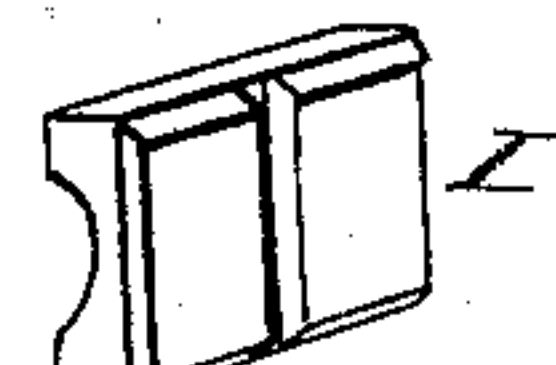
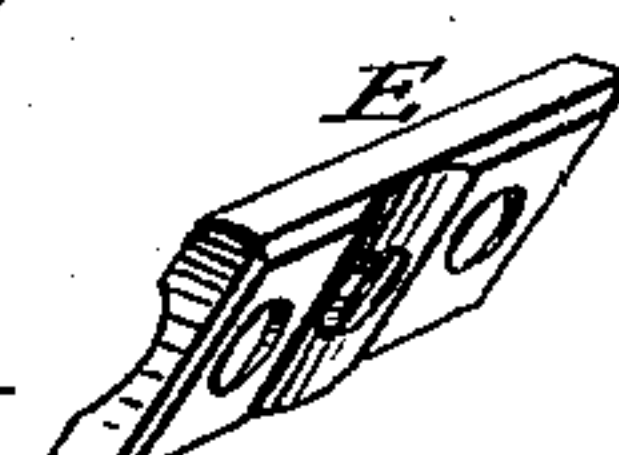
