

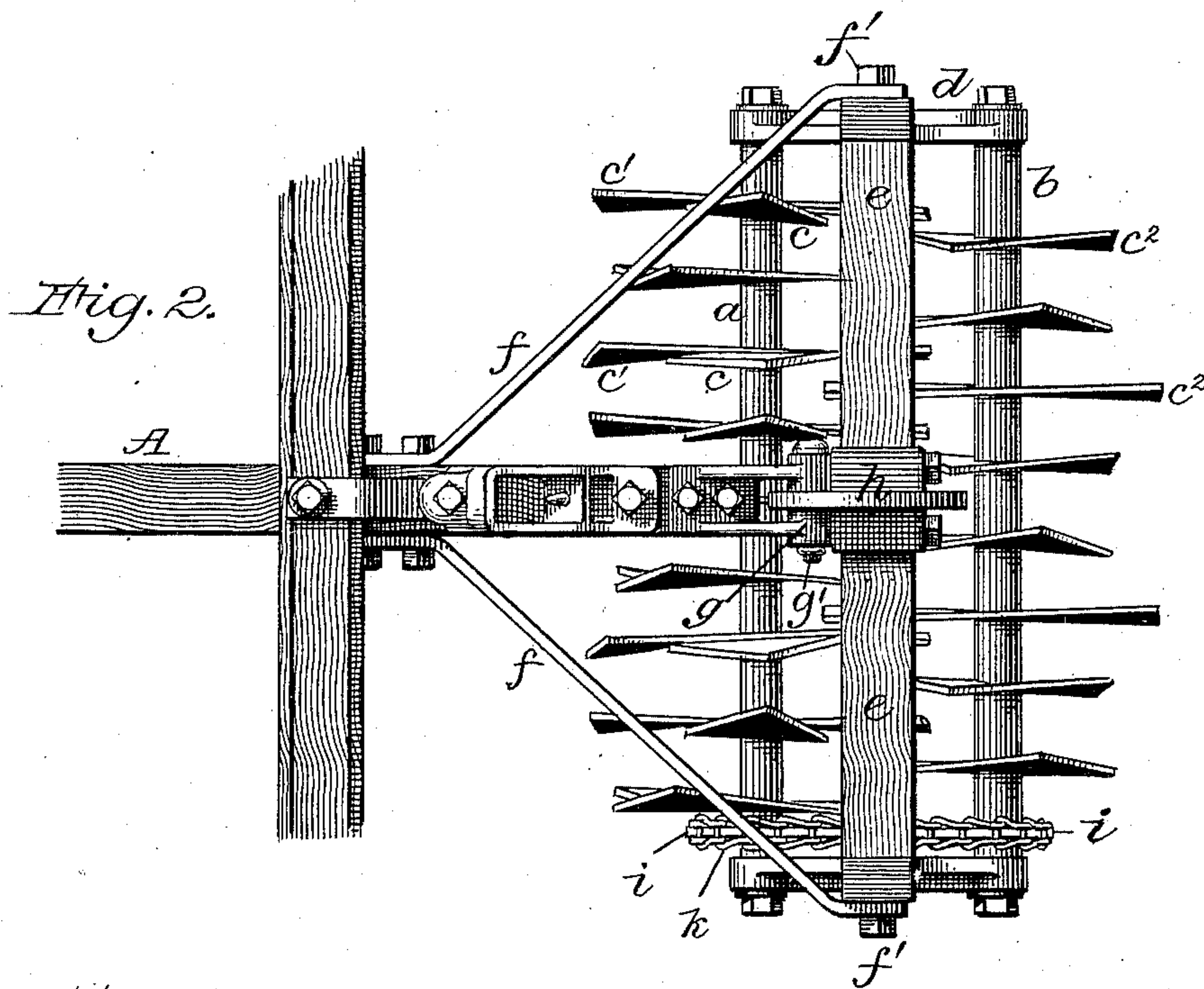
