(No Model.)

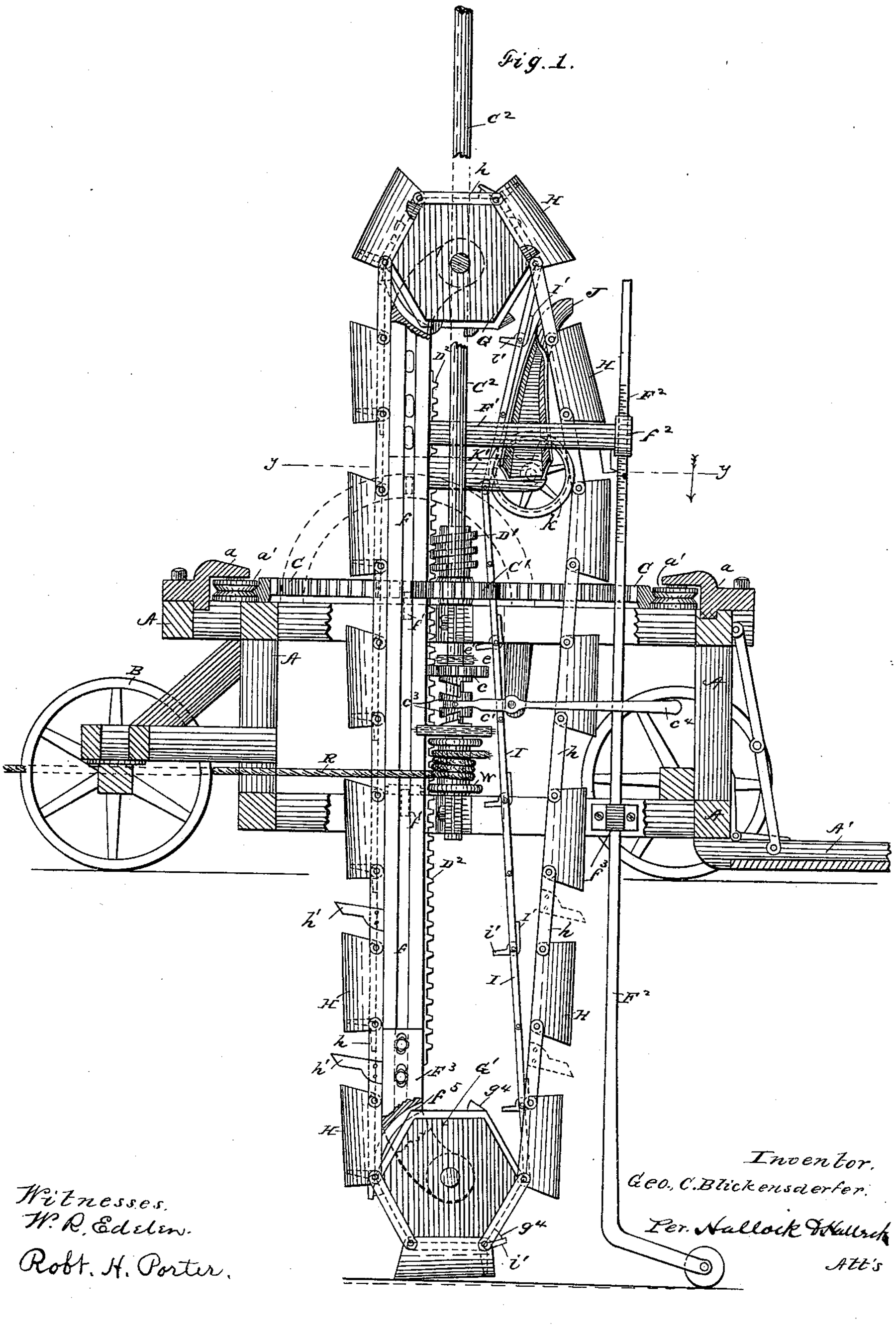
4 Sheets—Sheet 1.

G. C. BLICKENSDERFER.

EXCAVATING MACHINE.

No. 332,042. Patented Dec. 8, 1885.

Fig. 1.



Witnesses.
W. R. Edelen.
Robt. H. Porter.

Inventor.
Geo. C. Blickensderfer.
Per. Wallock & Wallock
Att's

(No Model.)