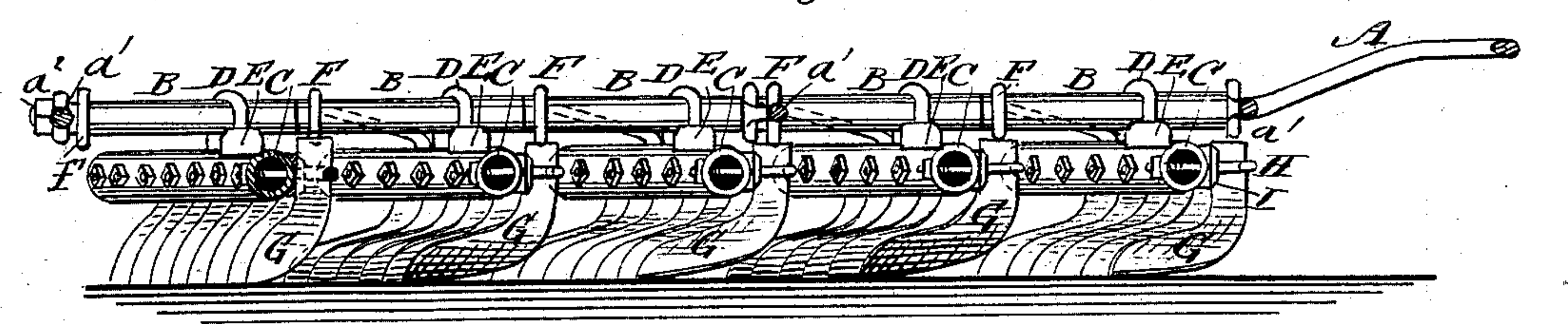
