(No Model.) 3 Sheets—Sheet 1.

D. LUBIN.

CLOD CRUSHER AND PULVERIZER.

No. 362,454. Patented May 3, 1887.

Fig. 1.

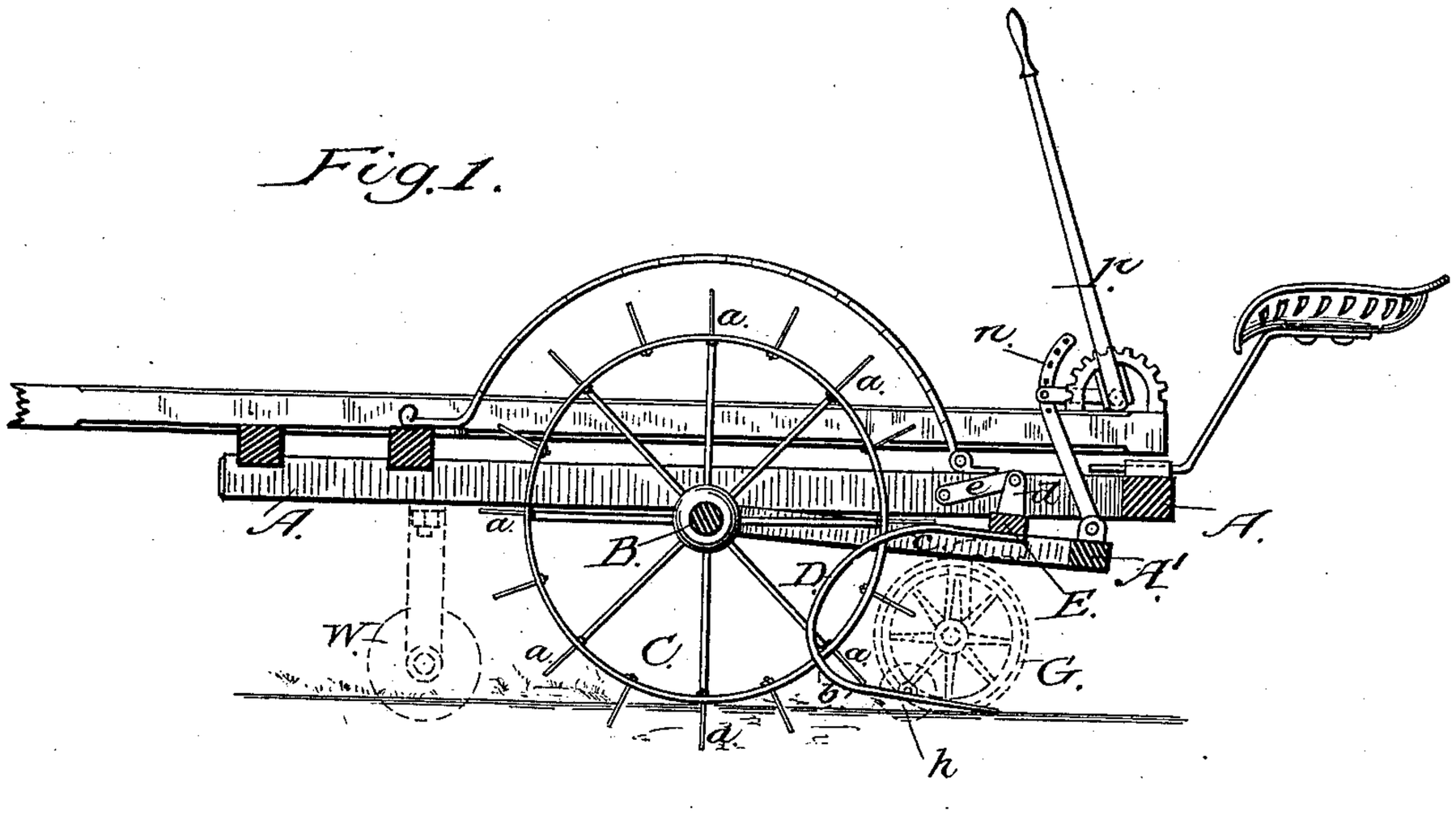
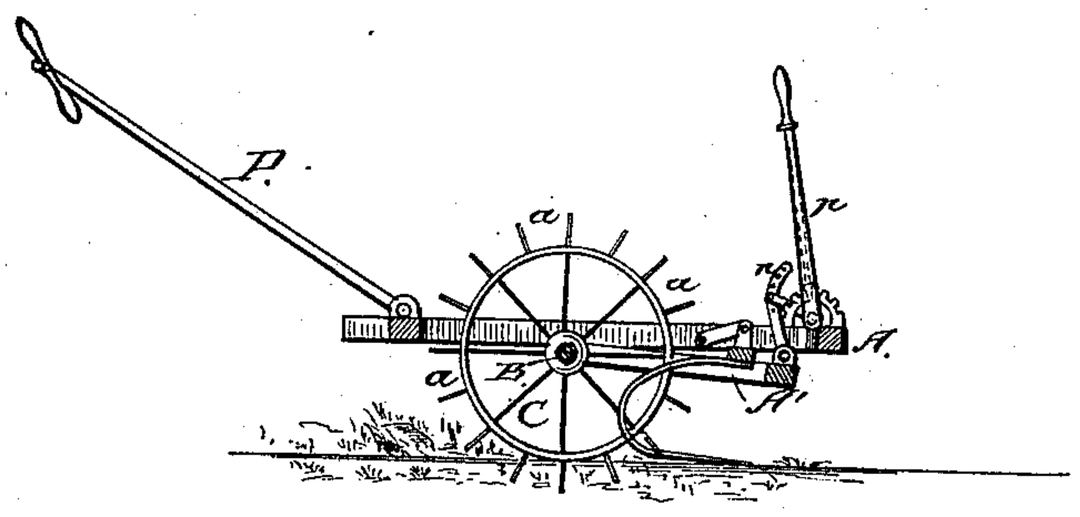


