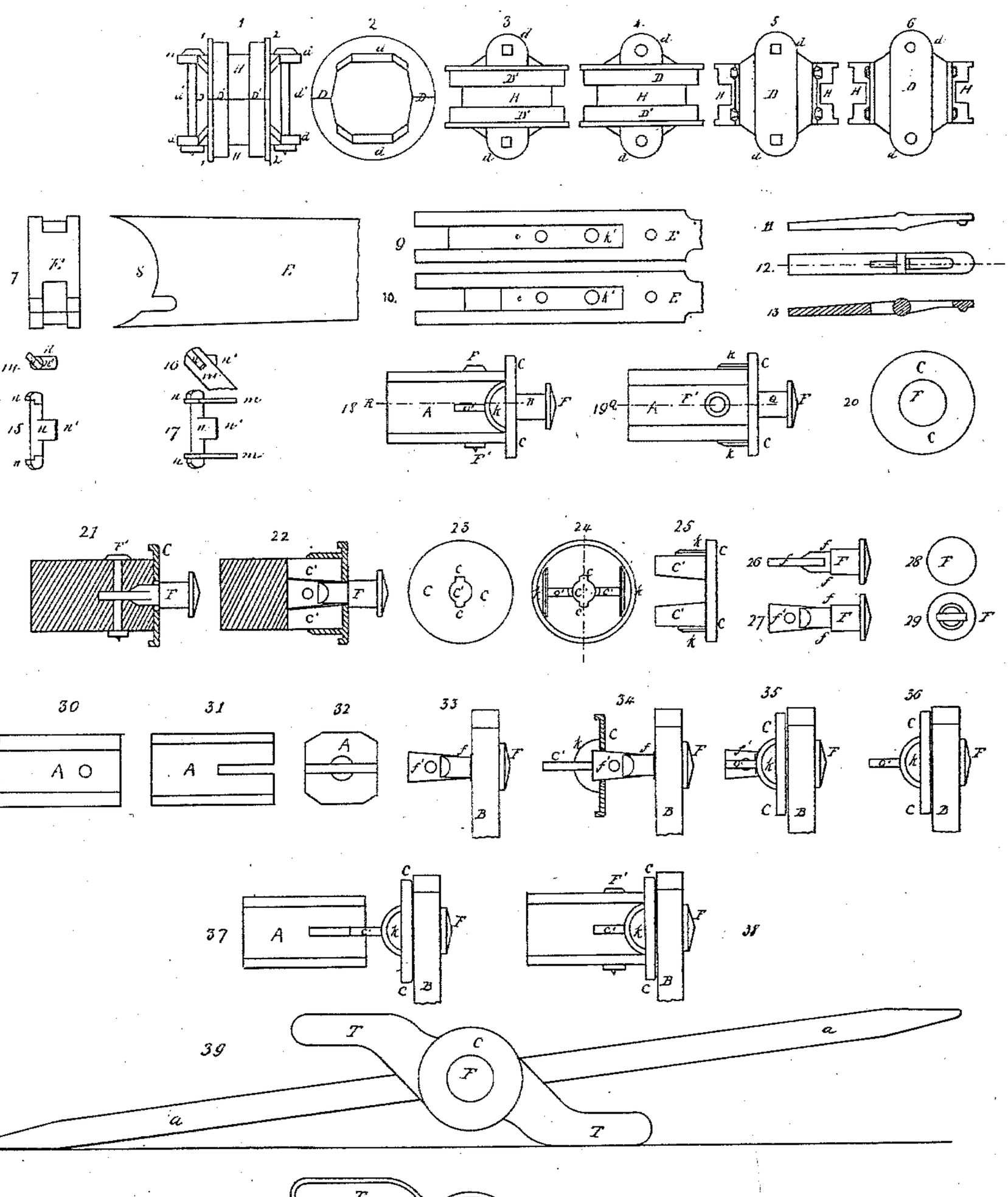
Sheet 2 - 4 Sheets.

S. E. Ament.

Revolving Rake.

No. 62107 Patented Feb. 19, 1867.



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Revolving Rake.

No. 62107 Patented Feb. 19, 1867.

Fig. 1.

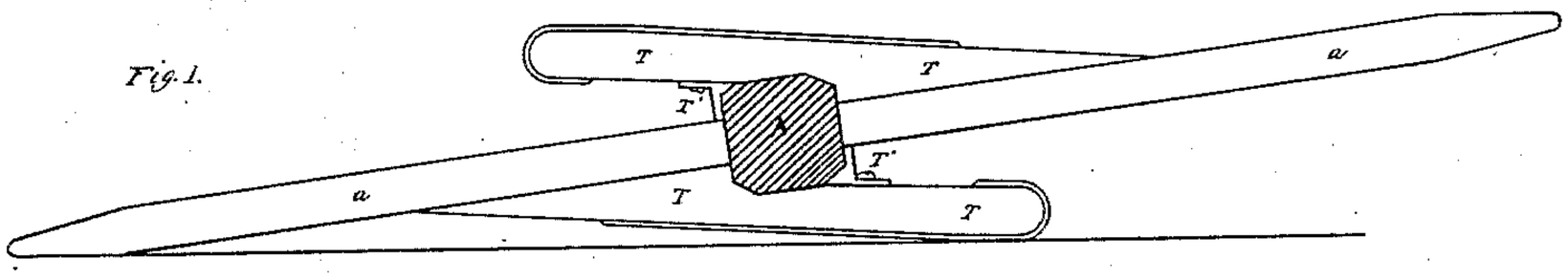

Fig. 2.