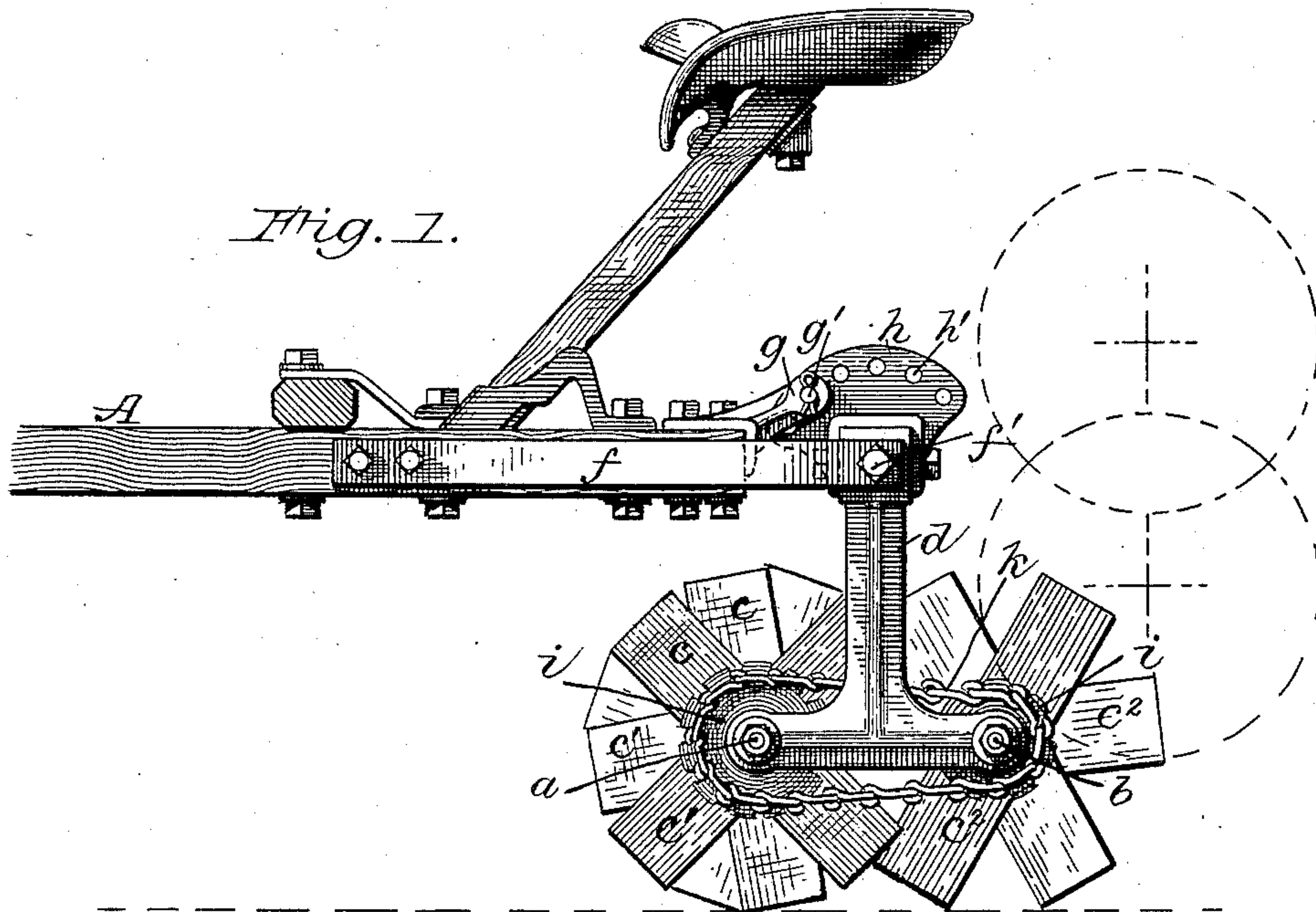
(No Model.)