Fig. 11.



Witnesses
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(No Model.) 3 Sheets—Sheet 2.

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CLOD CRUSHER AND PULVERIZER.

No. 362,454. Patented May 3, 1887.

Fig. 2.

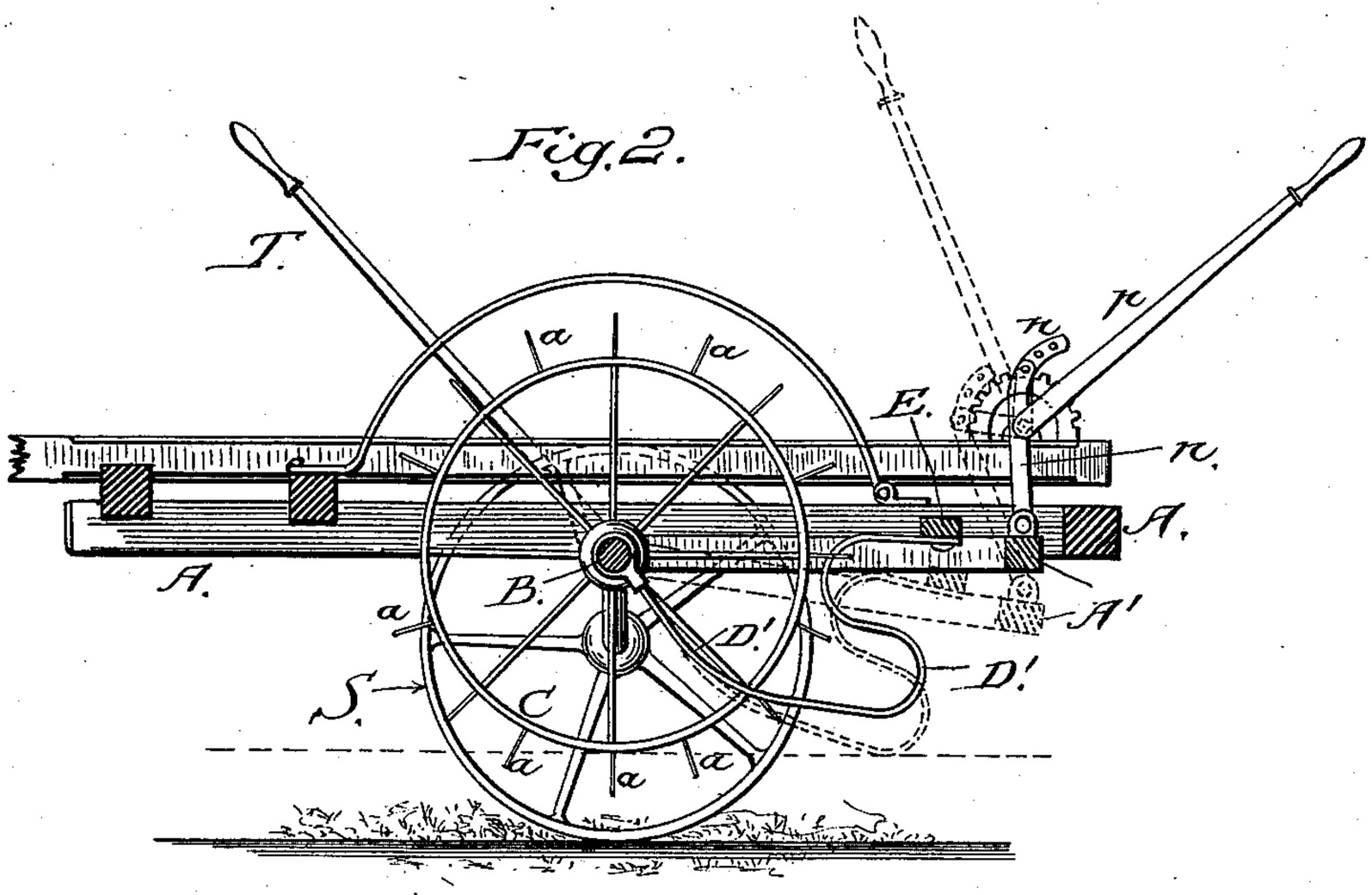


Fig. 1.

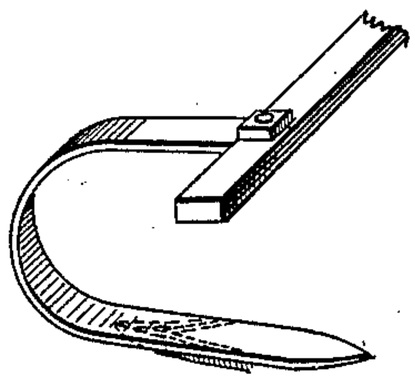


Fig. 5.