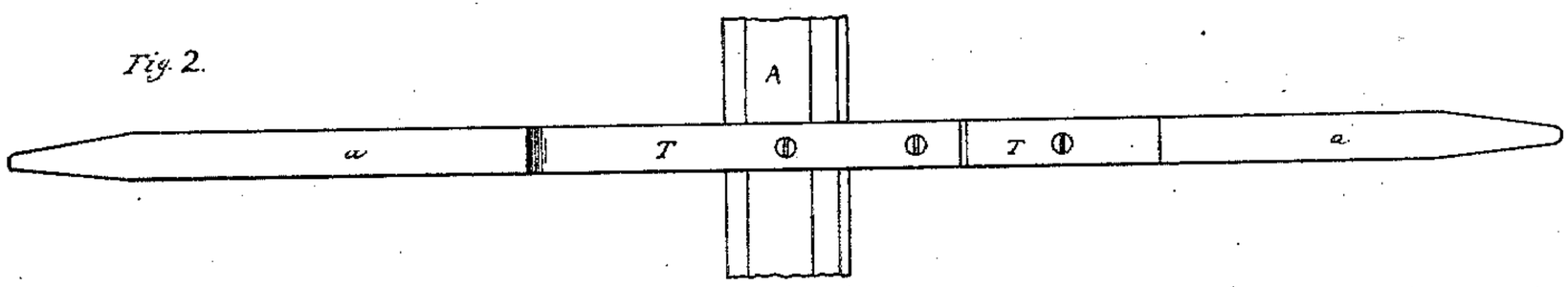

Fig. 3

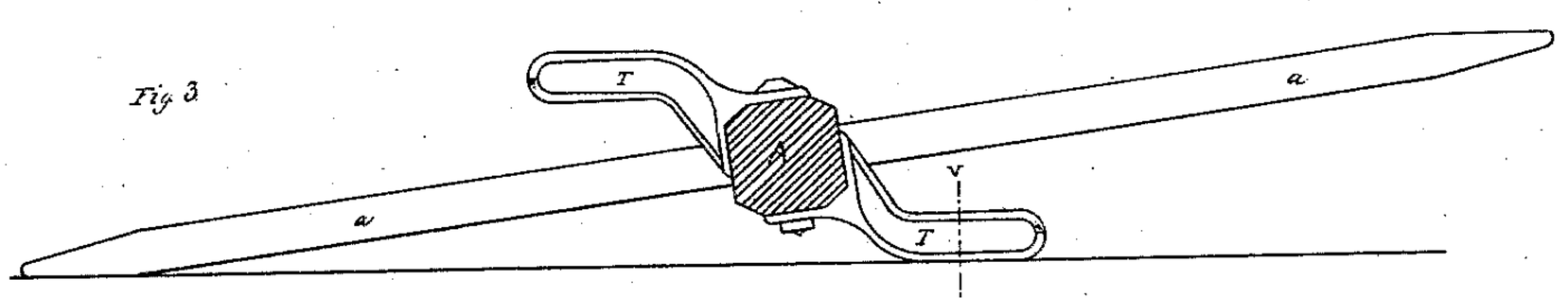

Fig. 4.

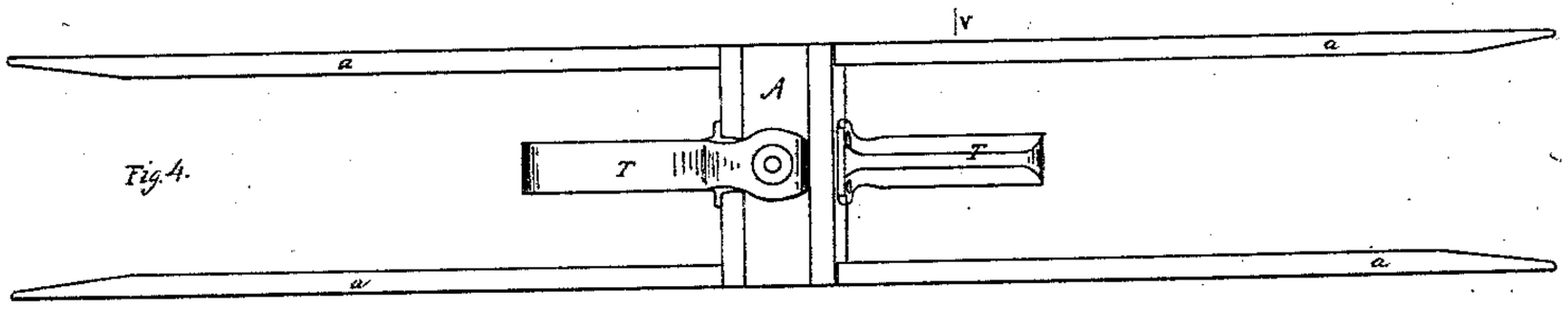

Fig. 5.

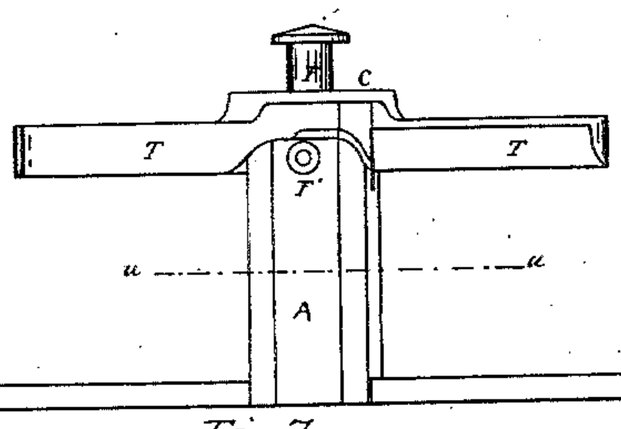

Fig. 6.

Fig. 7.

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Sheet 4 - 4 Sheets.

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Revolving Rake.

No. 62107 Patented Feb. 19, 1867.

Fig. 7.

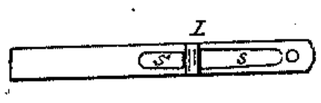


Fig. 8.

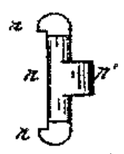


Fig. 1.