3 Sheets—Sheet 1.

G. M. CLARK.
HARROW.

No. 466,771.

Patented Jan. 12, 1892.



Attest:
Philip F. Larnet
Howell Barth

Inventor:
George Marshall Clark.
By *Wm. B. Wood*
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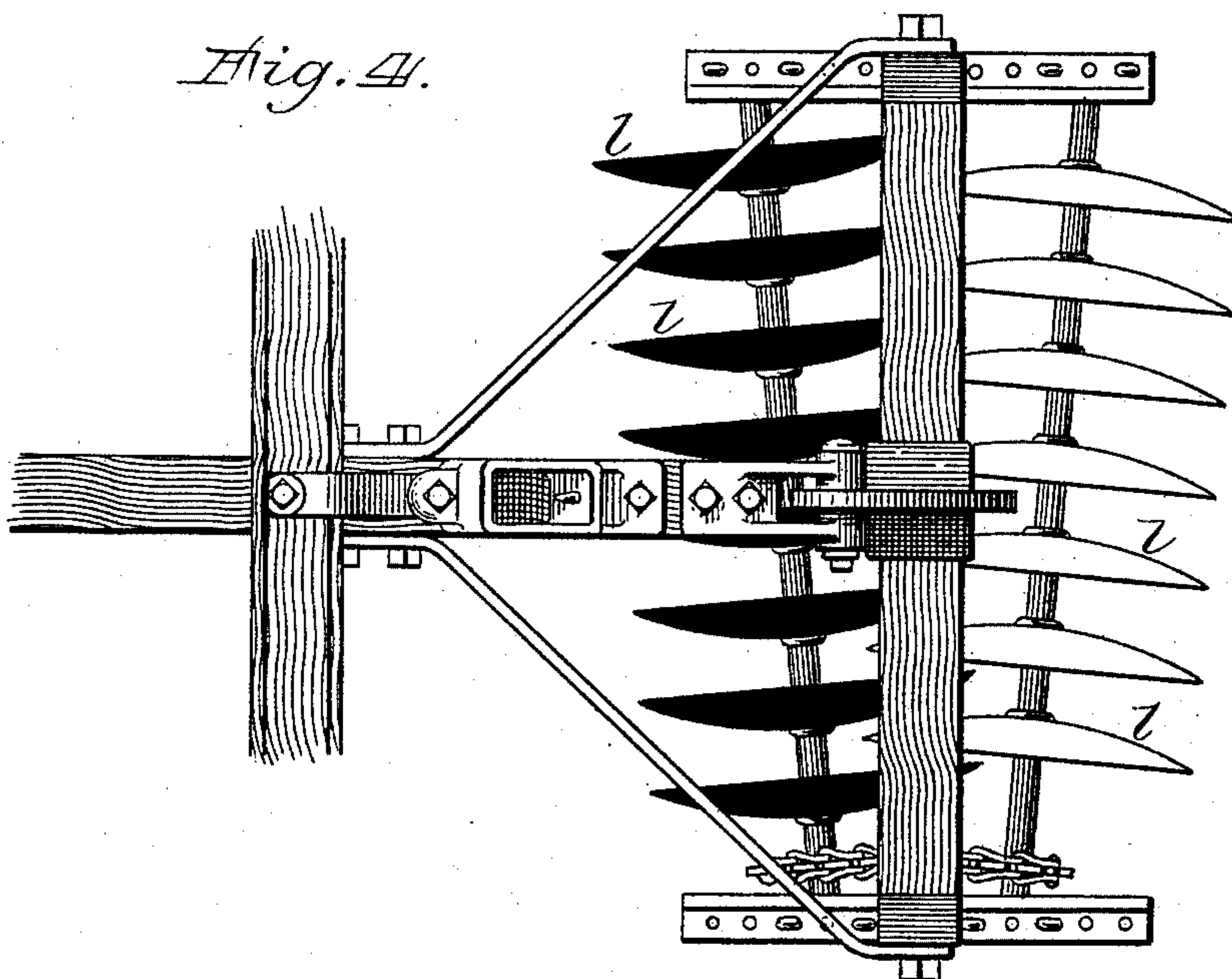
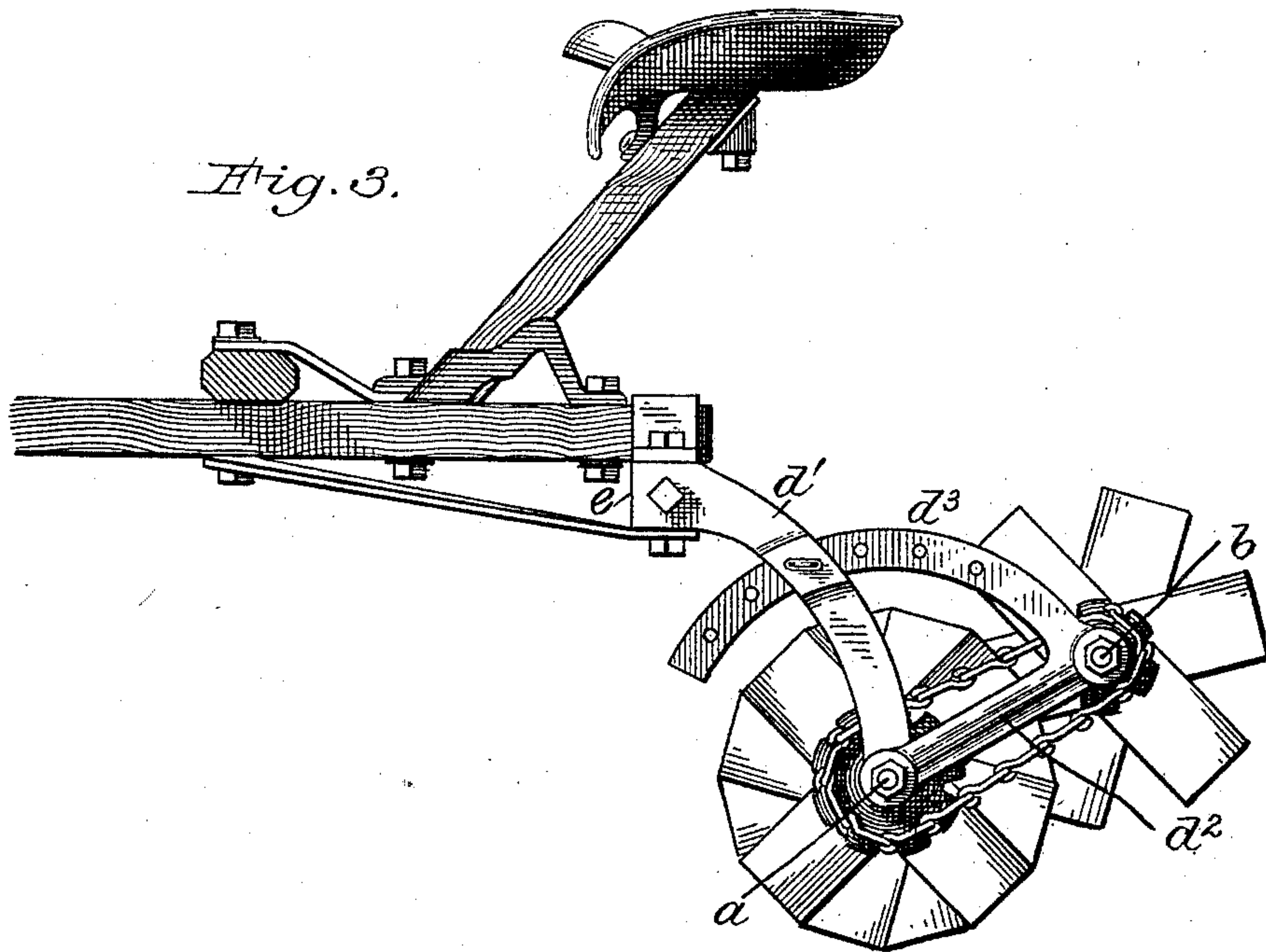