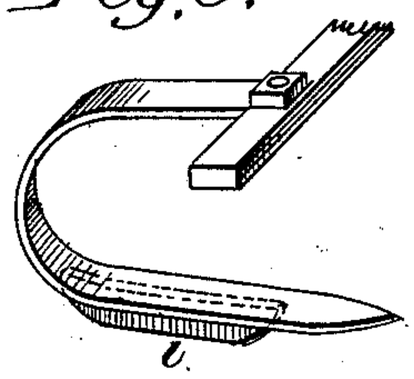


Fig. 4.

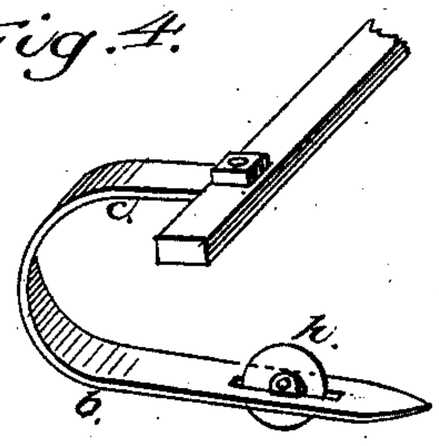
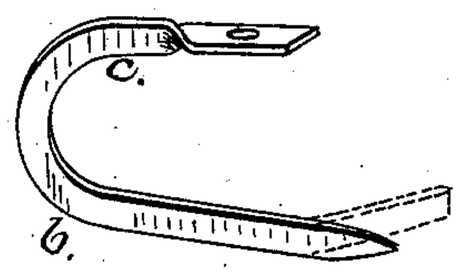


Fig. 3.



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(No Model.)

3 Sheets—Sheet 3.

D. LUBIN.

CLOD CRUSHER AND PULVERIZER.

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Fig. 10.