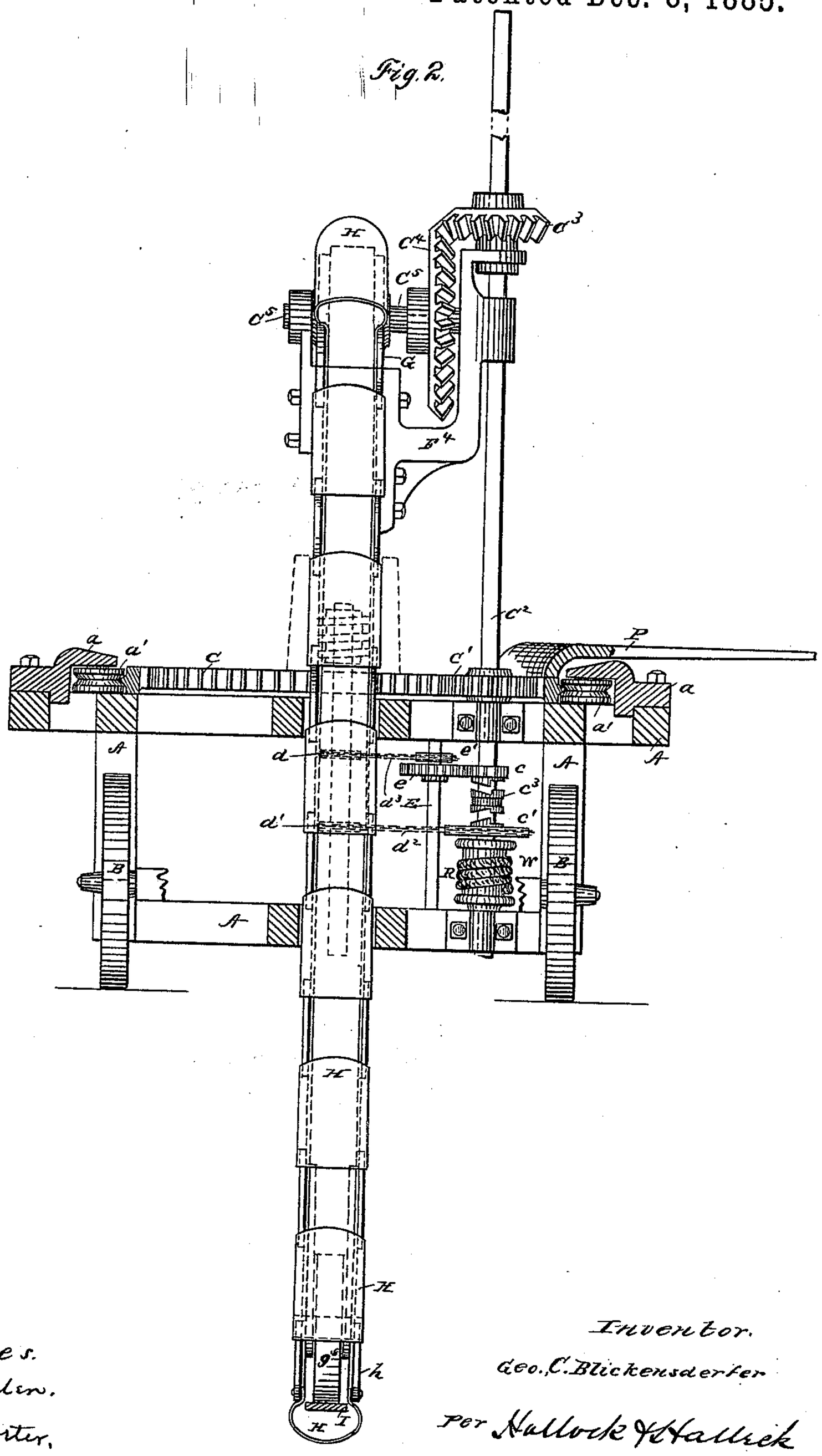
4 Sheets—Sheet 2.

G. C. BLICKENSDERFER.

EXCAVATING MACHINE.

No. 332,042. Patented Dec. 8, 1885.

Fig. 2.



Witnesses.
W. R. Eddew.
Robt. H. Porter.

Inventor.
Geo. C. Blickensderfer
per Mallock & Hallock
Att'ys

(No Model.)

4 Sheets—Sheet 3.

G. C. BLICKENSDERFER.

EXCAVATING MACHINE.

No. 332,042. Patented Dec. 8, 1885.

Fig. 3.