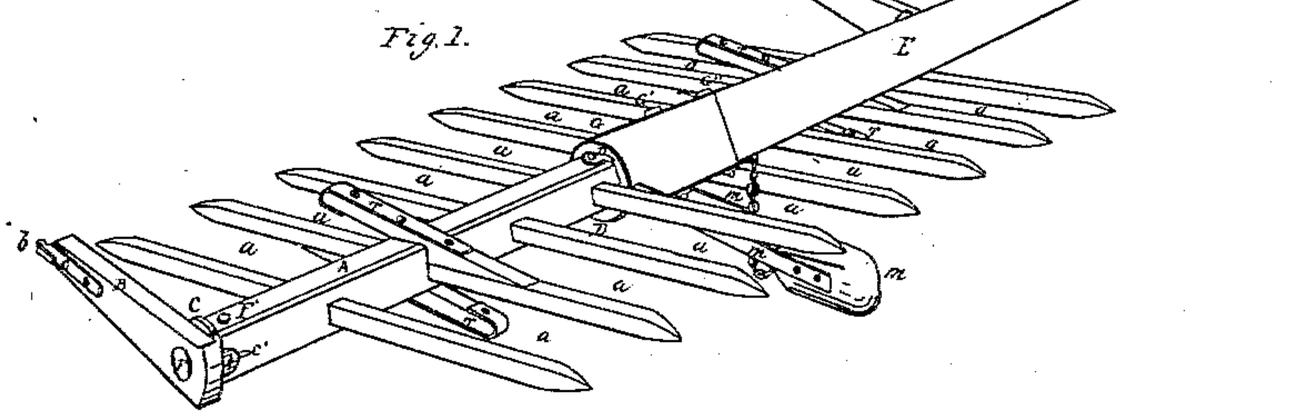


Fig. 2.

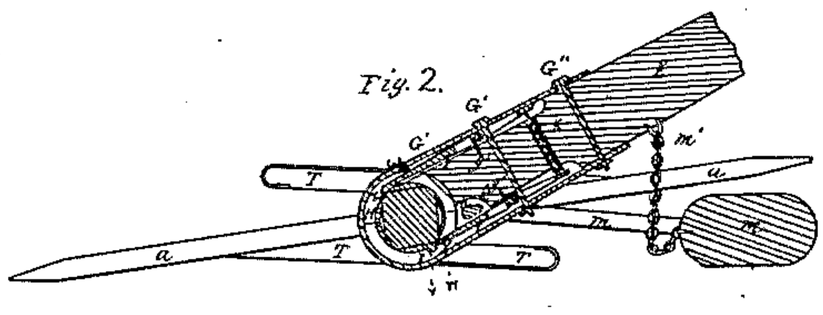


Fig. 4.

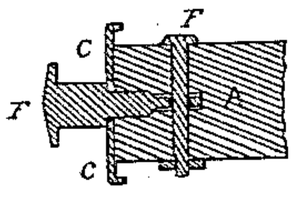


Fig. 3

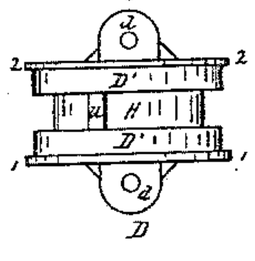


Fig. 5.

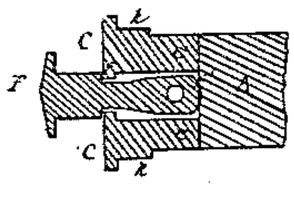
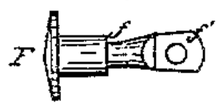


Fig. 6



Witnesses:

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E. H. Chaffee

Inventor

Sylvester E. Ament.

United States Patent Office.

SYLVESTER E. AMENT, OF OSWEGO, ILLINOIS.

Letters Patent No. 62,107, *dated February* 19, 1867.

IMPROVEMENT IN HORSE-RAKES.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, SYLVESTER E. AMENT, of Oswego, in the county of Kendall, and State of Illinois, have invented certain new and useful improvements in Revolving Rakes; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My improvements relate to rakes which slide upon the earth, with the teeth bearing very nearly a horizontal position thereto, and adapted to discharge the hay at the will of the operator by a half revolution of the revolving parts.

It is presumed that one draught animal will be sufficient to draw it, and that but one attendant will be necessary to control it; however, it will not be impossible to employ more of either, or more of both, if so desired.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation by the aid of the drawings and of the letters of reference marked thereon.

The revolving shaft or rake-head of a field machine is usually made nine and a half feet in length, containing fourteen teeth. With this exception, the representation of the rake as here given is supposed to be perfectly proportionate to the original machine.

The scale upon which the accompanying drawings are made is one-fourth of an inch to the inch.

Similar letters of reference indicate like parts in all the drawings.

Figure 1, page D, of the drawings, is a perspective view of the machine, with the parts applied thereto for use.

Figure 2 is a central vertical section of the machine, through the longitudinal centre of the handle E.

Figure 3 is a plan view of a portion of the machine, detached therefrom, usually distinguished as the metallic bearing girdle, and which is employed upon the middle of the revolving shaft, to which to attach the handle E.

Figure 4 is a central vertical and longitudinal section; and

Figure 5, a central horizontal and longitudinal section of a portion of the end of the rake-shaft, having the peculiar metallic contrivances applied thereto by which the draw-bars are attached to the ends of the said shaft.

Figure 6 is a plan view of one of the bearing-bolts, one of which is employed at each end of the rake-shaft.

Figure 7 is a plan view of one of the latches employed as a part of the locking devices. The two latches are alike in every respect.

Figure 8 is a plan view of the cam-shaft, employed as a medium through which to unlock one of the latches.

Figure 1, page A, is a side elevation of the machine with the parts applied together for use. The handle is cut in two and a part thereof thrown forward, as represented, in order that a larger-sized drawing might be represented within the same space.

Figure 2 is a plan view of a portion of the forward end of the handle, and also of the metallic bearing to which the same is attached, with the strap which attaches the handle to the bearing removed.