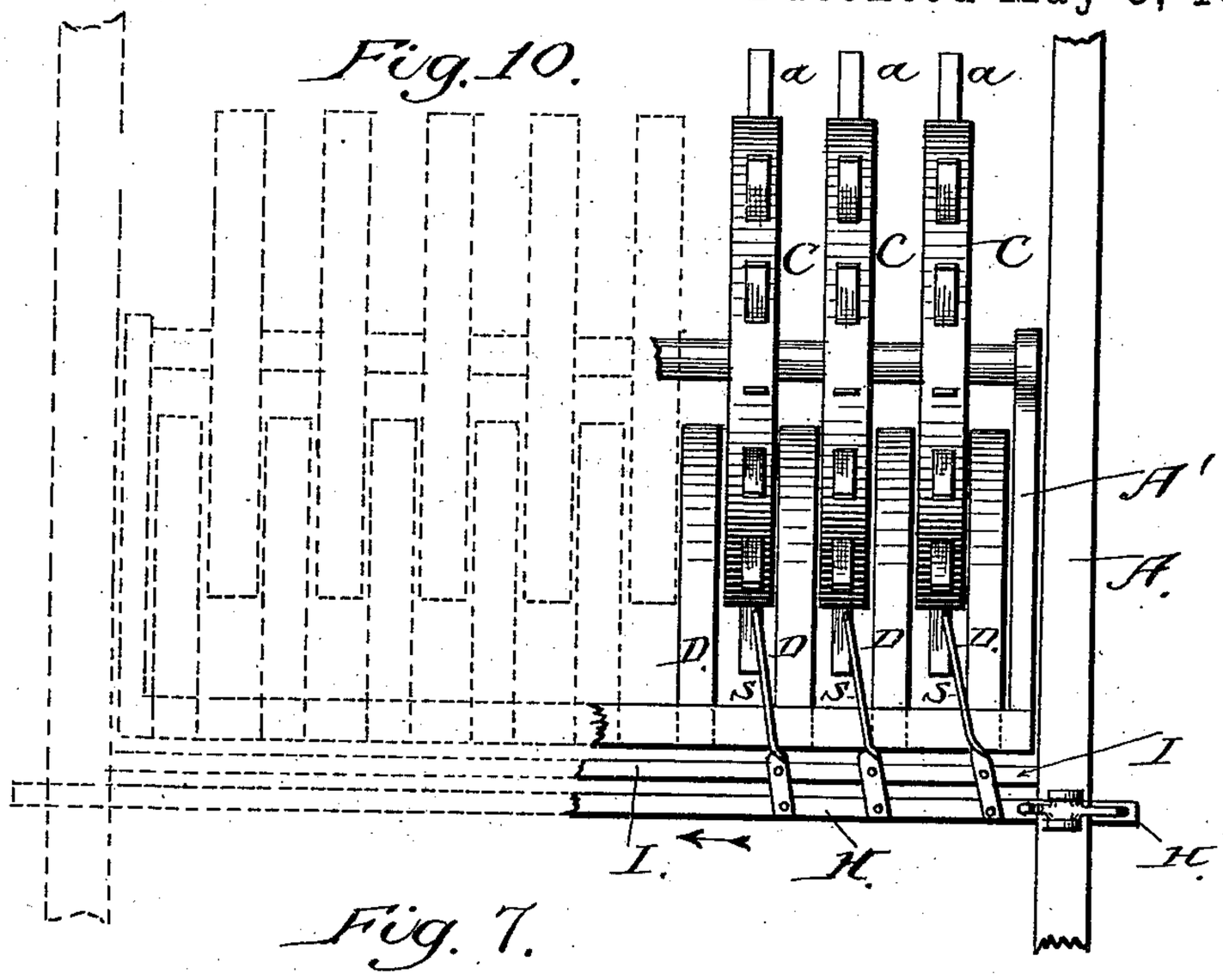


Fig. 7.