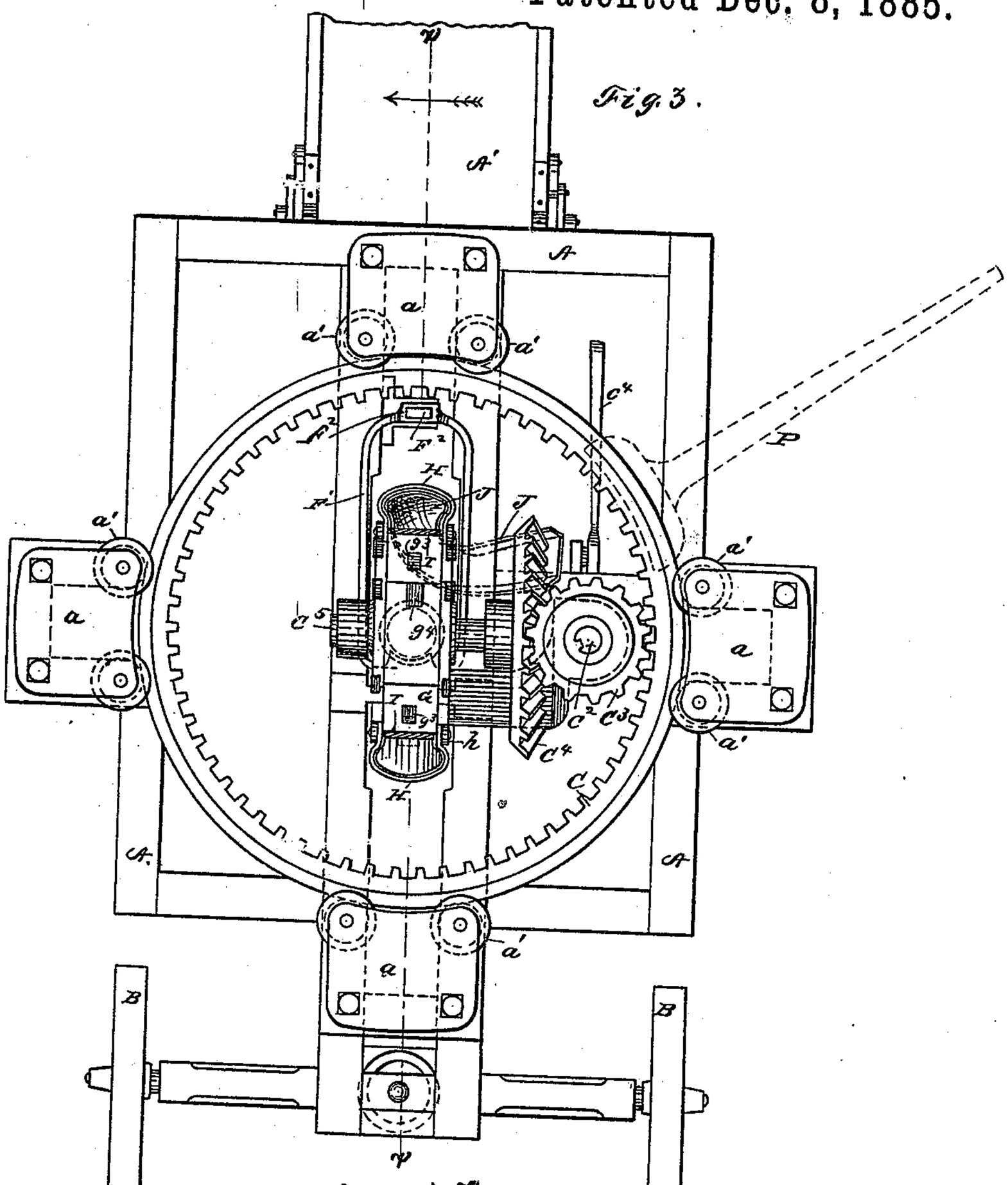
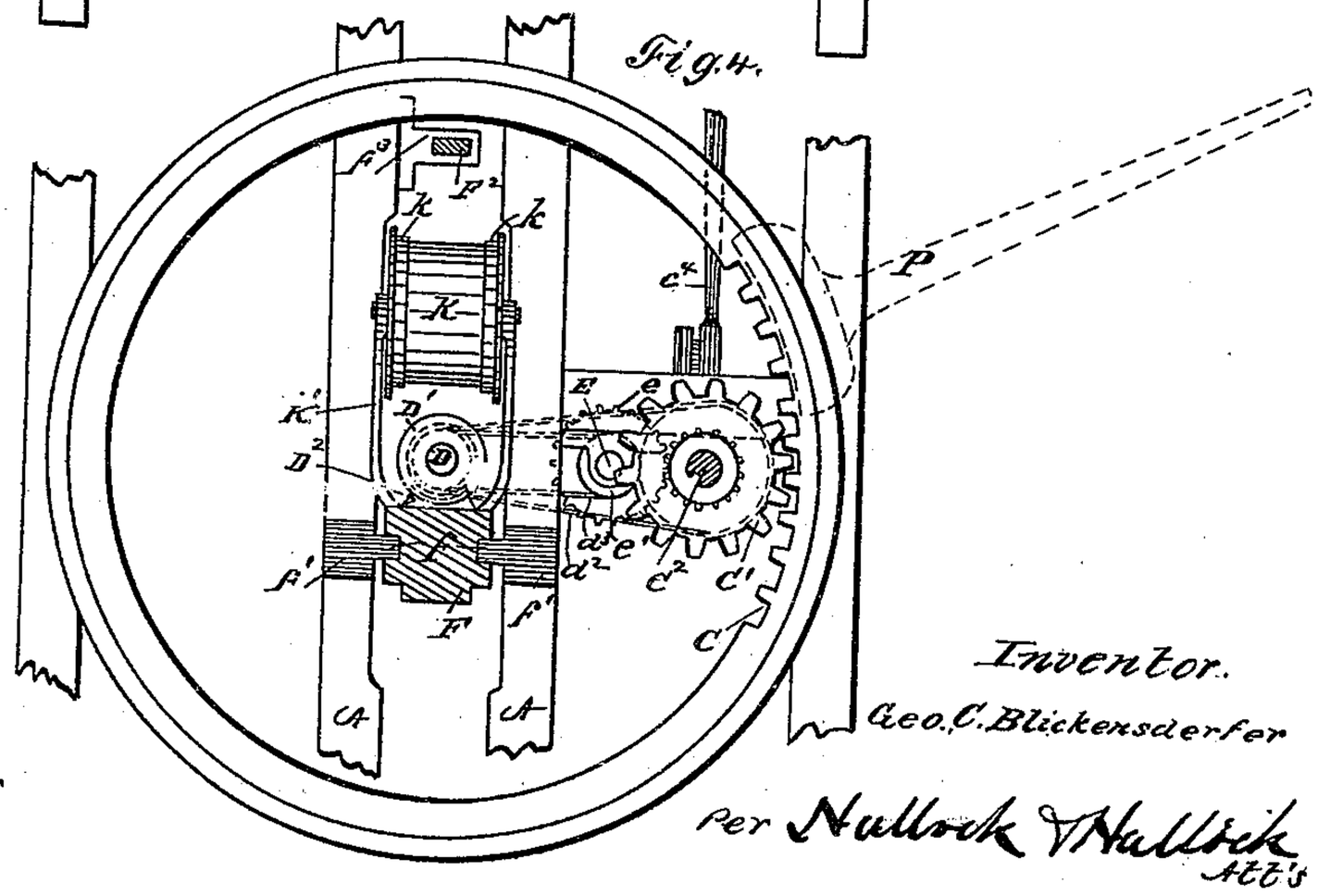