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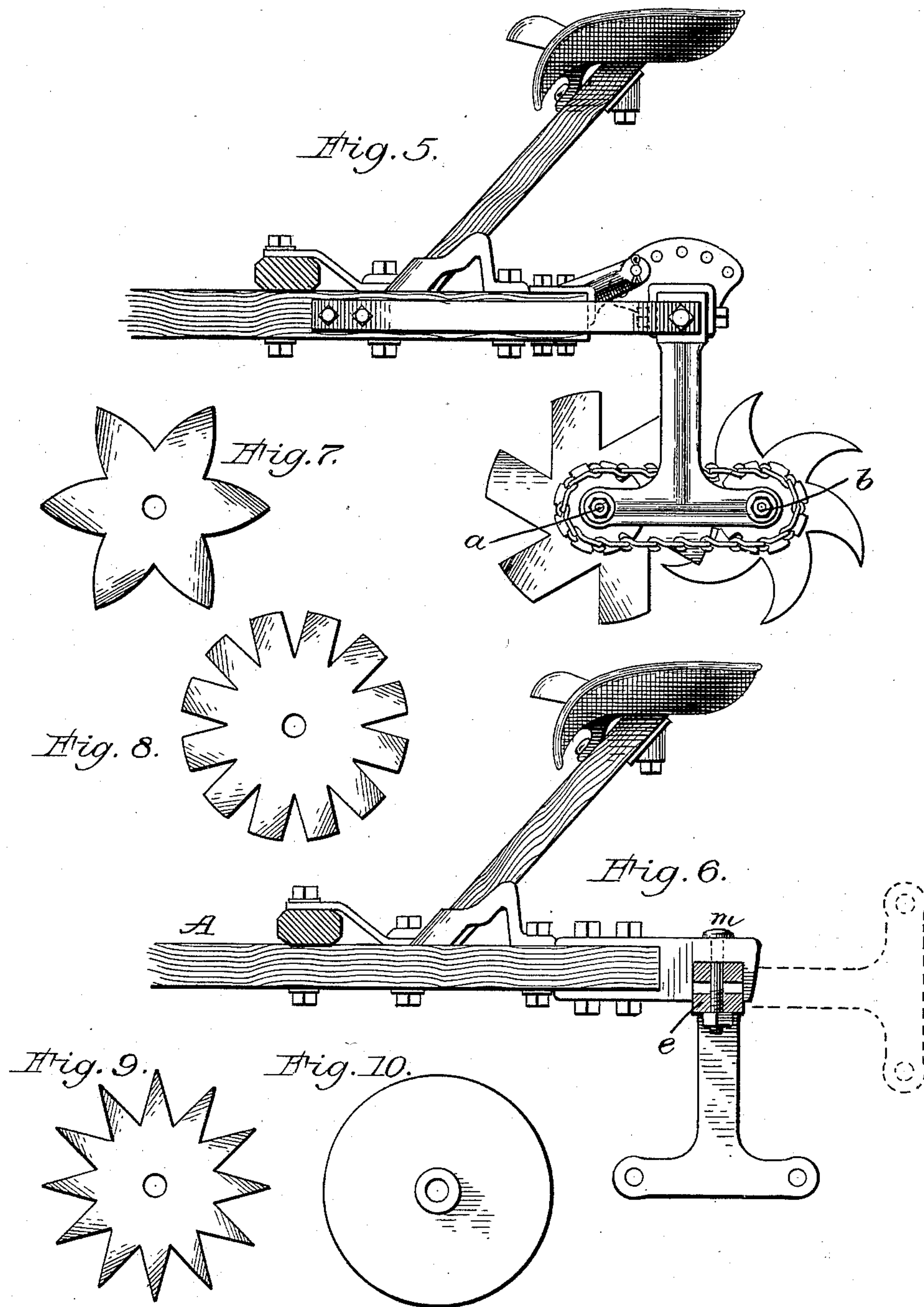
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Patented Jan. 12, 1892.