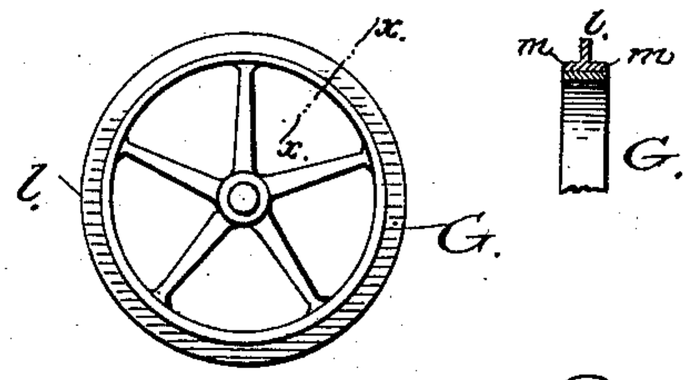


Fig 8

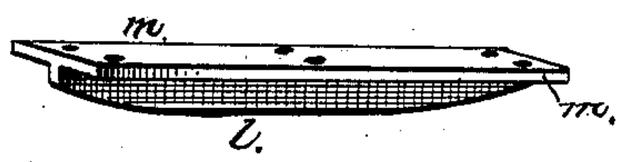


Fig. 6.

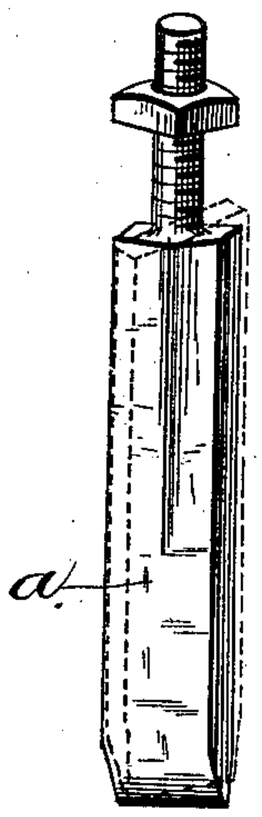
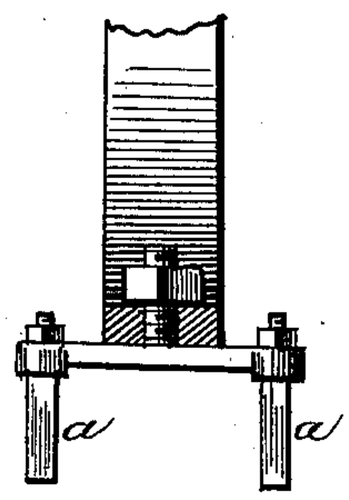


Fig. 12.



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UNITED STATES PATENT OFFICE.

DAVID LUBIN, OF SACRAMENTO, CALIFORNIA, ASSIGNOR OF TWO-THIRDS TO HARRIS WEINSTOCK AND ALBERT BONNHEIM, BOTH OF SAME PLACE.

CLOD CRUSHER AND PULVERIZER.

SPECIFICATION forming part of Letters Patent No. 362,454, dated May 3, 1887.

Application filed January 28, 1887. Serial No. 225,785. (No model.)

To all whom it may concern:

Be it known that I, DAVID LUBIN, a citizen of the United States, residing at the city and county of Sacramento, State of California, have invented certain new and useful Improvements in Clod Crushers and Pulverizers, of which the following is a full and clear description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents a sectional view of a clod crusher and pulverizer embodying my improvements. Fig. 2 is a similar view showing crushing bars or fingers of different form and showing the same elevated. Figs. 3 to 12, inclusive, illustrate different details of construction, which I will hereinafter refer to.

My present invention relates to clod crushers and pulverizers. It is an improvement on the patents already granted to me for similar machines, and especially on my Patent No. 357,152, granted to me February 1, 1887; and it consists in the peculiar construction and combination of devices, which I shall hereinafter fully describe and claim.

To enable others skilled in the art to which my invention appertains to make and use the same, I will now describe a preferred construction and indicate the manner in which the same is carried out.

In the said drawings, A represents a suitable frame adapted to support the working portions of my machine. A transverse shaft, B, is fixed within the frame A, and is provided with a series of wheels or disks, C, having teeth or projections *a*, which sink into the ground and by contact therewith rotate said wheels or disks.