Fig. 4.



Witnesses.
W. R. Eddon.
Robt. H. Porter.

Inventor.
Geo. C. Blickensderfer
per Mullock & Mullock
Att'y's

(No Model.)

4 Sheets—Sheet 4.

G. C. BLICKENSDERFER.

EXCAVATING MACHINE.

No. 332,042. Patented Dec. 8, 1885.

Fig. 5.

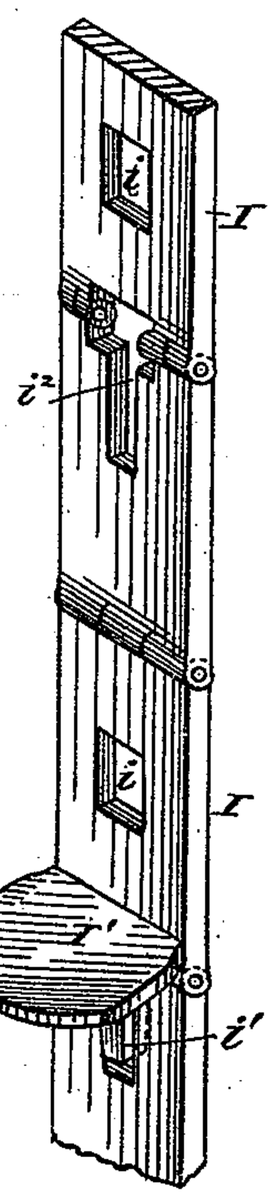


Fig. 6.

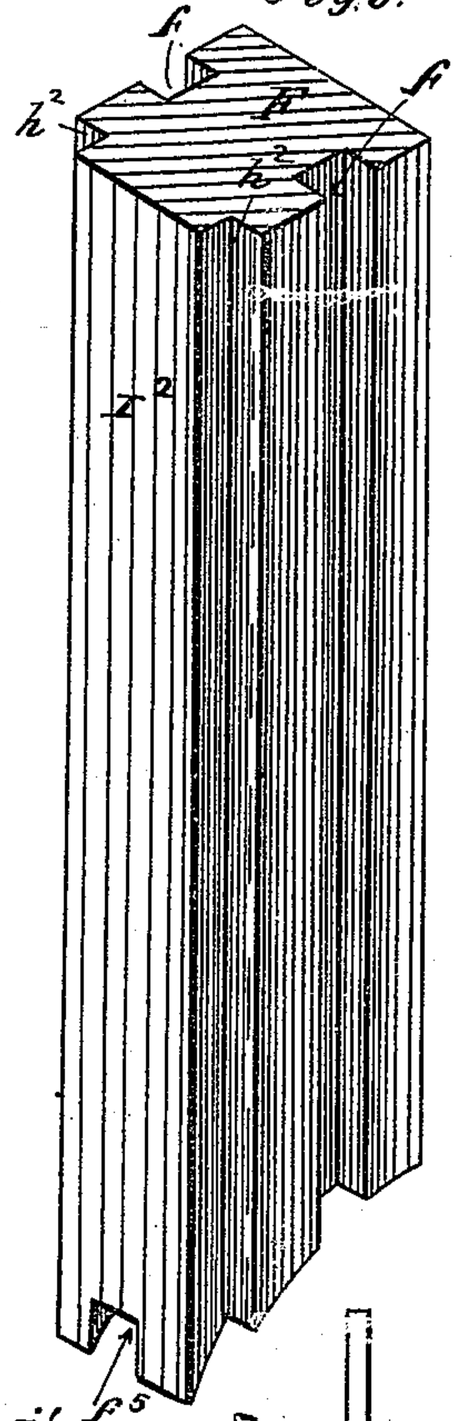


Fig. 7.