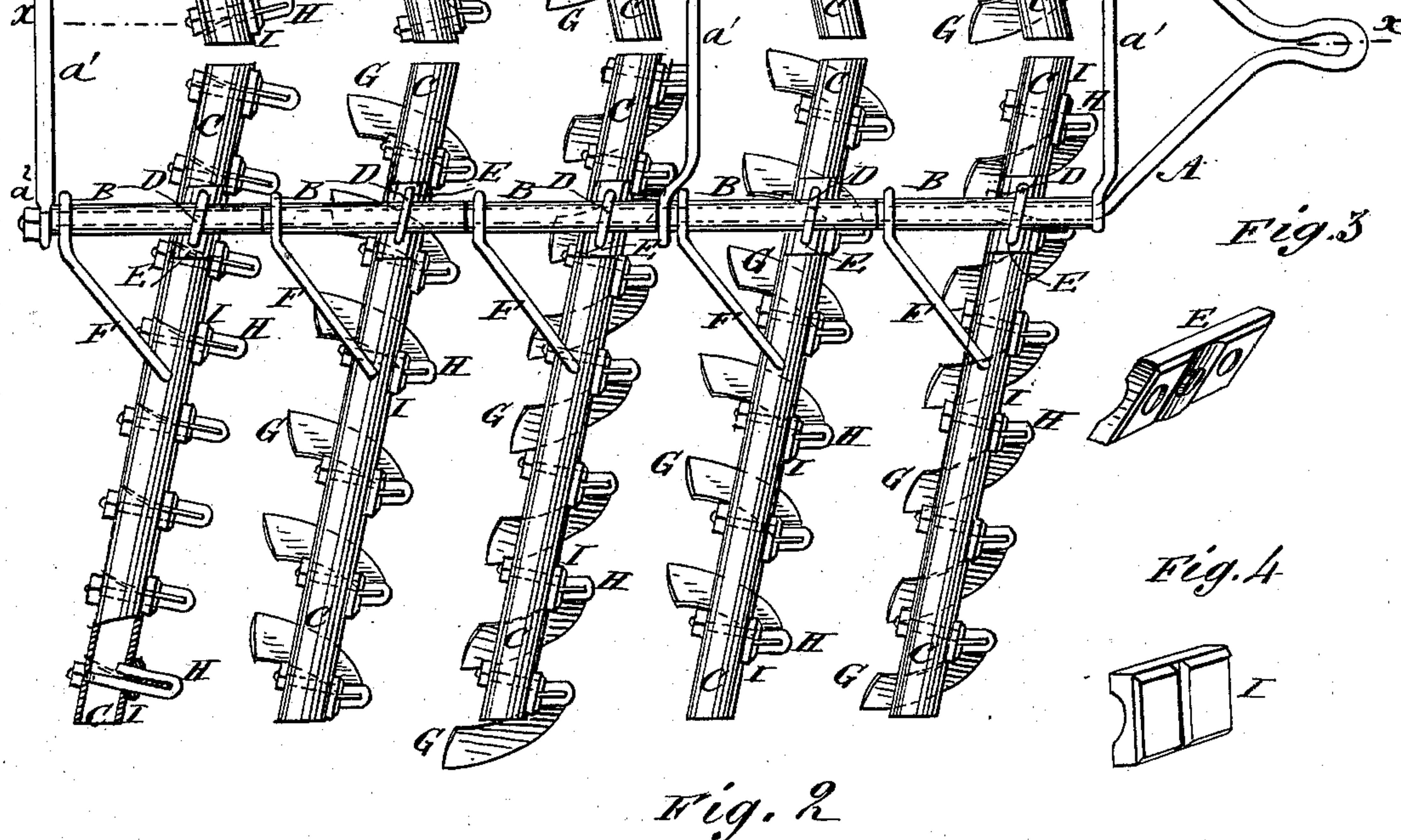
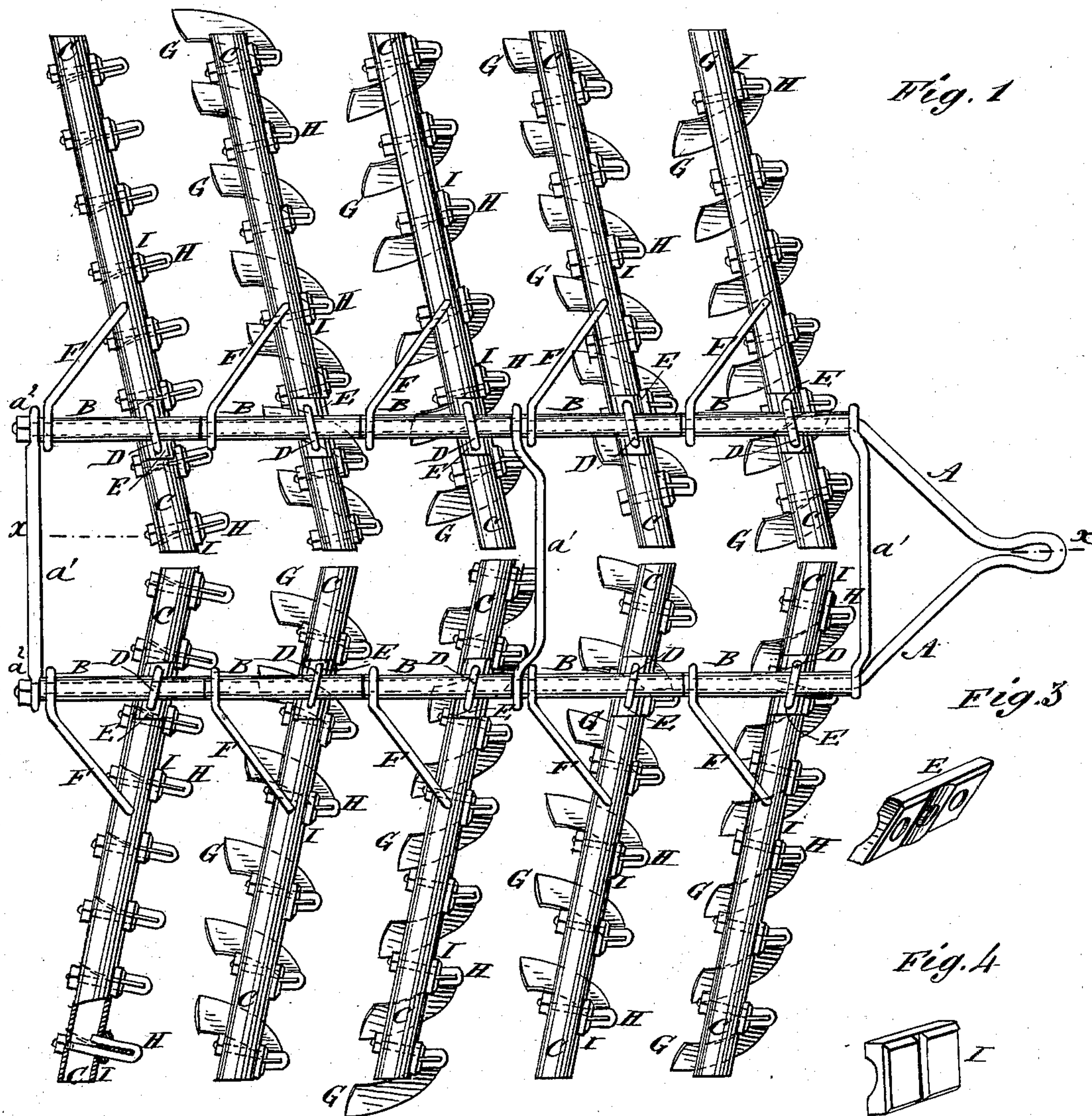