Figure 3 is a vertical section of the handle and of the metallic bearing girdle, and also of the revolving shaft on the line P P in fig. 2.

Figure 4 is a plan view of the machine with the parts applied together for use; except, however, the absence of the outer end of the handle, cut off in fig. 1, and also of a couple of portions of the rake-shaft, taken out to bring the ends in view.

Figure 5 is a plan view of the outer end of the handle.

Figure 1, page B, is a longitudinal, and

Figure 2, an end elevation.

Figures 3 and 4, an outside plan view of each half; and

Figures 5 and 6 an inside plan view of each half of the metallic bearing girdle; except, however, the absence of the two obstructions or stationary stops, heretofore represented within the inner groove of the said bearing, which were left out in order that the groove itself might be more distinctly shown.

Figure 7 is an end view;

Figure 8, a left-hand side view;

Figure 9, a top view; and

Figure 10, an under side view of the forward end of the handle, just before it is attached to the machine.
Figure 11 is a side view;
Figure 12, a plan view; and
Figure 13 is a central, vertical, and longitudinal section of one of the latches or acting stops.
Figure 14 is an end view; and
Figure 15 is a plan view of the cam-shaft.

Figures 16 and 17 are the same as the two last above, with a small portion of the two straps hooked thereon, which connect the ball thereto.

Figure 18 is a longitudinal elevation;
Figure 19 is a plan view; and

Figure 20 is an outside end view of a portion of the end of the revolving shaft, with peculiar metallic contrivances applied thereto, by which the draw-bars are attached to the ends of the said rake-shaft.

Figure 21 is a vertical section on the line 2 2 in fig. 19; and
Figure 23 is a horizontal section on the line R R in fig. 18.
Figure 23 is an outside or outer end elevation;
Figure 24 is an inside or inner end elevation;

Figure 25 is a plan view of the "disk piece" which forms a part of the "end irons" or peculiar metallic contrivances by which the draw-bars are attached to the ends of the rake-shaft.

Figure 26 is a longitudinal elevation;
Figure 27 is a plan view;
Figure 28, an outside end view; and

Figure 29, an inside end view of the bearing bolt, which forms also a part of the said "end irons" or peculiar metallic contrivances by which the draw-bars are attached to the ends of the rake-shaft.

Figure 30 is a plan view;
Figure 31, a longitudinal elevation; and

Figure 32 is an end view of a portion of one end of the rake-shaft, showing the manner in which the ends of said shaft are bored and nicked or framed, preparatory to the application of the said "end irons" thereto.

Figures 33 to 38, inclusive, indicate the process by which the draw-bars are attached to the ends of the revolving shaft by means of the said "end irons."

Figures 39 and 40 represent a different manner of applying the runners to the machine.

Figure 39 is an outside view or elevation of the runner as applied to the end of the rake-shaft, with the draw-bar not on; and

Figure 40 is an inside elevation or view of the same, with a transverse section of the rake-shaft on the line *n n*, fig. 7, page C, of the drawings.

Figure 1, page C, is a side elevation; and

Figure 2 is a plan view of a portion of the machine, having upon it the runners represented on pages A and D.

Figure 3 is a side elevation; and

Figure 4 is a plan view of a portion of the machine, having upon it a third way or manner of applying the runners to the machine.

Figure 5 is a rear view of one of the runners represented in figs. 3 and 4.

Figure 6 is a cross-section on the line *v v* in fig. 4.

Figure 7 is a plan view of the runner represented in figs. 39 and 40.

A is the revolving shaft, with the teeth *a a* fixed therein. The bearings F F at the ends of A are carried in draw-bars B B, which draw-bars B B are provided at their forward ends with hooks, *b b*, from which to extend a couple of trace-chains to meet the ends of the tugs. The said draw-bars are attached to the ends of the shaft A by means of the bearing-bolt F, disk C, and small bolt F′, as follows: The ends of the shaft A are previously prepared as represented in figs. 30, 31, and 32, page B. The said bolt F is then put through a hole in the rear end of the draw-bar, as in fig. 33, and the tenon part *f′* introduced into or through the rectangular notches *c c* of the hole C′ of the disk C, fig. 34. The said bolt is then shoved in through the hole C′ of the disk C up to the shoulder thereon, *f*, as in fig. 35, and turned a short distance around to bring the tenon part *f′* to lie within the same plane as that in which the tenon parts *c′ c′* of the disk C are situated, fig. 36, when the three tenons, *c′ c′* and *f′*, thus adjusted, are introduced into the incision in the end of the shaft A, as in fig. 37, and the whole driven in or on by the use of a mallet upon the head of the bearing-bolt F, and every part strongly secured by inserting the bolt F′ through the shaft A, and through the inner end or tenon part of the said bearing-bolt F, as represented in fig. 38. It will be observed that the small bolt F′, through the inner end of the bearing-bolt F holds them all on. The solid disk-head of the bolt F holds on the draw-bar, and the shoulder *f* of the bearing-bolt F holds the disk-piece on, and the bolt F′ through the shaft A and through the inner end of the bearing-bolt F, holds that on. The hole in the end of the shaft A, through which the bolt F′ is inserted, is bored at such a distance from the very end thereof that the parts F and C are drawn snugly and tightly on, thus forming an exceedingly solid and durable adjustment to each other of the parts described. The draw-bars B B, having the smooth, circular faces of the disks C C to bear or rub against, renders a cross-rail between their forward ends unnecessary. On which account, also, the draw-bars do not have to be so long; and there now being no cross-rail in front of the rake, the hay is free to gather into and to pile up upon the rake as it will. The lugs or lap pieces *k k* form strong braces to the tenons *c′ c′* of the disk C, while the said tenons *c′ c′* in turn form strong braces to the said lap pieces *k k*, which lap pieces *k k* prevent the ends of the shaft A from splitting in one direction, while the small bolt F′ prevents the ends of the said shaft from splitting in the other or opposite direction. The depth of the circular flange represented upon