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UNITED STATES PATENT OFFICE.

GEORGE MARSHALL CLARK, OF HIGGANUM, CONNECTICUT, ASSIGNOR TO
CLEMENT S. HUBBARD, OF SAME PLACE.

HARROW.

SPECIFICATION forming part of Letters Patent No. 466,771, dated January 12, 1892.

Application filed April 23, 1889. Serial No. 308,295. (No model.)

To all whom it may concern:

Be it known that I, GEORGE MARSHALL CLARK, of Higganum, in the county of Middlesex and State of Connecticut, have invented certain new and useful Improvements in Harrows; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming a part of the same, is a clear, true, and complete description of the several features of my invention.

Harrows embodying my said improvements pertain to that class of machines in which soil-working devices are revolved; but the character of said devices may be widely varied without departure from my invention. It is well known that various soils, crops, and weeds require more or less radical variations in the form and operation of the soil-working devices for securing the best results in each case, and hence I employ many forms of disks, such as the plain, concavo-convex, corrugated, bladed and toothed, and also star-wheels of various forms, according to the particular duty for which my harrow may be intended.

A harrow embodying my invention essentially embodies two gangs of rotative soil-working devices, one in front of the other, a frame which is supported upon both of said axles, and a pole which is adjustable rigidly with relation to said frame, so that the entire weight of the frame-pole (and a driver, if desired) may be borne wholly by the front axle, or partially by both axles, according to adjustment, thus enabling wide variation in capacity for service. For affording still further capacities the two gang-axles are geared together, so that either gang of soil-workers can rotate independently of the other, although at varied speed, if desired, and either gang of soil-working devices may be made to cut deeper into the soil than the other, or the rear gang may be elevated and placed wholly out of service as soil-workers.

It is to be understood that my invention does not relate to that class of machines in which one or more sets of rotative soil-working devices are suspended in hanger-frames from main frames which are supported on the axles of carrying-wheels or on rollers,

whether plain or provided with teeth or spikes, and which serve also as means for driving the rotative soil-working devices.

Referring to the drawings, Figures 1 and 2 illustrate in side elevation and in top or plan view one of my novel harrows embodying all of the features of my invention in a desirable form. Fig. 3 illustrates in side view one of my harrows adjusted so that one gang of soil-working devices will operate upon the soil and the other gang operate as clearers. Fig. 4 illustrates in top or plan view one of my harrows in which the gang-axles are inclined to the line of draft, instead of being at right angles thereto, as in Fig. 2. Fig. 5 in side view illustrates one of my harrows in which the gangs are geared to operate at the same speed. Fig. 6 illustrates the harrow-frame and its pole arranged to admit of only two adjustments of the gangs. Figs. 7 to 10 illustrate some other of the various forms of soil-working devices suitable for use in my harrows, according to the character of work intended.

In the harrow shown in Fig. 1 there are two gangs of rotative soil-working devices, respectively mounted upon and rotatable with their axles *a* and *b*. In this instance said devices are thin twisted steel plates, substantially alike in both gangs, although the plates *c* and *c'* on the axle *a* are coupled together in pairs. The plates *c''* on the axle *b* are mounted singly thereon, but are varied in their axial relations to the axle, and they are of such length and are so arranged that their ends, as they revolve intermittingly, occupy the spaces between the pairs of plates on the axle *a*. The axles are mounted in a frame, which can be widely varied in its construction without affecting my invention. In this instance the frame has at each side a hanger-plate *d*, and these two plates are coupled together by means of a cross-bar *e*, and to the ends of said bar a pole *A* is attached by means of a yoke *f*, rigid on the pole, but pivoted at *f'* to the ends of the bar. Upon the rear end of the pole there is also a rigid forked or slotted arm *g*, provided with a lateral bolt or pin *g'*, and on the bar *e* there is a rigid segmental plate *h*, which is provided with lateral holes *h'*, and said plate so occupies the fork or slot of

the arm g that the pin or bolt g' may be placed in any one of said holes and thus enable the bar to be axially adjusted with relation to the pole and firmly secured in any one of the positions of adjustment. When the two axles occupy the same horizontal plane, both sets of soil-working devices operate in the soil to an equal depth; but it will readily be seen that either set or gang may be more or less raised and that the rear set may be wholly lifted from the surface of the ground and made to operate as a clearer for the other set for detaching such weeds, roots, and balled soil therefrom as are liable to be accumulated.

The two axles are rotatively coupled, preferably by means of sprocket-wheels i and chain k , and in some cases chains should be applied at both ends of the axles, and in others a single chain or other suitable gearing can be relied upon, and, as a rule, the chains or other gearing should be housed within a shielding-cover to prevent undue accretion of obstructive matter. As here shown, the chain-gearing is arranged to drive the rear set of soil-working devices at a higher speed than the front set; but they may operate at uniform speed, or the rear set may be revolved slower than the front set without departure from my invention. With a harrow thus organized both sets of soil-working devices may operate with uniformity as to depth or either set adjusted to operate at a higher level than the other. Being geared together, should one set lag as to rotation, the other set will assist the first.

Should one set only be needed for soil-working, the harrow can be adjusted, as in Fig. 3, the rear set then operating as a clearer, even if not geared, because obstructive matter carried by the working set would be presented to the overlying set and thereby detached. In this machine the frame includes a cross-bar e ; but the hanger-plates d' are mounted upon but one axle a , and the rear axle b is coupled to the front axle by means of links or bars d^2 . The vertical adjustment of the rear axle is effected by means of segmentally-curved arms d^3 , passing through open mortises in the hanger-plates, and pins or bolts, which occupy lateral holes through the mortises and appropriate holes in the curved arms, as clearly indicated.