S. L. WATERS.
Harrow.

No. 219,043.

Patented Aug. 26, 1879.



WITNESSES:

C. Noveux
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INVENTOR:

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UNITED STATES PATENT OFFICE.

SAMUEL L. WATERS, OF GENOA, ILLINOIS.

IMPROVEMENT IN HARROWS.

Specification forming part of Letters Patent No. **219,043**, dated August 26, 1879; application filed April 9, 1879.

To all whom it may concern:

Be it known that I, SAMUEL LLOYD WATERS, of Genoa, in the county of De Kalb and State of Illinois, have invented a new and useful Improvement in Harrows, of which the following is a specification.

Figure 1 is a top view of my improved harrow. Fig. 2 is a vertical longitudinal section of the same, taken through the line *xx*, Fig. 1. Fig. 3 is a detail view of one of the washers for connecting the beams with the draw-rod tubes. Fig. 4 is a detail of one of the washers for connecting the knives with the beams.

Similar letters of reference indicate corresponding parts.

The object of this invention is to furnish an improved harrow for loosening, pulverizing, and smoothing land, which shall be simple in construction, convenient in use, and effective in its operation, leaving the ground in fine condition to receive the seed.

The invention consists in the harrow-frame formed of the rod bent in its middle to form a loop or bail, and having its arms parallel and connected by cross-rods, the tubes, the beams, the **U** or staple bolts, and the brace-rods; in the construction of the harrow-knife; in the blocks or washers interposed between the tubes and the beams, concaved upon their opposite sides to receive the said tubes and beams, and perforated to receive the arms of the **U** or staple bolts, and provided with a pin to enter a hole in the tubes **B**.

A is the draw-rod, which is bent together at its middle to form a bail having an eye at its center for convenience in attaching the draft. The end parts or arms of the rod **A** are straight and parallel with each other, and are connected at their forward and rear ends and middle parts by cross-bars *a*¹. Upon each of the arms of the rod **A** are placed as many short tubes **B** as there are to be beams **C** upon each side. The tubes **B** are made of a length equal to the required distance apart of the said beams **C**, and are secured in place upon the said rod **A** by nuts *a*², screwed upon its ends.

The beams **C** are also made of tubes, and each one, at a little distance from its inner end, is secured to one of the tubes **B** at a little distance from its forward end by **U** or staple

bolts **D**, which pass around the tube **B**, through the tubes **C**, and have nuts screwed upon their ends.

E are washers or collars, which are interposed between the beams **C** and the tubes **B**. The washers **E** are concaved longitudinally upon their lower sides to rest and fit upon the beams **C**, are concaved transversely upon their upper sides to receive and fit upon the tubes **B**, and are provided with a pin to enter a hole in the said tubes **B**.

The transverse grooves of the washers **E** are inclined at the angle at which it is desired to have the outer ends of the beams **C** incline to the rearward. The beams **C** are further strengthened in position by the brace-rods **F**, the outer ends of which are attached to the said beams, and their inner ends are attached to the rear ends of the tubes **B**. This construction allows the beams **C** to adjust themselves to an uneven surface of ground, each beam moving independently of the others.

G are the knives, the shanks of which are secured to the forward side of the beams **C** by the staple-bolts **H**, both arms of which pass through the forward side of the said beams, and one arm passes through both sides of the beams, and has a nut screwed upon its end.

I are blocks or washers, which are interposed between the forward sides of the beams **C** and the shanks of the knives **G**, and have holes formed through them to receive the arms of the staple-bolts **H**. The rear sides of the washers **I** are concaved horizontally to fit upon the beams **C**, and their forward sides are grooved vertically to receive the rear edges of the shanks of the knives **G**. The knives **G** are curved to the rearward and are twisted to one side to better adapt them to loosen up and pulverize the soil. The knives **G** are twisted in opposite directions upon the alternate beams **C**, as shown in Fig. 1. The knives of the rear beams are made more nearly vertical and without so much twist, and are designed to smooth off the ground after being loosened and pulverized by the knives of the forward beams.

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

1. The harrow-frame formed of the rod **A**, bent in its middle to form a loop or bail, and

having its arms parallel and connected by cross-rods a' , the tubes B, the beams C, the U or staple bolts D, and the brace-rods F, substantially as herein shown and described.

2. A harrow having bars set transversely to the line of draft, and provided with curved twisted knives G, alternately inclined toward opposite sides on adjacent bars C, as shown and described.

3. The blocks or washers E, interposed be-

tween the tubes B and the beams C, concaved upon their opposite sides to receive the said tubes and beams, and perforated to receive the arms of the U or staple bolts D, and provided with a pin to enter a hole in the tubes B, substantially as herein shown and described.

SAMUEL LLOYD WATERS.

Witnesses:

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