In my former patent the teeth or projections were shown and described as being square or rectangular, whereby their sharp angles effected a preliminary breaking of the clod before it was carried to the crushing bars or fingers; but in all the constructions heretofore employed by me these teeth produced the best results on lands that had previously been broken, either by a plow or by fingers or bars entering the ground in advance of the spiked wheels. This entailed double work and greatly added to the cost of preparing the ground. In the present instance I have so altered the construction of the teeth on the wheels or disks that they virtually become plows which break up the new ground, the same teeth immediately thereafter lifting the severed portions or clods of earth to be acted upon by the combined action of the wheels and of bars contiguous thereto. The teeth (see Fig. 6) as I now prefer to construct them have broad surfaces, and somewhat resemble a chisel, the lower edges of said teeth being beveled or not, as desired. When so constructed, (see Fig. 11,) it will be manifest they first enter the ground, and as they pass the vertical center of their wheel or disk they fulcrum upon the edges of the openings made by the teeth on entering the ground, and by the continued rotary movement of said wheels they sever from the main body of ground a portion of the earth, the same principle being set forth in the hoeing of land by hand, the severed portions or clods being advanced behind the main body of land by the continued movement of the wheels and teeth, and finally lifted or carried against contiguous bars and crushed, as I shall hereinafter describe.

The teeth are fitted to the rim of the wheel or disk so that they may be adjusted to different angles, the angle of adjustment in each instance, however, being such relative to the draft of the machine that the latter is modified to a greater or less extent.

In my said former patent I employed a series of crushing bars or fingers which acted in conjunction with the rotating spiked wheels to crush the clods. The main purpose of these crushing bars or fingers was to enter the ground at points adjacent to the teeth on the wheels, so as to loosen the earth and permit the latter to be broken by said teeth and afterward crushed. The crushing-bars were so arranged that their lower ends pointed in the direction of the machine's travel. They therefore were susceptible of clogging by rubbish, and also served to rake up foreign substances, stones, &c., to such an extent that special means had to be employed to throw the series of crushing bars or fingers sufficiently far enough in the rear of the wheels or disks to permit the machine to release itself of such obstruction. In the present case the fingers act as "crushers" and perform the work designed for their ac-

complishment in a very satisfactory and highly creditable manner. By reason of their arrangement and construction they overcome the difficulties attendant upon the former designs, and at the same time do their work equally as well. These bars D are mounted in a supplemental frame, A′, journaled upon the shaft B, and are arranged between the spiked wheels or disks, as in my former patent; but they curve rearwardly, or toward the back of the machine, so that their curved or, I may say, convex surface lies next to the ground. By so disposing of these bars they present a rounded surface to a stone, stump, or other obstruction, and permit such obstacle to pass beneath them, and thereby not obstruct the working power of the machine.

The bars D are made of some suitable metal possessing sufficient elasticity to permit them to yield when brought into contact with a stone or other object, and are secured to a transverse beam, E, located either in front or rear of the spiked wheels, but preferably in the rear, as shown in Fig. 1.

As before mentioned, the crushing-bars in my former patent were designed to enter the ground and lift up the earth to be acted on by the spiked wheels; but I have found that in utilizing the well-known process of hand-hoeing in a compact machine, such as is here represented, I do not require these crushing-bars to enter the earth to break the soil, while the draft in the present case is much lighter than in my former machines. In the present case the spring-bars curve away from instead of toward the wheels or disks; but in addition to this change of construction they perform a function somewhat different than the former ones, although the essential object of all my machines—*i. e.*, the crushing of the clods proper—is performed by the combined action of rotating spiked wheels and crushing-bars.

With my present machine, when the teeth break off portions of earth they advance them slightly forward to permit the succeeding teeth to perform their work, and then bring said clods against the bottom surface of the bars, the teeth on the rotating wheels passing between the said bars at an acute angle, to cause a shearing-force to be applied, the breaking power increasing constantly from the moment the clod first strikes the crushing-surface until the minimum space between the teeth and spring-bars is reached.

Owing to the peculiar construction of the present crushing-bars, I obtain a plural crushing-face on each bar, and this is at times very desirable, as in some instances the clod, after being broken, is left in lumps so large that they are sometimes carried by the spiked wheels during their continued revolution. It has been demonstrated by actual experiment that after a clod has first been crushed certain lumps have been retained between the adjacent teeth of the wheels, and when said teeth passed through or between the crushing-bars these lumps would fall upon the teeth of contiguous wheels and be carried around by said wheels.

An observation of Fig. 1 will develop the fact that as the teeth on the wheels or disks pass between that portion of the spring-bars represented at *b* they cause a crushing of the clod, and should any lumps be left between the teeth, as before mentioned, they would be brought against the bars at the point where said teeth again pass out of or between said bars, as represented at *c*. Each spring-bar, therefore, may have a plural number of distinct and independent crushing-surfaces, the clod not only being crushed, but practically pulverized, by the rotating spiked wheels and the crushing-surfaces of the bars.