It is to be understood that I do not restrict myself to the use of any special form of frame or to particular means for rendering either of the revolving gangs vertically adjustable, inasmuch as variations in such means could in no manner affect or vary the practical working of both gangs upon the soil, or one gang as clearers to the other.

It will be obvious that the character of the soil-working devices may be widely varied without affecting the main features of my invention, and that with some forms of these devices it will be desirable that the axles be inclined with reference to each other and to the line of draft—as, for instance, as shown in Fig. 4, wherein the soil-working devices are

the well-known concavo-convex disks l , these being so arranged that the side thrust of one set will be substantially balanced by that of the other when both are operating at same depth in the soil; but either set can be adjusted somewhat higher than the other. With the axles geared together it will be seen that neither gang is absolutely dependent for its rotation upon its own contact with the soil, and therefore each may at times aid the other. In this machine the boxes for the axles are longitudinally adjustable in the frame, thus providing for variations in their angular adjustment.

In some soils and under certain conditions two kinds of soil-working devices can be profitably employed—as, for instance, as shown in Fig. 5, wherein the front axle a is provided with bladed disks devised by me and disclosed in my Letters Patent No. 369,163, the blades in this instance being bent or twisted at their outer ends. The rear axle b has a set of spiral-toothed wheels. These axles may be geared for securing uniform rotation, as shown, or variably geared, it being obvious that in adapting my harrows for use in any particular kind of soil beset with any peculiar variety of weeds or grasses, it will be important that the form of the soil-working devices, as well as the relative rotation of the gangs, should be carefully considered for obtaining the most satisfactory results.

For meeting certain requirements my harrows need only be capable of working under two positions of adjustment—as, for instance, as illustrated in Fig. 6, wherein the cross-bar e is bolted directly to the rear end of the pole A , the bar having two holes at right angles to each other for receiving the bolt m , thus by one adjustment arranging both sets of soil-working devices, so that they will operate upon the soil, and with the other adjustment confining the soil-working to the front set, the other or rear set then occupying an elevated position and operating as clearing devices for the other set. In this simple form of harrow the soil-working devices will of course be varied to meet local requirements, and in some cases it will be found advantageous to employ only the front set for soil-working, and at times the other set need not be revolved at all, as when no clearing operation would be needed, as in non-adhesive soils free from heavy weeds, &c.

Among the many forms of revolving soil-working devices which can be effectively employed in my harrows is the one shown in Fig. 7, having round-pointed blades which may be either flat or twisted. Another (shown in Fig. 8) is of disk form, having sharp-pointed serrations or teeth at the periphery, and this disk may be either flat or concavo-convex. Another (shown in Fig. 9) is one of the star-wheel variety, with or without cutting-edges at the ends and edges of the arms which may be either flat or twisted. In Fig. 10 a plain flat disk is shown; but this has

value only in harrows having the angularly-
arranged axles. It will be obvious that the
teeth, blades, or arms of the soil-working de-
vices should as a rule be more or less twisted
5 or alternately offset, or bent in opposite di-
rections, when employed on axles arranged at
right angles to the line of draft, although
when the front set is mainly relied upon for
earth-working, and the rear set revolved at a
10 higher speed than the front set, the teeth of
the rear devices may or may not be thus
twisted or bent.

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

1. In a harrow, the combination of a pole
and a frame rigidly adjustable with relation
to each other, as by means of a segmental
plate with holes, and a bolt or pin, and two

gangs of rotative soil-working devices, one in 20
front of the other, in the same path, the said
frame being mounted upon the axles of both
gangs, and capable according to adjustment
of being carried wholly by the front gang-
axle, or equally by both axles, substantially 25
as described.

2. In a harrow, the combination of a frame,
a pole adjustable rigidly with relation to said
frame, and two gangs of rotative soil-working
devices which support said frame and the 30
pole, and are geared together, as described,
and adapted to operate together or separately,
and at variable depths in the soil.

GEORGE MARSHALL CLARK.

Witnesses:

ROBERT B. CLARKE,

ROBERT S. CRUTTENDEN.