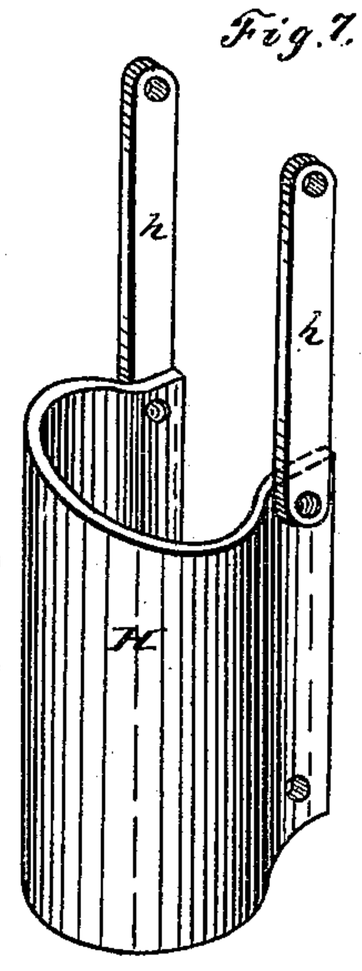


Fig. 13.

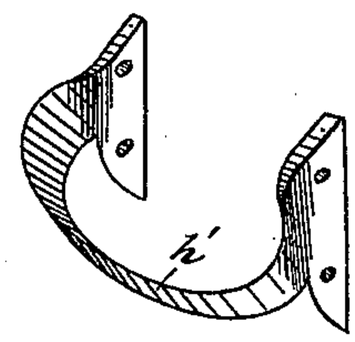


Fig. 14.

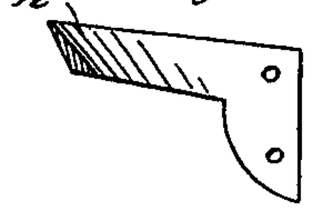


Fig. 12.

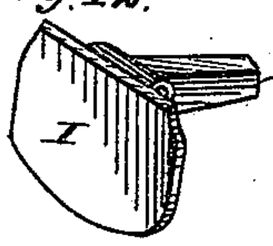


Fig. 9.

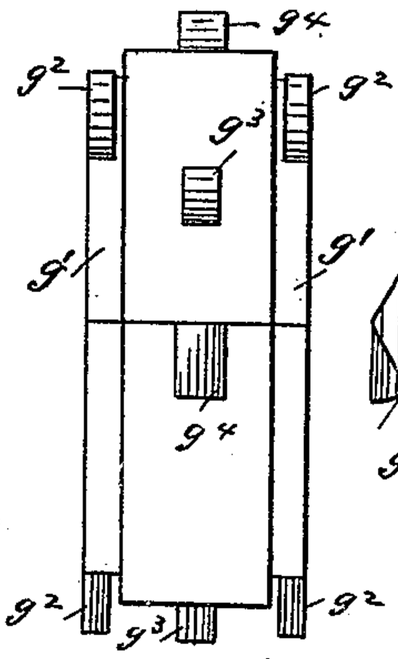


Fig. 8.

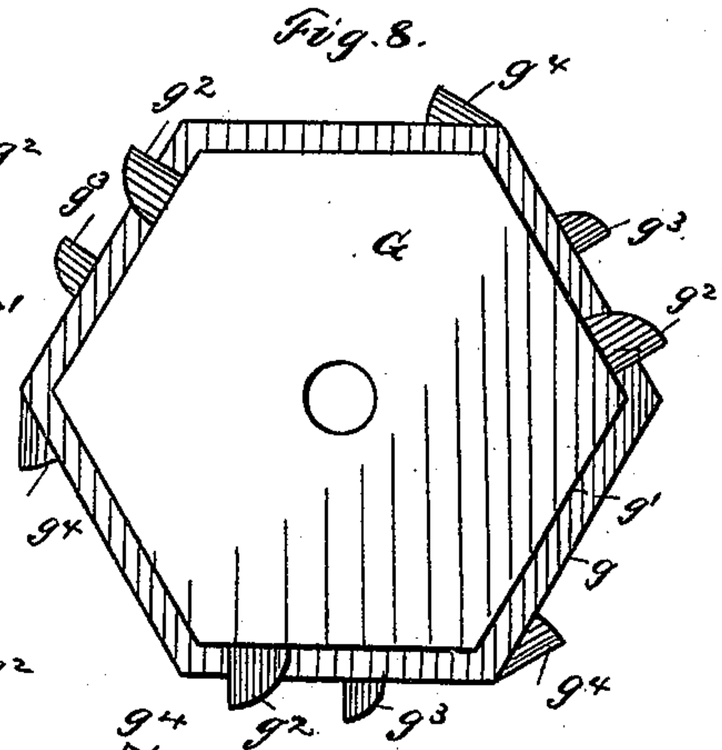


Fig. 11.