the inside of the disk C is diminished to a certain extent, and an extra flange—not represented, except in fig. 40, page B. of the drawings, but which will be readily understood by mechanics—a half inch deep, or nearly that, is now cast upon the inner side of the said disk to fit precisely the exterior of the shaft A, and which flanges extend from the edges of one of the lap pieces *k* over and under the shaft A to the edges of the other lap piece *k*, and which flanges prevent the said disk from so great a liability of breaking in two, or of cracking through the middle thereof in a vertical direction, hide the junction of the ends of A with the inner surface of the disk C, are an additional help to prevent any checking or splitting of the ends of the said shaft, and a help, also, to the formation of a more durable connection between the parts A and C described. It will be seen, also, that the disk C makes a more solid adjustment of the bearing-bolt F to the ends of A. The said bolt F passing through the hole C′ of the metallic disk C, and the said disk having a flange upon its inner surface that encircles and embraces and precisely fits the exterior of the shaft A, the adjustment of the said bearing-bolt to the ends of A is of a very solid and durable character. The said disk pieces thus form excellent caps to the ends of A, and the exterior thereof being smooth and circular, and of somewhat larger diameter than the ends of the rake-head can be, they form better endings to the ends of A, and better faces for the said draw-bars to bear or rub against, whether a cross-rail is used between their outer ends or not. The duplicate pairs of runners T T upon the upper and under sides of the shaft A, figs. 1 and 3, page A, figs. 1 and 2, page C, and figs. 1 and 2, page D, of the drawings, are shod with strap or band iron, and are applied to the machine with screws. They are usually fixed, in a field machine, upon the third tooth from the end. It would be difficult to apply a wooden runner to the rake except in the manner represented. But the runner proper, in point of fact, is only that part which extends backward from the back part of the rake-head A. That part which extends forward of the shaft A, along upon the under side of the tooth, and also that part which exists immediately beneath the said shaft, forms only a part of the means, *i. e.*, in conjunction with the screws aforesaid, by which to secure the runner to the machine, and is not wanted to come in contact with the ground. The chock T′, fig. 1, page C, secures the runner more firmly to the rake-head, and strengthens and braces the said runner at what was formerly its weakest point. The said chocks or braces T′ are formed as represented, made of cast iron, and are fixed to the said runner by means of a single screw, as also represented. The runners represented in figs. 39 and 40, page B, and fig. 7, page C, are of iron, and are cast to the disk piece C, hereinbefore described, both forming a single piece in casting. The same means, therefore, which secure the disk piece C to the ends of the rake-head A secure also the runners to the machine or rake-head; and when the described end irons become fixed to the ends of the said shaft, A, the said runners also become attached to the machine. This form or style of the runner is the least expensive, and very much the most efficient in its operation of any that have hitherto been devised by me. The runners represented in figs. 3, 4, 5, and 6, page C, are also wholly of iron, and are applied to the machine by means of a single bolt to two runners and a couple of screws each, as represented. These runners are the next least expensive, and the next most efficient in their operation of any that I have yet devised. One very favorable feature in the last two mentioned styles of runners is, that it is not possible for them ever to come in contact with the ground forward of the rake-head, which difficulty with the wooden runners hereinbefore described sometimes causes the rake, or at least would permit the rake to rock backward, when the attendant is for the time being compelled to hold up the outer end of the handle by hand. These wooden runners, shod with band iron and applied to the machine as described, are a little the most expensive, and are not quite so efficient in their operation, but are a little the most durable, the least likely to get broken or out of repair, perhaps, of either of the three forms described. It will be noticed that only one end of the runner herein described is attached to the machine, which end is the forward end, the hind end being free. It will also be noticed that the said forward end of the runner is attached to the rear part of the rake-head; and also, that the said runner moves in contact with the ground behind the rake-head only. Ordinary runners have both ends attached to the machine, and slide in contact with the ground only in front of and beneath the rake-head. The metallic bearing girdle D is made in two halves, and fixed upon the middle of the shaft A by means of lugs *d d d d* and bolts *d′ d′*, as represented, and which metallic bearing girdle, D, has within its cylindrical exterior two rectangular grooves, one cut within the other. The broad and outer one forms the cylindrical bearing or bearings D′ D′. The inner or narrow groove H makes room for the locking devices to play in, figs. 2 and 3, page A, and figs. 1, 2, 3, 4, 5, and 6, page B. Within the narrow groove H are two obstructions, U and V, one situated opposite the other, radially to the axis of the shaft A, which obstructions, U and V, fill just half the depth of the groove, and extend far enough each way within the groove to have an irremovable position; and which two obstructions, U and V, are each provided with two radial or perpendicular faces, W, Y, X, and Z; one face of each obstruction, W X, facing forward, and one face of each obstruction, Y Z, facing backward within the said groove H; and which faces, W, X, Y, and Z of said obstructions U and V stand radially, or nearly so, to the axis of the shaft A, as represented. The handle E is, by means of the strap G and bolts G^1 and G^2, attached to or fitted upon the cylindrical bearing D′ in such a manner as to allow the said bearing, with the parts upon which it is fixed, to revolve freely except when it is prevented by other means. The radial or perpendicular faces W, X, Y, and Z, described, are adapted to meet suitable stops, I and J, the faces W X adapted to meet the stop I, and the faces Y Z adapted to meet the stop J, in a manner which will now be described. The stop J is situated within the upper part or edge of the handle E, lying within a narrow excavation of sufficient dimensions to receive it, and immediately beneath the upper tangent of the strap G. The stop I is similarly situated within the lower part or edge of the handle E, immediately beneath the lower tangent of the strap G, figs. 2 and 3, page A. The bolt G^1 passes through the tangents of the strap G, through the slots S of the latches or stops I and J in the immediate rear of the bearings L in the central part of the said latches, and through the wood of the handle E, as represented. The iron pins *g′* are inserted through the slots S′ of the latches I and J in front of the bearings L, and into the handle E, as represented, to prevent the said latches from sliding forward. The