In Figs. 2, 4, 5, and 6 I illustrate modifications of the spring-bars shown in Fig. 1, these bars in all instances operating in the manner above described and thoroughly pulverizing the soil. In Fig. 2 the bars D′ are represented as having their front ends mounted upon the main shaft B and their rear ends fixed to the transverse beam E on the frame A′, in the rear of the wheels or disks, the said bars having also a compound curve of S shape, of less tensile strength than the major portion of the bars, so that said bars yield automatically to permit the passage beneath their lower surface of an incompressible object, stone, stump, &c. The beam E, which connects the rear portions of the bars, (shown in Figs. 1 and 2,) is capable of vertical movement to elevate said bars from the ground when going on or off the field, and the independent bars D (shown in Fig. 1) are capable of a movement toward or from the spiked wheels by reason of a link-connection, such as is shown in my said former patent, and herein represented by the letters *d* and *e*.

The bar illustrated in Fig. 3 is similar in construction to the bars D and D′, and operates in like manner thereto; but in addition to its function as a crushing-bar it is provided with an angular extension, *g*, which serves as a scraper to level the earth after being crushed. In this figure the bar is shown as presenting a sharp edge to the ground, the result being the same as before described.

Another modification of these spring-bars may consist in mounting in said bars a loosely-journaled disk or sharp-edged wheel, *h*, such as is shown in dotted lines in Fig. 1 and in full lines in Fig. 4, the function of this wheel being to effect a preliminary breaking of the clod at its center preparatory to its being again broken by the sides of the bars and the opposing spiked wheels or disks. Thus it is that various modifications and changes in the shape of the crushing-bars may occur. I therefore do not wish to be understood as limiting myself to any particular form or design of bars, as the same may be changed to meet existing circumstances, the essential feature, however, in all cases being the capability of said bars yielding to permit the passage of a stone, &c.,

beneath them, and the fact that they temporarily hold the clod between their crushing-surfaces and the spiked wheels. These bars generally rest upon the surface of the ground or slightly above it, and therefore the clod does not have to be lifted to any degree before the opposing crushing-surfaces meet.

Crushing-bars, when designed to perform the functions herein claimed, must necessarily wear rapidly at the points where the actual crushing takes place, and it is therefore necessary that some means should be adopted to provide for this wear. I therefore may supply the crushing-surfaces of the bars with steel shoes *l*, preferably T-shaped in cross section, (see Figs. 5, 7, and 8,) and having their flanges *m* bolted or otherwise secured to the bars, whereby they may be readily removed and new ones substituted when they become so much worn as to be unfit for use, and may also construct these shoes of V form, (see Fig. 9,) so that they force the earth from the crushing-bars in opposite directions and level the ground, it being understood that whenever the shoes are employed they enter the soil so that the flat portions of the bars rest on the surface.

In addition to the modifications previously noted, I may interpose between the spiked wheels other wheels, G, (see Figs. 1 and 7,) of smaller diameter than the wheels C, and provide these supplemental wheels with or without teeth, adjustable or otherwise, which act to crush the clods carried by the wheels C. These supplemental wheels may be substituted for the spring-bars. They may have a movement to permit an obstruction to pass beneath them, and may also be provided with a wearing-shoe similar to that above described, the result with these wheels being the same as with the several modified forms of spring-bars above noted, and when mounted upon a transverse shaft they may be adjusted vertically by the toggle-joint connection applied to said shaft as in Fig. 1.

In some cases it may be necessary to employ a series of sharp-edged disks to run in advance of the spiked wheels and cut the sod, so that the land may be more readily broken by the adjacent wheels, these disks W (see dotted lines in Fig. 1) being so arranged in relation to the main frame that they may be readily removed when not needed.

The supplemental frame A′, at its rear, is provided with a link, *n*, which is engaged by the short arm of a lever, *p*, journaled upon the main frame, and in conjunction with a pawl-and-ratchet mechanism serves to raise the frame A′ and its crushing-bars and hold said frame and bars in an elevated position. (See Fig. 2.)