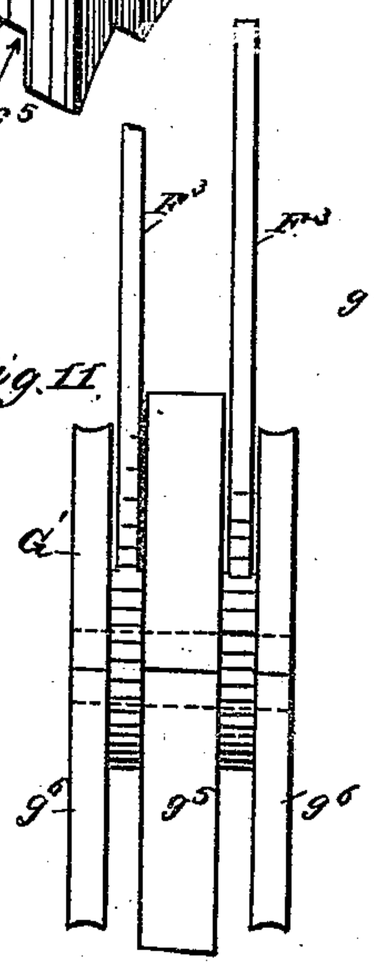
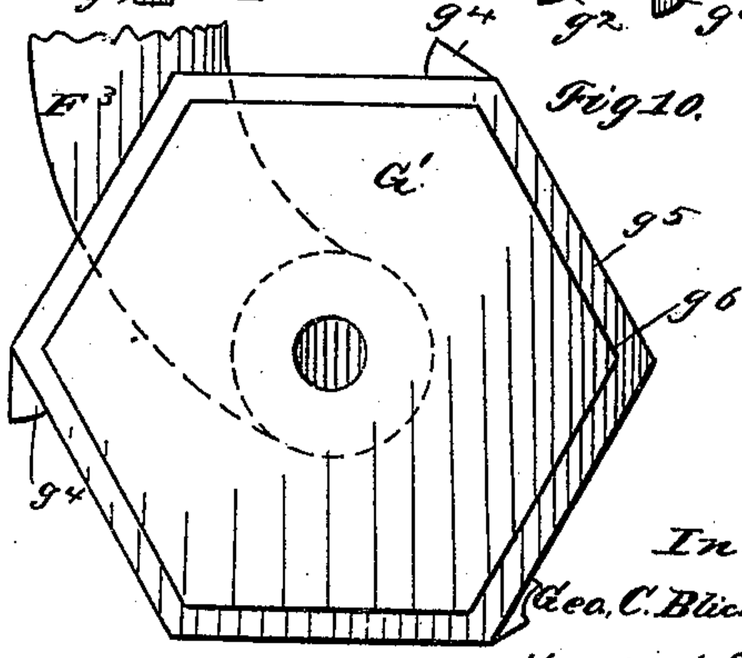


Fig. 10.



Witnesses.
W. R. Edelin.
Robt. H. Porter.

Inventor.
Geo. C. Blickensderfer
Per Hallock & Hallock
Att'ys.

UNITED STATES PATENT OFFICE.

GEORGE C. BLICKENSDERFER, OF ERIE, PENNSYLVANIA.

EXCAVATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 332,042, dated December 8, 1885.

Application filed July 25, 1884. Serial No. 138,783. (No model.)

To all whom it may concern:

Be it known that I, GEORGE C. BLICKENSDERFER, a citizen of the United States, residing at Erie, in the county of Erie and State of Pennsylvania, have invented certain new and useful Improvements in Excavating-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in excavating-machines in which a series of buckets or scoops are connected together and operated in the manner of an endless-belt conveyer; and the objects of my invention are, first, to provide a bucket or scoop which shall have one of its sides and its bottom removable from it, so as to insure a perfect clearance of earth from it at the dumping; second, to provide, in conjunction with such a bucket or scoop, a chute for receiving the dumpings, which acts as a wiper or cleaner for the bucket and clears it entirely of any adhering earth; third, a gage for regulating the grade of the excavation; and, fourth, to provide sundry minor improvements in the construction, which will fully be pointed out hereinafter.

My invention as illustrated in the accompanying drawings is adapted, principally, to excavating ditches—such, for instance, as are made for laying drain-pipes—and is shown mounted on wheels; but the same device mounted on a boat or raft will serve equally well for dredging under the water, or, if mounted on proper ways, it may also be used for general excavating work.