stops I and J move only in a vertical plane radially to the axis of their respective bearings L, which bearings turn in their respective confines, formed by the bolt G' passing through behind them, the little iron pin *g'* set in front of them, with the wood of the handle E beneath them, and the tangents of the strap G above them. The diameter of the said bearings L being somewhat greater than the thickness of any of the other parts of the said latches, the said latches do not therefore come in contact with any part of the interior of its enclosures except at their respective bearings, L, and at their front ends, where the upper or outer surface of the forward end of the latch comes against the interior surface of the strap G, when they are unlocked, and the under sides of the forward end of the said latches come against the bottom of the groove H, when they are locked. The central bearings L L of the stops I and J are held constantly in contact with the interior surfaces of the tangents of the strap G by means of the coiled spring K, which coiled spring, K, is inserted through a hole, K', in the wood of the handle E, and extended between the rear ends of the said latches I and J, as represented, (figs. 9 and 10, page B, and fig. 2, page D,) which contact of the bearings L L with the tangents of the strap G form the fulcrum or bearing points over which the spring K is to transmit motion to the forward ends of the stops I and J in a manner which will be obvious. The spring K; however, does only one-half of the work necessary to cause the stops I and J to perform their office. The spring K causes the said latches to lock themselves, but not to unlock. The front ends of the latches I and J are by the tension of the spring K between their rear ends held constantly towards the bottom of the groove or channel H, except when they are thrown outward by other means now to be described. There are two means by which the stop J may be raised outward from the bottom of the groove H, and consequently out of contact with either of the two radial or perpendicular faces Y and Z, which are these: first, the forward end of the stop J is raised outward from the bottom of the groove or channel H by one or either of the two obstructions U V passing under and crowding it outward, and which occurs at each half revolution of the rake, and when the said obstructions U or V shall have passed from beneath the end of the said latch or stop, the end of the said stop then by the tension of the spring K drops down behind the same; second, the stop J may be thrown out of contact with either of the two radial or perpendicular faces Y and Z by inserting a small round punch or pin, of wood or iron, through the hole *g* in the upper tangent of the strap G, and pressing inward upon the rear end of the said stop in a manner which will be obvious. There are also two means by which the stop I may be thrown out of contact with the radial or perpendicular faces W and X, against which it operates. The first is the same as that which was described in the first place for the stop J, except that the rotation of the rake must be in the opposite direction. The second may be described as follows: The cam-shaft N is inserted through the handle E from one side to the other, crossing on or near the upper surface of the stop I, and in the immediate rear of the peripheries of the flanges 1 and 2 of the bearing D'. Upon the middle of the said shaft N is projected the cam N', and upon each end thereof is a flat hook, *n n*, to which are attached the two iron straps *m m*, between the rear ends of which is fixed the ball M, which ball, M, is connected again to the under side of the handle E by means of the chain M', all as represented. Now, therefore, when by the handle E the rake is raised, in order to have the rotating parts perform a half revolution, the ball M falls to a certain distance, limited by the chain M', which turns the shaft N sufficiently to have the cam N' throw the stop or latch I entirely out of contact with the faces W X, in a manner which will be obvious. It will now be seen that when both of the latches or stops I and J, by the tension of the spring K, press upon the bottom of the narrow groove H, the rotation of the rake causes the radial or perpendicular face W to be brought into contact with the end of the latch I, which stops the revolution; and the forward end of the latch J at the same instant, by the action of the spring K, drops down or in behind the radial or perpendicular face Y on the opposite obstruction U. The revolving parts are by this means rigidly confined, without liberty to turn in either direction within the handle E, so long as the parts I and J remain in such position. The machine is used while the operative parts are thus adjusted, and drawn along, accumulating the hay, until when the attendant wishes to discharge the load by a half revolution of the revolving parts. At this juncture he elevates the outer end of the handle E, and as the rake is being thus elevated upon the points of the forward series of teeth the ball M falls a certain distance, limited only by the chain M', which falling of the ball M, through the medium of its straps, *m m*, turns the shaft N sufficiently to have the cam N' throw the stop I entirely out of contact with the radial or perpendicular face W, which allows the outer end of the handle E to be lowered to its usual position again, the draught of the horse to cause the revolving parts to perform a half revolution, and to leave the hay at the point desired. During the latter part of this half revolution the weight or ball M comes in contact with the ground again, which thereby raises the ball again, relatively at least to the descent of the rest part of the machine, and which thereby turns the cam N' off from the stop I, as represented, fig. 3, page A, whence the stop I, under the influence of the spring K, presses again upon the bottom of the narrow groove or channel H, and, as the rake rotates, travels round to meet the next face X, while at the same time the stop J is by the approach of the opposite obstruction V pushed or crowded up without offering any considerable resistance. But at the same instant that the stop I meets the radial or perpendicular face W X and causes the revolution to stop, the stop J falls into contact with one of the corresponding reversed faces Y Z, and guards thus against any retrograde movements or turning of the parts in the wrong direction.

Some of the advantages due to certain features of this invention may be enumerated as follows:

First. By reason of the employment of the ball or weight M, the locking devices existing between the handle E and revolving shaft A relatively to the forward rotations of the rake are perfectly automatic in their operation. It will be observed again that when the outer end of the handle E is raised to make the rake revolve, the falling (at least relatively to the ascent of the rest part of the machine) of the ball M unlocks the lower latch, which thereby allows the outer end of the said handle to be lowered to its usual position again, the rake to perform a half revolution, and to discharge the hay at the point desired. If the attendant were to let go the handle for a time, and during that time the points of the forward series of teeth should catch hold of