On the rear of the main frame is mounted a transversely-sliding bar, H, (see Fig. 10,) having a series of spring bars or strippers, *s*, which are fulcrumed upon a bar, I, in front of the bar H, and have their forward ends pressing against the sides of the teeth *a*, as shown in said figure.

The purpose and operation of these bars are obvious. It is well known that in certain lands the soil will adhere to the teeth and finally close the space between the adjacent teeth of the wheel, and therefore some means must be employed to force out these adhering portions and clean the teeth. The spring arms or strippers *s* are designed to do this. Their free ends rest against the sides of the teeth, and when passed by said teeth they spring within the space between the teeth and knock out any particles of dirt adhering thereto. The bars being mounted upon a sliding bar, it is manifest their tension or pressure against the teeth and the power of the spring-strippers is regulated, a lever and holding devices being employed to cause the parts to maintain their positions after being once adjusted.

The above is a preferred mechanism for this purpose, yet it may be modified, if found desirable, the main object being to have a spring-bar engaging each wheel to clear them, and at the same time have these bars so arranged that their tension or pressure against the teeth is regulated.

The present improvements may be applied to many of the agricultural machines now in common use with but little cost and trouble. They may be used in connection with a cultivator or a harrow of any well-known form. In either case the crushing will be substantially the same as that before described, and operate in conjunction with the shovels of said cultivator or the teeth of the harrow to facilitate the successful treatment of the ground.

When the machine is used as a straddle-row cultivator, certain of the spiked wheels and crushing devices will be removed, to provide the necessary space for the passage of the corn, &c.

In Fig. 11 the machine is represented as being on a reduced scale and provided with a handle, P, so that it may be drawn by hand, and thereby utilized as a hand-machine.

In Fig. 12 a holder is represented as containing two spiked or chisel teeth, adjustable or not, the arms of said holder extending outward in opposite directions to a point about midway between adjacent wheels, said holder having also a threaded shank, whereby it may be secured to the wheel.

The machine is mounted upon supporting-wheels S, which are operated by suitable levers, T, to adjust the said wheels, so that they support the machine in going on or off the field, and also regulate the depth to which the teeth on the wheels or disks penetrate the ground.

The crusher as now described embraces the active principles of a plow, crusher, pulverizer, and leveler, the several features enumerated co-operating with each other and subjecting the soil to thorough treatment.

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

1. The combination, with a series of spiked wheels, of a series of adjacent crushing-bars between said wheels, said bars being formed of spring metal, and having a curved or rounded front surface, whereby they yield to permit the passage of an obstruction, substantially as and for the purpose specified.

2. In a clod-crusher, the combination, with a main frame, a main shaft, and a supplemental frame, A′, projecting from said shaft, of a series of spiked wheels or disks and a series of adjacent crushing-bars secured to said shaft and supplemental frame, said bars having curved or rounded front ends and a curved or S-shaped rear end, substantially as and for the purpose herein described.

3. The combination, with a series of rotating spiked wheels or disks, of a series of adjacent crushing devices having a centrally-projecting preliminary crushing-edge, substantially as herein described.

4. The combination, with a series of rotating spiked wheels, of an adjacent series of crushing devices having crushing-shoes with a projecting rib or preliminary crushing-edge, substantially as herein described.

5. The combination, with a series of rotating wheels having flat teeth projecting therefrom, of a series of rearwardly-curved crushing-bars pressing upon the ground and crushing the clods between their lower surfaces and the adjacent teeth, substantially as specified.

6. A main frame, the wheels supporting said frame, and a main shaft having a series of spiked wheels thereon, in combination with a supplemental frame extending rearwardly from said shaft, a series of spring rearwardly-curved crushing-bars carried by said frame, and means for elevating the said supplemental frame and crushing-bars, substantially as herein described.

7. The combination, with a series of wheels having teeth projecting therefrom, of a corresponding series of crushing devices and a series of adjustable spring-arms adapted to engage the space between said teeth, substantially as herein described, and for the purpose set forth.

8. The combination, with a series of wheels having teeth or projections extending therefrom, of an adjacent series of crushing devices, a laterally-adjustable bar mounted in the main frame, and a series of adjustable spring-arms extending from said bar and engaging the spaces between the teeth, substantially as and for the purpose described.

DAVID LUBIN.

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