The accompanying drawings illustrate the device, as follows: Figure 1 is a side elevation of most of the working parts, the frame being in longitudinal vertical section on the line *x x* in Fig. 3. Fig. 2 is a front elevation, the frame being in transverse vertical section. Fig. 3 is a plan or top view, with the top scoops or buckets removed, so as to show parts below them. Fig. 4 is a cross-horizontal section on the line *y y* in Fig. 1, looking down and only showing a part of the frame-work. Figs. 5 to 14, inclusive, show details of construction, and will be referred to and explained as required hereinafter.

The construction and operation of the machine are as follows:

A supporting frame-work, A A, &c., is mounted on wheels B B, &c., and a leg-beam, F, is mounted in this frame-work, so as to slide in guides *f f'* vertically. The leg-beam is provided with sprocket-wheels G G' at each end, and it has a rack, D^2, on one side, by which it is raised and lowered by a worm-wheel, D', on a short upright shaft, D, in the center of the frame-work. A large internally-toothed gear, C, which has no hub or spokes, is mounted horizontally in sheaves *a'*, which are hung in brackets *a*, secured to the frame. This gear is provided with a lever, P, to which a horse will be attached and made to travel around the machine. An upright shaft, C^2, is mounted near one side of the frame-work, within the gear C, and geared to be operated from it by the pinion C'. A bracket, F^4, on the upper end of the leg F, supports the sprocket-wheel G, its shaft C^5, and its operating gearing, the beveled pinions C^3 C^4. The pinion C^3 is feathered upon the shaft C^2 and can slide up and down upon it, and the bracket F^4 also embraces and slides upon the said shaft C^2. In this manner motion is communicated from the gear C to the sprocket G at any point of elevation of the leg F.

The worm-wheel shaft D (seen in dotted lines in Fig. 2) is operated from the shaft C^2 as follows: A counter-shaft, E, is operated from the shaft C^2 by the gears *c e*, and by the sprocket-wheels *c'* and *d* and the chain d^3 the shaft D is revolved in a direction opposite to the shaft C^2, and I so proportion the gearing that the shaft D will revolve slower than C^2. On the shaft C^2 is a sprocket-wheel, *c'*, and a chain, d^2, connects it with a sprocket-wheel, *d'*, on the shaft D. By this gearing the shaft D can be revolved in the same direction as the shaft C^2, and I make the gearings of such a size that the shaft D will revolve faster than the shaft C^2. The purpose of thus changing the speed is that the leg may be elevated with safety at a rapid speed, while it should go down slowly. The gear *c* and the sprocket-wheel *c* on the shaft C^2 are provided each with one of the parts of a ratchet-clutch, and are mounted loosely on the shaft by an annular groove and set-screw, for instance, and a shifting collar,

c^3, feathered on the shaft C^2, can be thrown so as to bring either of the parts c or c' into action by moving a shifting-lever, c^4, which extends to the operator's stand, and by it the operator can raise or lower the leg at any time during the operation of the machine.

The means for regulating or gaging the grade of the excavation are as follows: One arm, F', extends back from the leg F at a point near its top. In the end of this arm is an opening or slot, f^2, through which passes a gage-staff, F^2, which has a foot with a roller in the bottom of the ditch. The staff is free to slide up and down in the opening f^2, and is loosely guided and held by a guide, f^3, on the framework. On the gage-staff at the point where it passes through the opening f^2 in the arm F' there is a scale laid out. If the front wheels run over a hillock, and thus lift the leg up so that the scoops will be lifted above the proper grade, the arm F^2 will be pushed down along the scale, and if the wheels run into a depression the reverse action will take place, and the operator will raise or lower the leg, as the case requires, until the scale shows the grade desired.

The means for propelling the machine consists of a winch, W, on the shaft C^2, and a rope, R, which will be fastened ahead to a stake in the line of the progress.

The construction and operation of the scoops or buckets are as follows:

H H, &c., are the scoops, one of which is shown in perspective in Fig. 7. They are formed preferably of one piece of sheet metal, bent into the form shown. They have no back or ends. They are connected together by links *h h*, which are pivoted to them, and when thus connected form an endless belt or chain, which runs over the sprocket-wheels G G'. A second endless belt or sprocket-chain, formed of the wide flat links I I, &c., is also adjusted on these same sprocket-wheels G G'. The arrangement is such that every alternate link I forms the back of a bucket or scoop. A section of this chain is shown in perspective in Fig. 5. In every alternate joint of this chain there is also pivoted a bracket or shelf, I', which is of the proper size and shape to form a bottom for the scoops. Figs. 5 and 12 show the form and adjustment of these shelves. They are provided with weighted arms i', which swing in openings i^2 in the chain-links, I. The arrangement is such that on the part of the chain which is passing down the weighted arms hold the shelves up against the face of the links. (See Fig. 1.)