some inequality of the ground, the said handle would rise with the rake until the said ball had fallen far enough to unlock the lower latch, when the said handle would fall, and when the said rake had rotated far enough would become locked to the other side of the machine. The said handle would not go over with the rake, neither would it fall to the ground; it would only fall far enough to lock itself to the other side of the machine. But suppose the attendant, when the points of the forward series of teeth had caught hold of the said inequality of the ground, instead of taking his hand off, were to press down upon the outer end of the said handle, the said lock or lower latch would not then become unlocked; said latch would be held too strongly in contact with the stop in the groove for the weight of the ball M to unlock it, and the said ball could only descend far enough for the point of the cam N′ to rest upon the middle of the latch, which latter would be suspended from the bearings L thereof to the face of the stop in the groove. But so soon as the outer end of the handle is relieved from pressure, the lower latch becomes unlocked, when the outer end of the said handle may be lowered to its usual position again, the rake allowed to perform a half revolution, and to discharge the load at the point described. It will now be seen, that, if the attendant desires, he can bear down upon the outer end of the handle to prevent the rake from going over, and can retain his pressure thereon to any point in its elevation with the same facility and with the same effect as that he could if the ball M and the cam-shaft N N′ were for the time being entirely removed. Still, so soon as the outer end of the handle E is relieved from the pressure of the attendant, the said ball unlocks the lower latch with certainty and promptness in the manner described. It is but seldom, however, that the outer end of the said handle ever gets the advantage of the attendant so far, under the circumstances described, as to rise with his weight or pressure upon it to such a distance as that if he were to let go of the handle the falling of the said ball would unlock the lock. The handle to take hold of being lower, and being situated by the side of the attendant, directly beneath his fore-arm and hand, within convenient reach of the latter when his arm hangs down, the machine is more perfectly controllable than it is where the attendant has to walk behind a round suspended between the outer ends of the two handles, and control the machine at a sort of half arm's-length, as in the old commonly used revolving rakes. The new machine is perfectly controllable in every respect. The attendant, with the lines from the draught animal thrown over his shoulders, seizes hold of the left hand end of the handle to take hold of, in the outer end of E with his right hand, and travelling along behind the rake, is able to control the machine with facility while it is being drawn along to accumulate the hay, and to revolve it at each crossing of the windrow, and cause the same to commence the accumulation of the hay again, immediately upon its descent from the windrow to the ground, with precision, deliberation, and ease.

Second. The locking devices, and all the parts connected therewith, being concealed within the handle, or, rather, within the parts E, D, and G, there is no liability of the hay making any interference therewith, nor any danger of the said parts getting broken from things accidentally coming in contact therewith while being handled around.

Third. Another very favorable feature about the locking parts is, that the strain incident to their use is transmitted only through the longitudinal centre of the said parts instead of crosswise thereof, as is the case with most others; that is to say, the said strain is transmitted through the longitudinal centre of the latches I and J themselves, through the same of the tangents of the strap G, and through the longitudinal centre also of the handle. It is obvious from this that the parts described are very strong and very durable.

Fourth. Another very favorable feature in the construction of the machine is the simplicity of the castings. From digging them out of the sand till they are bolted upon the machine a hole does not have to be drilled nor a thread cut. The turning of the bearing D′, to which the handle is attached, is the only lathe work about, and which is a small though very important item.

Fifth. By reason of the application or use of the peculiar metallic contrivances by which the draw-bars B B are attached to the ends of A, the blacksmithing is obviated formerly required in the making of bands to go round the ends of the said shaft, and also the getting loose of the same after having been put on, and the resetting or tightening thereof; second, the blacksmithing is obviated formerly required in the making of the bolts F, and the cutting of threads thereon or the punching of holes therein, as a means by which to secure the same to the shaft; third, a solid and durable metallic bearing is had to which to attach the draw-bar; fourth, the said bearings being of metal, there is no danger of the shrinking and swelling thereof, rendering any part of the machine inoperative; fifth, the said draw-bars have in the disk C smoother and larger circular faces to bear or rub against than formerly, when only the circular ends of the rake-head were used for that purpose; sixth, no danger of the bolt F getting loose; seventh, the disk pieces C form excellent caps to the end pieces A, and are therefore a great protection to the same against checking or splitting, or of otherwise becoming wasted or worn out; eighth, the said parts are less liable to get out of repair, as a whole, than the means heretofore employed to attach the said draw-bars to the ends of A; ninth, ease with which they can be taken apart and put together again.

Sixth. The runners T T are employed chiefly for the purpose of carrying the shaft A at a suitable distance from the ground; to sustain the outer end of the handle E at a position in which it was formerly carried by the attendant, and to present the teeth in a good and favorable position to the ground. The heels of the said runners form also favorable fulcra over which to raise and lower the front part of the rake over inequalities of the earth. And when the said runners are applied to the third tooth from the end, they help somewhat in preventing the hay from sliding clear over and falling upon the ground behind the rake.

The outer groove to the bearing D, which the strap G and the concaved end of the handle E slide round in, may be turned of such a width as to fit precisely the width and thickness of the said strap, and the said strap thus made to fit precisely the width and depth of the said groove, the edges of the said strap G first being straightened in a metallic planer. And when the concaved end of the handle E is made also to precisely fit the said groove, the desired rigidity and firmness will then be imparted to the side motions of the outer end of the said handle.

And when the latches I and J are of such length as to make it necessary to thrust or bear downward the outer end of the said handle with some considerable force to make the latch J drop into contact with the upper stop in the groove H—the latch I in the same event or act coming a little the first into contact with the lower stop in the said groove—the locking of the said lock or locks will then impart the desired rigidity and firmness to the vertical motions of the outer end of the said handle. It will be seen, therefore, that the outer end of the said handle is made firm and rigid with relation to all the different directions in which the attendant's force may be brought against it.

I secure the chain M′ to the handle E by dropping one end thereof into a hole made in the under side of the said handle and inserting a small iron pin through the end link, and through the handle E from one side to the other and heading up the ends thereof a little to keep it in. The lower end of the said chain is secured in a similar manner to the ball M, the side straps *m m* keeping the said iron pin from coming out and hiding the ends of the holes through which the same is inserted. The said chain may be kept from kinking by drawing a tight sleeve upon it and securing the ends thereof to the links of the chain. Thin plates of iron, wrought or cast, may be embedded in and screwed to the sides of the forward end of the handle E, having concaved edges to fit precisely the bearing D′, and smoothly ground sides upon which to take the friction heretofore existing between the flanges 1 and 2 and the handle E, which side plates will then prevent the said flanges from wearing away the wood of E, and also the cam-shaft N from getting loose, as heretofore. Screws may be inserted through the bottom of the narrow groove H and into the shaft A, to assist in fixing the metallic bearing girdle D more firmly to the said shaft. Calks or nibs half an inch deep, with a lively taper, may be cast upon the inside of the outer ends of the lugs *d d d d*, which will also assist in giving greater fixedness and rigidity to the said metallic bearing girdle D when applied to the said shaft.

It will be observed that the reversed faces W Y and X Z are situated within the same cylindrical and vertical planes, and are so arranged relatively to each other, and to the pawls I and J, as that the said pawl I, or its equivalent, may have the whole of the time occupied by the rake to make a half revolution to fall into contact with the next perpendicular face, and in such a manner, also, as that the said pawl J, or its equivalent, is possessed of the same when the rake performs a half revolution in the opposite direction. And it will be seen, also, at the same time, that the said pawls I and J are so arranged relatively to each other, and to the above-described faces W, X, Y, and Z, as that the said pawl I may be unlocked, to allow the rake to rotate forward, while the said pawl J is locked to prevent the rake from rotating backward, and as that the said pawl J may be unlocked to allow the rake to revolve backward, while the said pawl I is locked to prevent the rake from rotating forward; and also, as that both of the said pawls may be unlocked at the same time, or that they may both be locked at the same time. It being so seldom required to unlock the pawl J to allow the rake to rotate backward, or the handle to be carried forward about the axis of A that a more convenient means for the operating of this bolt at such times than the one provided is not thought to be necessary.

I am aware that the use of wooden runners in connection with revolving rakes is not new, but I am not aware that a wooden runner has ever before been employed in which the following ten characteristics are combined:

First. Its only contact with the ground is behind the rake-head A; or, in other words, behind a preponderance in the weight of the machine.

Second. The rear end of the said runner is detached from the machine.

Third. It is applied to the rake-head directly beneath one of the teeth of the rake, and in such a manner as that it shall occupy the same vertical plane as that in which the said tooth is situated.

Fourth. The runner lies in contact with the tooth to which it is fixed from the forward point of the former back to the front side of the rake-head.

Fifth. Said runner is shod with band iron.

Sixth. A chock or brace, T′, is employed in combination therewith, by which means the rear end of the said runner is braced downward, and thus strengthened and made secure against being broken off; and by which means, also, the part of the rake-head A which lies beneath the tooth *a* is grasped, received, or embraced within the said runner; or, in other words, within the recess thereof formed by the said chock or brace T′, lying in contact with the rear side of the rake-head; the runner itself, or a portion thereof, lying in contact with the under side of the said rake-head, and the wooden shoulders of the said runner lying in contact with the front side of the said rake-head. The said runner is by this means very strongly and securely applied to the machine.

Seventh. It is a perfectly rigid and inflexible runner.

Eighth. It is not an adjustable runner, but, on the contrary, it is a perfectly rigid and inadjustable runner.

Ninth. The said runner is employed in combination with a revolving rake, A *a a*.

Tenth. It rotates with the rake; it forms a part of the revolving parts; it turns or revolves about the arms of A when the rake revolves, the same as do the rest part of the revolving parts.

Having now described my improvements, what I claim as my invention, and desire to secure by Letters Patent, is—

1. I claim the formation of a groove or channel H, cut within and around the cylindrical part of the bearing D′, when employed substantially as and for the purpose herein set forth.

2. I claim situating the radial or perpendicular faces W, X, Y, Z within the joint rim or parts E, D, G, substantially as and for the purpose herein set forth.

3. I claim putting the stops I and J beneath the tangents of the strap G; or, in other words, concealing the same within the handle E, substantially as and for the purpose herein set forth.

4. I claim the employment of duplicate pawls, I and J, when adapted to operate relatively to one or more pairs of reversed faces, W Y, substantially as and for the purpose herein set forth.

5. I claim the employment of a spring, K, inserted through a hole in the handle E, and adapted to serve in combination with the duplicate pawls I and J, substantially as and for the purpose herein set forth.

6. I claim the employment of a cam-shaft, N, having a cam, N′, thereon, and a hook, *n*, upon each end thereof, adapted to operate in combination with the locking devices of a single-handled revolving rake, A *a a* E, substantially as and for the purpose herein set forth.

7. I claim the employment of a ball or weight, M, adapted to slide or to be dragged upon the earth behind the rake-head A, and to serve in combination with the locking devices of a revolving rake, A *a a*, substantially as and for the purpose herein set forth.

8. I claim the application of the disk pieces C C to the ends of the shaft A, when constructed and employed substantially as and for the purpose herein set forth.

9. I claim the use of the bearing-bolts F F, when constructed and employed substantially as and for the purpose herein set forth.

10. I claim in revolving rakes A *a a* the use of one or more chocks or braces, T′ T′, when employed to brace the runner in the rear of the rake-head, substantially as and for the purpose herein set forth.

11. I claim the wooden runners T T, provided with braces in the rear of the rake-head, in combination with a revolving rake A *a a* in such manner that the only point of contact of said runners with the ground shall be in rear of the rake-head, substantially as and for the purpose herein set forth.

12. I claim in combination with a single-handled revolving rake, A *a a* E, when its locking devices do not depend upon the teeth for resistances, except uniformly upon the whole through the medium of the shaft A, the employment of two pairs of reversed faces, W Y and X Z, when arranged relative to each other and to pawls I and J, or their equivalents, substantially as and for the purpose herein set forth.

13. I claim the use of a check chain or connection, M′, when employed substantially as and for the purpose herein set forth.

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Witnesses:

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