The sprockets-wheels G G' are shown in detail fully in Figs. 8, 9, 10, and 11, Fig. 8 being a side view of the sprocket G, and Fig. 9 a front view, and Fig. 10 a side view of the lower sprocket, G', and Fig. 11 a front view. These wheels are hexagonal in form and are provided with faces for receiving both the chain formed of the scoops H and links *h* and the chain formed of the links I. The former rest upon the faces g' g' in the sprocket-wheel G, and g^6 g^6 in the wheel G', while the links I rest upon the faces g in wheel G, and g^5 in the wheel G'. The faces g on the wheel G are provided with sprockets g^3, which enter the holes i in the links I, and the face g' in the same wheel have sprockets g^2, which catch under the ends of the links *h*. (See Fig. 1.) In this manner the two chains are moved simultaneously. The wheel G' on the lower end of the leg F has on its face g^5 lugs g^4, which are so placed as to strike the arms i' of the pivoted shelves I', and turn the shelves so that they will enter and fill the bottoms of the scoops. (See Fig. 1.) The wheel G also has the same lugs, g^4, for keeping the bottoms I' in place while they are passing around that wheel. As the buckets pass up from the wheel G', their back edges and the links *h* slide in rabbeted ways h^2 on the leg-beam F, and the links I' lie flat upon the face I^2 of that beam. In this manner the parts of the buckets are kept in place while they are passing up. When the buckets have passed over the wheel G, (see Fig. 1,) and are ready to dump, they hang directly above a chute, J, into which their contents will fall. The upper end or nose of this chute is so arranged that it will pass directly through the shells of the buckets from end to end.

The chain, which forms the backs and bottoms of the scoops, separates from the chain carrying the shells immediately as they leave the wheel G. The separation of these two chains is effected by a double sheave, K, which is supported on arms K', which extend from the beam F. This sheave is divided into two parts—one, k', will receive the chain formed of the links I, and the other, k k, the one formed of the buckets H and links *h*. This separation of the two chains takes the backs and bottoms out of the buckets above the chute J and leaves the shells of the buckets free for the passage of the nose of the chute through them. The passing of the nose of the chute through the shells wipes them clean of all adhering particles of earth, the nose being of such a form as to fit the sides of the shells. (See Fig. 3.)

Figs. 13 and 14 are respectively perspective and section views of cutters or scrapers *h'*, which are attached to the links *h* just in front of each scoop or bucket, (see Fig. 1,) and serve to relieve the buckets of the work of digging or cutting the earth with which they are to be filled. The use of these is not essential, for the buckets may have cutting-edges on top so as to do this work; but as the cutters are liable to be nicked or broken it is much easier to replace or repair them when separate from the bucket than when attached thereto. I prefer to use them about as shown.

What I claim as new is—

1. In an excavating-machine, a scoop or bucket having its back and bottom separable from its front and side walls, substantially as and for the purposes mentioned.

2. In an excavating-machine wherein the

scoops or buckets are operated in the manner of an endless-belt conveyer, the combination of a conveyer-chain which carries the backs and bottoms of the buckets with a second chain which carries a series of shells which form the remaining sides of the buckets, substantially as shown and described.

3. In an excavating-machine, the combination, substantially as shown, of the following elements: a leg-beam, sprocket-wheels at each end of said leg-beam, having faces for two separate conveyer-chains, and two conveyer-chains running on said sprocket-wheels, one of which carries shells which form the front and side walls of the buckets or scoops, and the other the bottoms and back walls of the buckets or scoops.

4. In an excavating-machine, the combination, substantially as set forth, of the following elements: a supporting frame-work, a leg-beam guided in said frame-work and movable vertically, sprocket-wheels at each end of said leg-beam, having means, as described, for carrying two separate conveyer-chains, the arm K′, and double sheave K, connected with said leg-beam, the conveyer-chain formed of the shells H, and links *h* passing over said sprocket-wheels and outwardly over the sheave K, the conveyer-chain formed of the links I, and having the shelves I′ pivoted thereon, passing over said sprocket-wheels and inwardly over the sheave K, and finally the chute J, adjusted, as described, above the sheave K and in position to have its nose pass through the shells H as they descend.

5. In an excavating-machine, the combination, substantially as set forth, of the following elements: a supporting-frame, a driving-gear consisting of the internally-toothed rotating rim C, and a scoop-conveyer and its operating mechanism, arranged, substantially as set forth, within and vertically adjustable through said driving-gear on the line of its axis.

6. In an excavating-machine, the combination, as described, of the drive-gear C, the upright shaft C^2, arranged within and operated from the drive-gear C, a vertically-adjustable scoop-conveyer arranged within said gear C, and operated from gearing, substantially as described, on said shaft C^2, and vertically adjustable through said driving-gear C on the line of its axis.

7. In an excavating-machine, the combination, substantially as herein set forth, of a vertically-adjustable scoop-conveyer, an arm extending back from the leg-beam of said conveyer, and a gage-staff sliding loosely in an opening at the end of said arm, and having a foot trailing on the bottom of the excavation.

In testimony whereof I affix my signature in presence of two witnesses.

GEO. C. BLICKENSDERFER.

Witnesses:
JNO. K. HALLOCK,
ROBT. H. PORTER.